Exploring Relationships between Social Capital, Community-Driven Development Activities, and Education: Findings from Rural Brazil

by

Jill D. Lammert

A Dissertation
Submitted to the
Graduate Faculty
of
George Mason University
in Partial Fulfillment of
The Requirements for the Degree
of
Doctor of Philosophy
Education

Committee:

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Date: July 20, 2010

Summer Semester 2010
George Mason University
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Dedication

I would like to dedicate this to Dr. Jane McDonald—friend, mentor—whose courage, strength, and wisdom motivated me to embark on this journey, and to Dr. Marcia Grenell—advocate, confidante—whose insight, support and encouragement helped me find the will to complete it.

Acknowledgements

First and foremost I would like to thank my dissertation committee: Dr. Beverly Shaklee, Dr. Anastasia Kitsantas, and, especially, Dr. Dimiter Dimitrov, for their guidance, patience, and support. I look forward to many more opportunities to learn from you in the future!

Many thanks go to the team from the World Bank, who so generously shared their data with me so that I could conduct these analyses, and who continue to work tirelessly to alleviate poverty and improve the lives of the rural poor in Brazil and in other countries around the world.

I'd also like to acknowledge my classmates and professors at George Mason University, especially Dr. Stacia Stribling (We did it!) and Dr. Earle Reybold, for providing endless opportunities to challenge myself and the way I approach life and learning; Dr. Sonia Jurich, Michael Frye (It's your turn now!) and the rest of the team at RMC Research Corporation for being such great colleagues (and friends); my wonderful friends spread out around the world who have shared in the making of so many fantastic memories over the years (There are too many of you to name, but I'm so happy to have all of you in my life!); and my former teammates and coaches, who taught me the value of hard work, determination, and "stick-to-it-iveness," and who continue to be great sources of friendship and encouragement.

I would like to thank Arnaldo Posadas and his family: Jorge and Maria Auxiliadora; Mauricio; and Jorge Luis, his wife Adriana, and their daughters Sofia and Laura—as well as the extended Posadas and Pernalete families—for the love and support they have given me since the very first day we met.

Finally, I want to thank my parents—John and Misti Lammert and Marilyn and Doug Hume—for their loving guidance, for teaching me that it's good to ask questions, and for encouraging me to develop the skills I need to accomplish my goals. I also want to give special thanks to my sister Joy Russell, her husband Dan, and their kids Ryan, Sarah, Danielle, and Hannah; to my brother John Lammert, his wife Magali, and their kids Lizbeth, Edward, Jonathan, Dakota and Olivia; and to the other members of the extended Lammert and Fretwell families.

Your value to me goes well beyond any discussion of "social capital." This would not have been possible without all of you and I am very, very grateful.

Table of Contents

List of Tables

List of Figures

Abstract

EXPLORING RELATIONSHIPS BETWEEN SOCIAL CAPITAL, COMMUNITY-DRIVEN DEVELOPMENT ACTIVITIES, AND EDUCATION: FINDINGS FROM RURAL BRAZIL

Jill D. Lammert, Ph.D.
George Mason University, 2010
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Using confirmatory factor analysis in the framework of SEM to analyze data collected in 2005 in 864 rural households in the Northeast region of Brazil, this study provides evidence in support of the existence of a latent construct of general social capital and four latent dimensions of social capital (information and communication, collective action and cooperation, trust and solidarity, and social cohesion and inclusion). The study then utilizes a series of structural regression models to examine the relationships among social capital, having completed implementation of a community-driven development (CDD) subproject, and selected indicators of education in participating households. The study concludes with a discussion of the results and presents implications for the field of education.

Chapter 1. Introduction

> *Comparing himself with the city folk, Fabiano held himself inferior. … People talked to him only to get something out of him. The tradesmen cheated on measure, price, and accounts. The boss's figuring with pen and ink he could not understand; the last time he met with him there had been some confusion about numbers, and Fabiano, his brain awhirl, had left the office in indignation, sure he had been cheated. He took a beating from all of them.*
>
> *It was hard to think. … He had never seen a school. That was why he couldn't defend himself, why he couldn't put things in their proper place. He no sooner got that devilish business in his head than it slipped out again. It was enough to drive a man crazy. If they had only given him some schooling, he could understand it. But it was no use.* [1]

Even though I, too, grew up in a rural area, as a young woman born and raised in the United States it is difficult for me to identify with Fabiano, the unfortunate Brazilian herdsman in Graciliano Ramos's internationally-acclaimed novel *Vidas Secas (Barren Lives;* 1938/1965/1978*)*. Yet, in 1938 when the novel was written—and to some extent even to this day—Fabiano's story was typical among the rural poor living in the poverty-stricken, drought-prone Northeast region of Brazil. Numerous authors have written about the plight of the rural poor in the Northeast—of the extreme poverty, social inequality and the exploitation of workers by wealthy landlords, local elite and the political leadership (e.g., Chilcote, 1990; Ramos, 1938/1965/1978; Tendler, 1993; World Bank,

[1] Excerpts from *Vidas Secas (Barren Lives)* by Graciliano Ramos (1938/1965/1978, pp. 77 and 33 respectively).

1974, 1975)—but oftentimes a simple story can make a point so much more clearly: Without education, there is little hope for the poor.

Organization of this Study

This dissertation is organized into five chapters. After presenting a brief statement of the problem and the purpose and significance of the study, I provide some background information about Brazil, the Northeast region, and the World Bank community-driven development (CDD) program. This is followed in Chapter 2 by a review of the literature on social capital and its links to education, with a primary focus on international education development. Chapter 3 outlines the study methodology and data analysis techniques. Chapter 4 presents the results of the data analyses, and Chapter 5 wraps up with a discussion of the findings, conclusions, and implications for education.

Statement of the Problem

The excerpts from Ramos's (1938/1965/1978) novel above serve as simple, yet powerful examples of the way social exchanges and (lack of) information can affect a person's beliefs regarding other people's motivations, feelings regarding the trustworthiness of others, and sense of empowerment. Moreover, it shows the importance of education as a way to improve a person's understanding of common societal interactions and a means to improving one's lot in life. These elements form the foundation of the concept of social capital—a topic that has received much attention in the past two decades among researchers in the social sciences and those working in international development.

A comprehensive cross-country series of studies of drivers of sustainable rural growth in Central America (World Bank, 2004a, 2004b, 2004c) found that *education "has the most consistently positive impact on household welfare of all of the assets included in the study*" (i.e., natural, physical, financial, human, social, political, institutional, and location-specific assets, p. xv, italics added) and that the effects are both direct and indirect. "However, *the impacts of education on poverty reduction depend on other key productive assets*, such as land, infrastructure, productive capital, and location" (World Bank, 2004c, p. xv, italics added). Therein lies the problem: Rural areas typically have lower literacy rates and more problems related to educational access and quality than urban areas, while simultaneously suffering from a lack of these very productive assets that, according to the World Bank study cited above, serve to increase the impact of what little education is available. "Rural poverty and related characteristics, such as geographical isolation and the need to use children as domestic labor, severely limit the time children have to prepare for school, if they get to go at all" (World Bank, 1999, p. 38). Access to education for rural children is particularly limited at pre-school and post-primary levels. This is explained by low demand—itself a consequence of rural poverty—as well as inadequate supply of educational services (World Bank, 1999).

Providing further indication of a vicious cycle perpetuating poverty in rural areas, problems related to limited access to basic services such as health and nutrition are aggravated by the generally low educational attainment of rural women. High illiteracy rates such as those found in rural areas have been strongly correlated to high fertility rates, poor interaction between children and their caregivers, and high child mortality

rates. Clearly, rural children are at a disadvantage before they even enter the educational system (World Bank, 1999).

These patterns are unmistakable in Brazil. One of the largest countries in the world in terms of population, landmass, and economy, Brazil has more than 190 million people and covers an area of 8.5 million square kilometers (World Bank, 2008). Despite significant improvements in key poverty indicators, such as decreasing infant mortality (from 50 per 1,000 live births in 1990 to 19 per 1,000 in 2008); increasing net enrollment in basic education (from 86% to 89%) and increasing access to improved water sources (from 83% to 91%; World Bank, 2008), Brazil is still characterized by extreme levels of income inequality and poverty rates are higher than in other countries with a similar level of per-capita Gross Domestic Product (GDP). In 2008, 22% of the population was below the poverty line. Data collected in 2001 indicated that almost 20% of the population was living on less than US$2 a day and 8% lived on less than US$1 a day (World Bank, 2007).

Poverty is widespread in rural areas, particularly in the Northeast region[2] which is the focus of this study (World Bank, 2003a). As can be imagined, the rural poor in Brazil are worse off than the rest of the population in terms of access to basic infrastructure and services (e.g. electricity, health care, safe and sufficient drinking water, paved roads, and crop irrigation). Educational achievement, access and quality are also significantly worse in rural areas (World Bank, 2003b).

[2] The Northeast region is comprised of nine states (Maranhão, Piauí, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Bahia) and part of a tenth (Minas Gerais).

Exacerbating these problems, Brazil generally, and rural Brazil in particular, has a long history of centralized power and decision-making. At the local level, political and landowning elites have traditionally dominated formal and informal decision-making processes, opposing participatory governance and supporting policies that served to increase their dominance over the rural inhabitants (see, for example, Chilcote, 1990; Tendler, 1993). Like Fabiano, whose "boss's figuring with pen and ink" left the poor herdsman confused about what he should have been paid and sure he had been cheated, the rural poor often have had little choice but to work as sharecroppers or other "hired hands," lacking control over their earnings or even their lives.

Decades of government investment and development assistance from international organizations have led to positive changes in both the causes and consequences of rural poverty. In the rural Northeast, a large-scale community-driven development (CDD) program financed by the World Bank in conjunction with the Brazilian government has been an important contributor to these changes. The CDD approach to rural development employed in Brazil—hereafter referred to as the Program—places power, responsibility and financial resources directly into the hands of participatory community associations (CAs). The CAs, in turn, identify and decide upon their priorities for development investment subprojects (such as rural electrification, sanitation, or construction of health posts or school buildings); procure services and/or goods; monitor subproject implementation; maintain transparent records of the process; and are accountable for the results (See Appendix A for a more detailed description of the CDD Program design). Additionally, both decision-making authority and program funding have been

decentralized from the federal government to the states, thereby encouraging local participation (World Bank, 1993). All the states in the Northeast have implemented development projects using the CDD approach, with small variations among states and with continuous improvements based on program implementation experience and lessons learned (Coirolo & Lammert, in press)[3].

By 2008, the CDD program had reached approximately 11 million rural poor with infrastructure, social and productive investments, and there is evidence that it has made a significant impact on the quality of life of beneficiaries (Binswanger et al., 2006; Coirolo & Lammert, 2008; Dongier et al., 2002; van Zyl, Barbosa, Parker & Sonn, 1995; van Zyl, Sonn & Costa, 2000). More than 100 evaluations and studies of the Program have been conducted thus far, including mandatory World Bank supervision reports; World Bank Quality Assurance Reviews; studies contracted by the different Brazilian states to evaluate their individual project performance (e.g. Faculdade Latino-Americana de Ciências Sociais-FLACSO, 1998; Hydros Engenharia e Planejamento Ltda., 2004; Cooperativa Interdisciplinar de Serviços Profissionais Ltda.-INTERCOOP, 1998; Matos Filho, Pires da Cruz, Moraes de Souza & Roldán de Braceras, 2005a, 2005b); independent research studies (e.g. Matos Filho, 2002; Menezes-Filho & Vasconcellos, 2004); and studies commissioned to examine overall Program performance (e.g. van Zyl, Barbosa et al., 1995; van Zyl, Sonn & Costa., 2000).

[3] Although I worked as a consultant for the World Bank on a project to document the work of the CDD Program in Brazil (Coirolo & Lammert, in press), I had no involvement with the program management and did not participate in the design, data collection, or analysis of the impact evaluation study from which the data for this dissertation originated (Binswanger et al., 2006).

The results of these studies are mixed, but there is clear evidence in all of them that the CDD program has made important achievements in terms of providing access to basic infrastructure and services to the rural poor. Moreover, an impact evaluation conducted in 2005 by Binswanger et al. (2006) concluded that, in addition to bringing essential small-scale, sustainable, infrastructure to rural areas and delivering high-quality services at lower costs, the CDD program encourages inclusion, improves beneficiaries' quality of life, possibly impacts income and physical capital, and creates social capital and improves local governance. It is this link between community-driven development activities and social capital that the current study seeks to investigate further.

Purpose and Significance of the Study

Purpose. The purpose of this study is twofold. First, using data collected during the impact evaluation of the CDD Program conducted in 2005 (Binswanger et al., 2006), I seek to provide validity evidence in support of a theory that social capital has two general dimensions (cognitive and structural social capital) that underlie six primary dimensions (e.g. Grootaert, 2001, 2003; Grootaert, Narayan, Jones, & Woolcock, 2004; Grootaert & van Bastelaer, 2002a, 2002b; Krishna, 2000; and Uphoff, 2000). I then investigate the relationships among social capital, having completed implementation of a CDD subproject, and selected indicators of education in participating households. Accordingly, I seek to answer the research questions listed below.

Research questions.

- Do the data collected in Northeast Brazil in 2005 support the validity of the theory-based model that social capital has two general dimensions—cognitive and

structural—that underlie the following primary dimensions: trust and solidarity, collective action and collaboration, social cohesion and inclusion (cognitive elements), groups and networks, information and communication, and empowerment and political action (structural elements)?

- RQ2: Does living in a community that has completed implementation of a CDD sub-project lead to greater levels of social capital among households participating in the study?
- RQ3: Is there a relationship between the level of social capital, completion of CDD subproject implementation, the parents' level of education, and the educational enrollment of children among households participating in this study?

Significance of the study. As will be seen in Chapter 2, there is still considerable debate regarding the definition of the concept social capital among researchers and theorists in the field. This study uses structural equation modeling (SEM) to test the fit of the data collected in Brazil in 2005 to a model of social capital that has gained popularity among writers on the topic in the field of international development (e.g. Grootaert et al., 2004). Moreover, it examines whether living in a community that has completed implementation of a CDD subproject has a positive effect on the level of social capital in participating households. A major advantage of structural equation modeling is that it allows researchers to test direct and indirect effects of variables in complex multivariate models while explicitly accounting for measurement error—something "classical linear models" cannot do (Raykov & Marcoulides, 2006). Consequently, this study's findings

will inform both theory and practice regardless of statistical significance and implications of the results.

The relevance of this study to the field of education stems from the very foundation of the concept of social capital. As will be seen in the next chapter, two of the principal theorists, Pierre Bourdieu (1985, 1989) and James Coleman (Coleman et al., 1966; Coleman & Hoffer, 1987; Coleman, Hoffer, & Kilgore, 1982), became interested in the concept of social capital after observing differences in educational achievement among children of different social classes. Since then, numerous researchers have found that increased social capital is linked to improved outcomes and greater community engagement in education (e.g. Adams, 2006; Park & Sandefur, 2006; Ross & Lin, 2006). By exploring the relationship between social capital and education in the context of rural Brazil, this study builds upon and extends previous research in this field. Furthermore, by identifying any direct and indirect effects among social capital, implementation of a CDD subproject, and educational outcomes, the study will provide information to international development practitioners and policy makers that may aid in their decision-making and investment choices.

Before moving on to the review of the literature, I would first like to provide some additional background information about Northeast Brazil and the World Bank's CDD program.

Background[4]

Poverty in the Northeast. Northeast Brazil contains the single largest concentration of poverty in Latin America. Its size—just 16% of Brazil's total—is equivalent to roughly that of Germany, Italy, Spain and France combined. According to the latest Brazilian census data, the Northeast is home to approximately 27% of Brazil's total population yet *more than 60% of all Brazilian poor and about 70% of the country's rural poor live in the region* (Instituto Brasileiro de Geografía e Estatística-IBGE, 2000). Of this total, 83.6% live in remote, isolated, sparsely populated, and low productivity areas (World Bank, 2003a). Rural poverty in the Northeast is fostered by a relatively weak natural resource base, frequent droughts, low labor productivity, high illiteracy rates, poor quality and coverage of education, poor access to basic infrastructure and services, skewed land distribution, poorly functioning rural financial markets, and relatively large family size (World Bank, 1975; 2003a).

Socioeconomic indicators have traditionally been worse in the Northeast than in other regions of Brazil. Per capita income in the region as a whole is less than half of Brazil's, while in rural areas income levels are only 10% of the national average. In 2003, of the 16.8 million people in rural communities of the Northeast, 6.8 million (40%) were scraping by on about US$1 per day, and 9.4 million people (56%) lived on around US$2 per day (World Bank, 2003b). Key indicators for the region reflect a lack of access to basic infrastructure and services (e.g. safe and stable water supply, electricity, sanitation) that has persisted over time. By 2003 these indicators had improved, but in all cases they

[4] This section is adapted from Coirolo & Lammert, in press.

remained lower compared to the rest of the country, despite demonstrating generally higher growth rates (World Bank, 2003a). Table 1 contains information on key socioeconomic indicators in the rural Northeast.

Table 1

Socioeconomic Indicators in the Rural Northeast (1981, 1992, 2004)

Indicator	% of rural population		
	1981	1992	2004
Water supply through public water distribution system	3.1	8.4	17.8
Water supply through well or small spring	1.1	3.2	13.7
Electricity	12.6	37.2	75.3
Public sanitation system	0.7	2.4	1.4
Septic tank	1.7	3.2	8.0
Radio	n.a.	67.0	76.0
Television	n.a.	19.2	59.7
Refrigerator	6.0	14.8	43.5
Illiteracy (15 years or older)	57.1	50.2	37.7
Illiteracy (10 years or older)	57.1	49.4	34.0

Source: Consultoria Econômica e Planejamento, 2005.
n.a. = Information not available

Education indicators in the Northeast have lagged behind the rest of the country as well. In 2004 the illiteracy rate in the rural Northeast was 37.7%—significantly higher than rural Brazil's rate of 25.8%. Furthermore, in 2003 the average number of years of schooling in Northeast Brazil was 5 years, compared to 6.4 years in the rest of the country (Consultoria Econômica e Planejamento, 2005). The quality of education is also poor. In the rural Northeast, 27% of teachers have not completed primary education, while 26% of schools lack sanitation. Moreover, 85% of school enrollments in the rural areas is concentrated in the first four grades, compared to 50% for the rest of the country. Finally, repetition rates are high and standardized achievement scores are the lowest in the country (World Bank, 2003a).

Governance and political context. From 1964 to 1985 Brazil was under military rule, with power and decision-making concentrated in the federal government. State governors were often appointed by the federal government and state and local agencies had little autonomy in terms of decision-making about budgetary use or development programs. On the local level, formal and informal decision-making processes were dominated by a politically-conservative absentee-landlord elite who owned most of the land, supported the military-led central government, controlled state and local governments, and were opposed to participatory governance (see, for example, Chilcote, 1990). The military dictatorship in Brazil ended in 1985, but the centralization, the top-down approach to government policies and programs, as well as the lack of participation at the local level, continued. In 1988 a new Constitution was ratified, approving different measures of decentralization and increasing—on paper at least—the role of states and

municipalities in the management of their own affairs. Although responsibilities were transferred to the state and municipal levels, in practice the resources needed to implement them did not necessarily follow (van Zyl, Sonn et al., 2000; World Bank, 2003a).

In fact, years later a study conducted by Kottak, Costa and Prado (1994) found that Northeast rural poor communities still suffered from (a) a long-standing tradition of dependence on local elites, (b) low levels of social capital and community organization, (c) lack of a tradition of citizenship, (d) distrust in relation to the State, and, (e) the ability of local and regional elites to reap the benefits of government investment and control institutional civil representation.

Since 1993, intense investment by the Brazilian government and the World Bank in development projects targeted at reducing poverty, economic growth, and improving local participation and governance has had positive results. This is discussed more fully in the next section.

Using community-driven development to combat poverty in Northeast Brazil. As highlighted above, poverty and inequality have been persistent challenges in the Brazilian Northeast. The region first raised the attention of policy makers during severe droughts in the 19th century, but most development activities have taken place over the last 60 years. Initial government efforts in the region centered on attempts to deal with one of the most important problems for agricultural production and rural development in the region: the recurrent droughts. The decade of the 1960s saw a primary focus on programs aimed at industrialization of the Northeast; during the 1970s rural

development activities targeted at small producers received greater emphasis (World Bank, 1975). Over time, however, growing recognition of the socioeconomic origins of rural poverty led the government to shift its focus away from activities targeted at reducing the effects of droughts toward multi-pronged regional development programs, otherwise known as integrated rural development (IRD) programs.

Community-driven development in Brazil. The approach to CDD adopted during the initial World Bank pilot program had five guiding principles which formed the foundation of all subsequent CDD projects implemented in Brazil: (a) use simple, explicit and easily-monitored poverty targeting mechanisms; (b) decentralize decision making and involve local authorities as participants; (c) maintain transparent decision making at all levels; (d) stress community participation in identifying, executing, operating and maintaining their priority subproject investments; and, most importantly, (e) give money for implementing approved subprojects directly to beneficiary communities (Coirolo & Lammert, in press).

Community-driven development differs from community-*based* development in that CDD gives direct control over decision making and resources to participating community associations so that they can implement a subproject investment of their choosing, while community-based development "is an umbrella term for projects that actively include beneficiaries in their design and management" (Mansuri & Rao, 2004, p. 2). According to the World Bank (2005a), "CDD programs operate on the principles of local empowerment, participatory governance, demand-responsiveness, administrative autonomy, greater downward accountability, and enhanced local capacity" (para. 1).

In the next chapter, I first present a brief summary of the results of a few comprehensive studies investigating the performance and impact of the CDD program in Brazil. This is followed by a review of the literature related to the foundations of social capital theory and to measurement of social capital in the field of international development. Finally, I explore research into the link between social capital and education in the context of international development.

Chapter 2. Literature Review

It is not within the scope of this paper to conduct a detailed review of the research on the World Bank's community-driven development (CDD) Program in Brazil, but presented below are summaries of the results of a few studies whose purpose was to do just that.

The first, a study by van Zyl, Sonn et al. (2000) concluded that the CDD Program provided significant benefits to beneficiaries while better targeting the poorest segments of the rural population. Living conditions of participating community associations improved, particularly in terms of access to basic infrastructure and improved health indicators. Additionally, investments funded by the Program largely satisfied genuine community needs, were of good or satisfactory technical quality, and were less costly than projects of similar type and quality when executed by public agencies (municipal, state and federal).

In addition, a number of studies found that the CDD approach promoted community organization and empowerment, increased transparency, and demonstrated that rural communities could influence the allocation of resources at the municipal level to alleviate poverty—all of which are considered to be elements of social capital. Furthermore, the large scale implementation of the Program demonstrated that CDD

could be replicated and could mobilize additional funds from municipalities to communities (Kottak & Costa, 1994; Kottak, Costa, & Prado, 1994; van Zyl, Barbosa et al., 1995).

Another study conducted by the World Bank (2005b) had mixed results regarding the Program's impact on the processes of community participation and social capital formation. Using data collected in the Northeast state of Rio Grande do Norte—also included in the data for the present study, the results indicated that: (a) only a small fraction of those interviewed in beneficiary communities were formally involved in decision-making relating to subprojects; (b) the local populations demonstrated little sense of the concept of accountability; and, (c) interview participants' perceptions of changes in the capacity of community leaders to respond to their needs between the period before and after project implementation grew much less in the communities served by the PCPR than in the control communities. However, the researchers also found that the communities participating in the CDD program showed higher levels of trust, associational life, and participation in political and traditional events, but a smaller circle of friends than the non-CDD communities.

Binswanger et al. (2006) conducted an impact evaluation which sought to determine whether the CDD program had a significant effect on poverty reduction (measured in terms of increased access to assets and infrastructure) among participating community associations (CAs), and to investigate whether social capital (defined as the norms and networks that enable collective action) increased in beneficiary communities during the course of Program implementation. There were two parts to this evaluation: (a)

review of all relevant pre-existing empirical studies of the Program and (b) design and execution of a quasi-experimental impact evaluation of program results. According to the authors, the results of the impact evaluation demonstrated that the CDD program: brings essential small-scale infrastructure to rural areas, delivers services at lower costs, reaches the rural poor, encourages inclusion, satisfies beneficiaries with high-quality subprojects, achieves subproject sustainability, improves beneficiaries' quality of life, possibly impacts income and physical capital, and creates social capital and improves local governance (See Appendix B for more detail).

In the sections that follow I discuss the theoretical foundations of the concept of social capital, some conceptual questions that remain, and the issue of measuring social capital in the field. This is followed by a discussion of social capital in the context of international education development.

Theoretical Foundations of Social Capital

The concept of social capital has been gaining popularity over the past two decades, yet as many writers have pointed out no agreement has been reached regarding a definition (e.g. Castiglione, van Deth & Wolleb, 2008; Dasgupta & Serageldin, 2000; Field, 2003; Herreros, 2004; Krishna, 2002; and Lin & Erickson, 2008). Nevertheless, there is general consensus that three theorists have been responsible for developing the foundational thinking on the topic: Pierre Bourdieu, James Coleman, and Robert Putnam.

Before exploring their theories further, however, it is important to acknowledge the contribution of those who were among the first to use the term "social capital." Durkheim, Marx, and de Tocqueville have been credited for establishing the essential

ideas of the social capital perspective (Portes, 1998; Walker 2008), while Lyda J. Hanifan (1916), Jane Jacobs (1961), and Glen Loury (1977) were among the first to discuss social capital (Herreros, 2004; Putnam, 2000; Smith, 2007). Perhaps not surprisingly, as will be seen, Hanifan was an educator in rural West Virginia. While Hanifan (1916) used the term 'social capital' in a purely figurative sense—in reference to those "tangible substances" such as "good-will, fellowship, mutual sympathy and social intercourse" that count most in peoples' daily lives—he nevertheless recognized that such "social capital" was an important element to community building. In turn, Jane Jacobs (1961) reinvented the term social capital in the 1960s, describing it as a web of human relationships that provides mutual support during times of need, increases safety in communities, and fosters a sense of civic responsibility. Glenn Loury elaborated upon the concept in the 1970s, using the term to refer to the resources in family relations that are used to further the cognitive development of the child (Erdem, 2002). In a discussion of the policy implications of racial income inequality, Loury pointed out, "The social context within which individual maturation occurs strongly conditions what otherwise equally competent individuals can achieve. This implies that absolute equality of opportunity … is an ideal that cannot be achieved" (1977, p. 176). Loury's view of the relationship between social capital and cognitive development is consistent with the view of James Coleman, which is discussed further below. Keeping the contributions of these early theorists in mind, I will now turn to the three men who have had the greatest influence on the theory and study of social capital to date. It is not the purpose of this literature review to go into great depth regarding the theories and writings of these three foundational

authors, but rather to give the reader an understanding of the development of the concept of social capital before turning to the question of how social capital can actually be measured in the field.

Pierre Bourdieu. A French sociologist, Pierre Bourdieu was interested in issues of social class and entrenched inequality (Field, 2003). Through his development of the concept of "habitus"—the structured sets of values and ways of thinking that provide a bridge between subjective agency and objective position—Bourdieu developed the concept of "cultural capital", whereby "groups were able to use cultural symbols as marks of distinction, both signalling [*sic*] and constituting their position in the social structure" (Field, 2003, p. 13). According to Bourdieu, a person's stock of cultural capital did not necessarily correspond with the amount of financial capital they possessed. Rather, cultural capital might be used to pursue power and status even when money was lacking (Field, 2003).

Bourdieu's theory of social capital grew out of observed differences in academic achievement among children of different social classes. In a study that sought to explain why children of different social classes—and in groups within those social classes—had unequal academic achievement, Bourdieu and Passeron (1977) found that some social groups were able to ensure that their children maximized the returns from education by pursuing certain cultural investment strategies within the family. Even though Bourdieu saw economic capital as the foundation of all other types of capital, he recognized that in order to understand the social world it was necessary to consider the role of *all* forms of capital, including social capital (1985). Moreover, the different forms of capital could be

combined to produce even more capital (Bourdieu & Passeron, 1977). Nevertheless, Bourdieu's primary concern was to gain an understanding of social hierarchy and the ways individuals and groups use the resources available to them "to reproduce both the conditions in which they live and the relative relationships of power characterizing society" (Castiglione et al., 2008, p. 3; see also Bourdieu, 1989; Field, 2003).

Bourdieu came to define social capital as the sum of actual or virtual resources that accrue to an individual or a group through "possession of a durable network of more or less institutionalized relationships of mutual acquaintance and recognition" (1985, p. 248). Furthermore, "the value of an individual's ties (or 'volume of social capital possessed by a given agent') depends on the number of connections they can mobilise [*sic*] and the volume of capital (cultural, social and economic) possessed by each connection" (Field, 2003, p. 17; see also Bourdieu, 1985). Bourdieu (1985) also pointed out that individuals must work to maintain the value of their social capital. This would entail individual or collective investment strategies designed to transform contingent relationships—e.g. with neighbors, coworkers or even family—into "social relationships that are directly usable in the short or long term" (Bourdieu, 1985, p. 249). These strategies must involve deliberate investment of both economic and cultural resources (Portes, 1998), and to be effective over the long term, the 'transformed' relationships must involve "durable obligations subjectively felt" (Bourdieu, 1985, p. 249). From this it is clear that for Bourdieu social capital is "decomposable into two elements: first, the social relationship itself that allows individuals to claim access to resources possessed by

their associates, and second, the amount and quality of those resources" (Portes, 1998, pp. 3-4).

Critics of Bourdieu have pointed to his (a) focus on social capital as the exclusive property of the elites, (b) overemphasis [of] the role of social capital based on kinship, (c) disinterest in exploring the "dark side" of social capital, and (d) old fashioned and individualistic view of social capital (Field, 2003; Schuller, Baron & Field, 2000). Notwithstanding these criticisms, however, Bourdieu made key contributions to the development of the theory of social capital, particularly with respect to "his analysis of the general logic of social capital and its accumulation, as well as of its interplay with other forms of capital and their accumulation" (Field, 2003, p. 20). As Portes (1998) put it,

> Bourdieu's analysis is arguably the most theoretically refined among those that introduced the term in contemporary sociological discourse. His treatment of the concept is instrumental, focusing on the benefits accruing to individuals by virtue of participation in groups and on the deliberate construction of sociability for the purpose of creating this resource (p. 4).

James Coleman. Similar to Bourdieu, eminent American sociologist James Coleman became interested in social capital after observing relationships between academic achievement and social inequality. Whereas Bourdieu was concerned with social capital as a means to understand social hierarchy, however, Coleman sought to identify the contribution of social capital to the development of human capital (1988/2000). To Coleman, human and social capital were two interrelated and 'often

complementary'—but nonetheless separate—phenomena (Field, 2003). Coleman believed that social capital could contribute to cognitive development and the evolution of a secure self-identity (both of which could be considered forms of human capital; Coleman 1988/2000; Field, 2003).

Coleman approached the topic of social capital through the framework of rational choice theory (1988/2000; see also Krishna, 2000). According to rational choice theory, people tend to rationally act in ways to serve their own interests; as such, "social interaction [can be] viewed as a form of social exchange" (Field, 2003, p. 21). However, Coleman and other rational choice theorists have repeatedly observed that people's actions do not always follow the predictions of the theory: people *do* cooperate, even when it might not be in their individual interests. The concept of social capital helped Coleman to explain why this happens (Field, 2003).

Coleman sought to establish a causal link between social capital and access to resources, holding that social capital could be developed through the creation of relationships. These relationships could be considered 'capital' to the extent that they establish obligations and expectations between actors, make the social environment more trustworthy, open information channels, create norms regarding appropriate and inappropriate types of behavior, and enforce sanctions against actors behaving inappropriately (1988/2000). Coleman described this as "closure"—the existence of mutually reinforcing bonds between actors and institutions that guarantee the observance of norms (1994). Moreover a person's ability to call on the 'capital' available in the social structure depended on, (a) the actual extent of obligations held, and (b) the level of

trustworthiness of the social environment. These elements, in turn, were context-specific and shaped by variations in social structures. Given this context-specificity, Coleman argued that social capital may not be helpful in all circumstances, and may actually be harmful at times (1988/2000).

To avoid inconsistency with rational choice theory, Coleman held that actors did not set out to create social capital, *per se*, but rather that it "arose as an unintended consequence of their pursuit of self-interest" (Field, 2003, p. 25). Specifically, the creation of social capital was considered "a by-product of activities engaged in for other purposes" (Coleman, 1994, p. 312). This made social capital different from human or physical capital, which were both individual assets, and made it a public good (Coleman, 1994). Further, because social capital was a public good, Coleman argued, there tended to be underinvestment in it. As he pointed out, even though asking or doing favors and keeping trust benefit both the individual and others involved in the relationship, often times an individual will choose not to ask a favor or keep trust when it is in his self-interest. When that happens, social capital is not developed (1988/2000).

Defining social capital by its function, Coleman held that it is a "variety of different entities" having two characteristics in common: "they all consist of some aspect of a social structure, and they facilitate certain actions of individuals within the structure" (1988/2000, p. 16). Moreover, Coleman believed that certain types of social structures could facilitate individuals' choice of actions better than others (Field, 2003). He saw the family as the "archetypal cradle of social capital" (Field, 2003, p. 26), and considered this

‘primordial’ form of social organization to be stronger than ‘constructed’ forms such as associations or religious groups (Field, 2003; Portes, 1998).

As mentioned above, Coleman became interested in social capital through his work in the field of education. Coleman first reported the results of a study of high school students in Chicago in which teenagers’ views were more influenced by their peers than by adults, and peer-group norms governed students’ behavior more strongly than the expectations of parents and educators. Then, in a comprehensive survey of educational achievement and opportunity among six ethnic groups—which came to be known as the “Coleman Report,” Coleman, Campbell et al. (1966) determined that background characteristics of families and communities tended to outweigh factors related to the school.

In a subsequent series of studies of student achievement in public and private schools, Coleman, Hoffer et al. (1982) found additional support for a link between social capital and educational achievement. Specifically, they concluded that students from Catholic and other religious schools performed better than their public school peers, even when controlling for factors of social class and ethnicity. A follow-up longitudinal study showed that students in Catholic schools tended to have lower absenteeism and drop-out rates than those with comparable backgrounds and ability in state schools. In a follow up to these prior studies, Hoffer, Greeley, and Coleman (1985) found this tendency to be even more pronounced among students from the most disadvantaged socio-economic and ethnic backgrounds, whose families presumably had less to ability to contribute to their children’s cognitive development. Coleman and Hoffer (1987) argued that the most

important factor in explaining this pattern was the impact of community norms upon parents and students, which functioned to endorse teachers' expectations. From this the authors "concluded that communities were therefore a source of social capital that could offset some of the impact of social and economic disadvantage within the family" (Field, 2003, p. 23).

The studies cited above have been widely criticized—particularly with respect to their methodological shortcomings—and consequently disagreement regarding their conclusions remains (see, for example, Cain & Watts, 1970; Carver, 1975; and Witte, 1992). It is not within the scope of this review to discuss these varied criticisms, but rather to highlight the influence that James Coleman has had on the development of social capital theory. Of this, there is little disagreement.

Critics have claimed that Coleman tended to overestimate the importance of close or dense ties, and underestimate the importance of weak or loose ties (Field, 2004; Portes, 1998; Schuller et al., 2000); that he often did not acknowledge the impact of historical processes (Field, 2003; Morrow, 1999); that he was "remarkably negative about individualism" for a person who based his thinking on rational choice theory (Field, 2003); and that there were flaws in his analysis related to the role of social capital in building human capital—particularly with respect to the link between social capital and academic achievement (Cain & Watts, 1970; Carver, 1975; Field, 2003; Witte, 1992). Further, Portes (1998) argued that Coleman's definition of social capital was "rather vague," leaving it open to "relabeling a number of different and even contradictory processes as social capital" (p. 5). Schuller et al. (2000) found questionable Coleman's

emphasis on ‘primordial’ versus ‘constructed’ forms of social capital, stating, “Coleman appears to be appealing to a common-sensical, and nostalgic, division which cannot withstand close scrutiny” (p. 8).

Notwithstanding these criticisms, Field (2003) pointed out,

> the strengths [of Coleman’s work in this area] must include his ambitious attempt to integrate social capital into a wider theory of the origins of social structures; his recognition that social capital could be an asset for disadvantaged social groups and not solely an instrument of privilege; and his interest in the mechanics of social networks (p. 29).

A comparison of the works of Bourdieu and Coleman highlights clear differences between the two theorists. While Bourdieu saw social capital as a mechanism by which privileged people maintain their position by using their connections with other privileged people, Coleman saw social capital as the value of connections between all actors, individual and collective, privileged and disadvantaged (Field, 2003). Additionally, Bourdieu deeply opposed rational choice theory (Wikipedia, 2009, “Bourdieu’s Theory of Power and Practice,” para. 1), which formed the foundation of Coleman’s thinking. Finally, while Coleman’s theory of social capital focuses primarily on the positive aspects of social capital—the returns to cooperation—“Bourdieu’s usage of the concept … virtually allows only for a dark side for the oppressed, and a bright side for the privileged” (Field, 2003, p. 28).

Still, there are some important similarities as well. Both men were interested in the relationship between social capital and academic achievement, both viewed social

interactions as a form of exchange, and "neither paid much heed to affect, to the fact that people like, love or loathe one another – and therefore associate together or avoid each other—for reasons that lie outside the domain of rational calculation" (Field, 2003, p. 28).

Robert Putnam. American political scientist Robert Putnam is considered to be "the most widely recognized proponent of social capital" (Field, 2003, p. 29; see also Arrow, 2000; Castiglione et al., 2008; Schuller et al., 2000; Serageldin & Grootaert, 2000). Unlike Coleman and Bourdieu, who are best known within the fields of sociology and social theory, Putnam's work has had much broader appeal, gaining the attention of President Bill Clinton in 1995 and earning him a feature in *People* magazine (Schuller et al., 2000). The reason behind his fame was the publication of a series of papers and later a book claiming that the decline in social capital in the United States since the 1940s was responsible for "the ungovernability of much of urban America" (Field, 2003, p. 29). This view stems from the writings of the nineteenth century French author Alexis de Tocqueville, who, after traveling throughout the United States in 1831, concluded that "associational life [was] an important foundation of social order in a relatively open, clearly post-aristocratic system" (Field, 2003, p. 30). According to Field (2003), Putnam's message—"that America's social capital was in a state of long-term decline, and the main culprit in its demise was the rise of television" (p. 31; see also Putnam, 1995, 2000)—"found such a wide audience precisely because he suggest[ed] that the Tocquevillian foundation stone of American democracy [was] starting to crumble" (p. 30).

In 1993, Putnam's first major study investigated the role of civic engagement in generating political stability and economic prosperity in Italy (see Helliwell & Putnam, 2000). Specifically, he explored differences in regional administration in the north and south regions of Italy, taking an institutional approach and concentrating on the relative performance of public policy actors in both regions. Holding other factors constant, Putnam concluded that the best performing regional governments were those where there was a strong tradition of civic engagement. In this work, Putnam defined social capital as "features of social organization, such as trust, norms, and networks, that can improve the efficiency of society by facilitating coordinated actions" (1993, p. 167). Like Coleman, Putnam saw social capital as a private and a public good. Further, he held that social capital contributes to collective action by increasing the potential costs to defectors; fostering robust norms of reciprocity; facilitating flows of information, including information on actors' reputations; embodying the successes of past attempts of collaboration; and acting as a template for future cooperation" (1993, p. 173).

By the year 2000, Putnam had refined his definition of social capital to refer to "connections among individuals—social networks and the norms of reciprocity and trustworthiness that arise from them" (p. 19). Putnam identified seven dimensions of social capital: political participation, civic participation, religious participation, workplace networks, informal networks, altruism, and mutual trust. According to Putnam, these dimensions could be combined in numerous ways to produce social capital, but the norms of reciprocity and trust were quite important elements: "Social capital calls attention to the fact that civic virtue is most powerful when embedded in a dense network

of reciprocal social relations. A society of many virtuous but isolated individuals is not necessarily rich in social capital" (Putnam, 2000, p. 19).

As Serageldin and Grootaert (2000) pointed out, Putnam's definition of social capital has two underlying assumptions. First, that there is an empirical association between networks and norms; second, that these networks and norms have important economic consequences. Indeed, Putnam claimed "that membership in associations strengthens political and economic efficiency even though the associations themselves play no role in either the polity or the economy" (Arrow, 2000, p. 4).

An important contribution of Putnam's work is his distinction between two basic forms of social capital: bridging (inclusive) and bonding (exclusive).[5] "Bonding social capital tends to reinforce exclusive identities and maintain homogeneity; bridging social capital tends to bring together people across diverse social divisions" (Field, 2003, p. 32). As Putnam (2000) put it, "Bonding social capital constitutes a kind of sociological superglue, whereas bridging social capital provides a sociological WD-40" (p. 23). Clearly, each form of social capital can help meet different needs. Although he did not discuss it in great length, Putnam did acknowledge that there could be negative effects of social capital—for example when communities with large amounts of bonding social capital are exclusionary and distrustful of outsiders. Nonetheless, Putnam's views on the subject were largely positive.

The impact of Putnam's work on the theory and study of social capital has been tremendous. Yet, he, too, has not escaped criticism. For example, Putnam has been

[5] Woolcock (2001) later added a third form of social capital: linking social capital—the capacity to leverage resources, ideas, and information from formal institutions beyond the community (p. 11).

accused of adopting a circular definition of social capital—of conflating means and ends (Schuller et al., 2000); using "too celebratory a tone" regarding the benefits of social capital (Portes, 1998, p. 1); and underestimating the importance of politics (Field, 2003). Other critiques include questions of whether Putnam's conclusions about the decline of social capital in the United States can stand up to comparisons with similar phenomena in Western Europe, where the patterns of leisure and generational change are similar to those in the U.S. (Field, 2003; Morrow, 1999).

Putnam's theory appears to see social capital as functional, but he does not approach it from the framework of rational choice theory (Field, 2003). Nevertheless, Putnam does acknowledge the influence of Coleman's writing on his own work. Coleman was, in turn, influenced by Bourdieu—although he does not acknowledge this outright in his writings (Schuller et al. 2000). Field (2003) pointed out that, despite their individual approaches to the subject, all three writers might be criticized for similar failings. First, they appear to be relatively "gender-blind." Second, they have developed "a somewhat undifferentiated concept of social capital" (p. 41), in that (a) they tend to minimize the "dark side" of social capital (see also Portes, 1998), (b) their approaches are somewhat ahistorical, and (c) they do not really distinguish between different types of social capital and the ways in which they can be combined to produce different results (p. 42; see also Morrow, 1999; Portes, 1998; and Schuller et al., 2003).

Expanding Social Capital Theory

Conceptual questions. As previously mentioned, there is still considerable debate regarding how to define social capital. Much of the on-going discussion of social

capital centers on a number of key conceptual questions (Castiglione, 2008). Given the extensive literature on the subject, I do not attempt to discuss these questions at length; nevertheless, presented below are some of those whose answers remain subjects of significant debate. I based the outline of this section on Castiglione (2008), since his discussion is one of the most recent and encompasses a wide range of literature.

How should social capital be defined? An examination of the literature points to three increasingly broader conceptualizations of social capital. Putnam's (2000) view could be considered the narrowest of all in that he sees social capital as a set of horizontal associations among people which affect the productivity of the community (Serageldin & Grootaert, 2000). Coleman (1988/2000) broadened the concept to include vertical as well as horizontal links among people, as well as the behavior of other entities such as firms. Woolcock's (2001) conception of "linking social capital" fits nicely here as well. Although "bridging" social capital does acknowledge vertical connections among people outside of the community or immediate social group, "linking" social capital connects people to "key political (and other) resources and economic institutions—that is, across power differentials" (Grootaert et al., 2004, p. 4). Finally, the broadest view of social capital—that which has been adopted by many researchers and theorists in the field of international economic development—includes as well the "social and political environment that enables norms to develop and shapes social structure" (e.g., formalized institutional relationships and structures, such as governments, political regimes, the rule of law, court systems, and civil and political liberties; Serageldin & Grootaert, 2000, p. 46).

In their discussion, however, Serageldin and Grootaert (2000) stated that "the three definitions of social capital are not really alternative views but complementary aspects of the same concept (p. 49)," pointing out that theoretical distinctions in the literature "are largely artificial and unnecessary [and] detract from the fact that different types of social capital coexist and can be mutually reinforcing" (p. 55). They went on to highlight common features shared by the three increasingly broader conceptions of social capital. First, they all link the economic, social, and political spheres. Second, they "all focus on relationships among economic agents and the ways in which formal and informal organizations of these agents can improve the efficiency of economic activities." Finally, they "all imply that desirable social relationships and institutions have positive externalities" [and by extension that 'undesirable' ones have negative externalities; p. 47].

In what could be seen as an extension of the broader conception of social capital discussed by Serageldin and Grootaert (2000), other authors have attempted to simplify the concept by breaking it down into two categories of social capital: "structural" (roles, rules, precedents, procedures, and organizations) and "cognitive" (norms, values, attitudes, and beliefs; Uphoff, 2000; see also Esser, 2008; Krishna, 2000[6]). The structural elements facilitate mutually-beneficial collective action by lowering transaction costs and making cooperation more predictable and beneficial through the establishment of norms of behavior and interaction (Uphoff, 2000). The cognitive elements, especially when widely shared, predispose individuals toward cooperation with others. Both are required for social capital to be sustainable and broad-based (Esser, 2008; Krishna, 2000; Uphoff,

[6] Esser uses the terms "relational" and "system" capital, while Krishna talks about "Institutional" and "Relational" capital, but both are clearly similar to Uphoff's terminology.

2000). As Uphoff (2000) pointed out, "While it is possible in the abstract to have structural forms of social capital without cognitive ones, and vice versa, in practice, it is unlikely and difficult for either to persist without the other" (p. 218). This is true because "both the social structural and cognitive realms are linked in practice (and in social science theory) by the subjective behavioral phenomena known as **expectations**" (Uphoff, 2000, pp. 218-19, emphasis in original).

The role played by Uphoff's (2000) "expectations"—similar to other authors' norms of reciprocity and trustworthiness—in the creation and maintenance of social capital is as an important one. Not only do attitudes, values and beliefs (cognitive social capital) create expectations about how people *should* act, the very existence of these expectations implies how people *will* act. Moreover, networks (structural social capital) are held together by mutual expectations of benefit and critically sustained by expectations of reciprocity (cognitive social capital; e.g. Putnam, 2000, Uphoff, 2000).

Uphoff pointed out that this conceptualization of social capital as comprised of two categories is consistent with both Colman (1988/2000) and Putnam (1995, 2000), as well as with the third conception of social capital discussed by Serageldin and Grootaert (2000). Indeed, the breakdown of social capital into structural and cognitive elements encompasses other theorists' conceptualizations as well. For example, Stiglitz (2000) elaborated four distinct aspects of social capital: (a) tacit knowledge [cognitive], (b) a collection of networks [structural], (c) information about reputations [structural], and (d) organizational capital [i.e. "structural" characteristics of the organization/institution that establish the contextual framework]. Likewise, Herreros (2004) discussed how

obligations of reciprocity and availability of information regarding reputations [structural] interplay with issues of trust [cognitive] to create social capital.

Does social capital refer to something concrete? This question seeks to determine whether social capital is actually an observable variable that can be studied, or whether it is more of an abstract construct. For example, some authors, such as Coleman (1988/2000), have maintained that social relations are considered to be resources for the individual, and therefore that they constitute social capital. Questions that may arise from this assertion, then, might be whether relations in general are social capital, or if they constitute social capital only if a person makes use of them? Or, do the relations become social capital only if a person is able to profit from them? (e.g. Castiglione, 2008; Castiglione et al., 2008; van Deth, 2008).

The literature in this area is inconclusive. In an article discussing measurement of social capital, van Deth (2008) pointed out that some authors (e.g. Paldam, 2000) have found evidence for the existence of a single latent construct, while others (e.g. Stone, 2001) have argued for the multidimensionality of the concept. Results of analyses targeted at identifying the latent structure of social capital vary widely, and little agreement has been reached (van Deth, 2008). This lack of agreement might stem in part from the fact that social capital is evidenced at the micro, meso and macro levels, affecting individuals, communities and entire nations in differing degrees (see, for example, Serageldin & Grootaert, 2000). As such, what constitutes social capital in one context may be very different from what is considered social capital in another (this relates to the discussion of externalities presented in the section on the "dark side" of

social capital). For Fukuyama (2001), "social capital is an instantiated informal norm that promotes co-operation between two or more individuals" (p. 7). Accordingly, elements such as trust, networks, and civic engagement—commonly used indicators of social capital—*arise as a result of social capital but do not constitute social capital itself*, thereby making them inappropriate measures of a single concrete variable of social capital (italics added).

Is it really "capital"? This is another area where there is considerable disagreement. As already mentioned, the "founding fathers" believed that social capital was appropriately labeled 'capital' in that it facilitates the "achievement of certain ends that in its absence would not be possible" (Coleman, 1988/2000, p. 14). Krishna (2000), Esser (2008), and Ahn and Ostrom (2008) agreed, positing that social capital comprises a stock of resources that can be produced or used in a variety of ways in order to achieve certain ends (see also Ostrom, 2000). In contrast, authors such as Arrow (2000) and Solow (2000) argued against calling it 'capital,' highlighting that the concept does not fit traditional definitions and cannot be measured in the same way as other forms of capital. Moreover, they said, the motivation behind the creation of social networks is not necessarily tied to the economic value of those networks to participants.

What about social capital's "dark side"? This question stems from critics who argue that early theories of social capital (particularly Coleman's and Putnam's) are generally too positive with regard to the effects of social capital. Indeed, it is clear that despite all of the benefits it can bring to individuals and to society, not everything that results from social capital is positive. As organized criminal groups and exclusionary

social clubs show, social capital can definitely have a dark side (e.g. Field, 2003; Fukuyama, 2001; Narayan & Pritchett, 2000, Warren, 2008). Nevertheless, it appears that the "founding fathers" of social capital understood this quite well. In fact, Field (2003) underscored that in Bourdieu's conception, "the negative consequences of social capital can be seen as inseparable from the benefits," since social capital was primarily a means for the privileged to maintain their position at the top of the social hierarchy (p. 74). Coleman (1988/2000) highlighted that "a given form of social capital that is valuable in facilitating certain actions may be useless or even harmful for others" (p. 16). In turn, Putnam (2000) pointed out that Timothy McVeigh, the man responsible for the Oklahoma City bombing, discussed tactics with his fellow conspirators while bowling. Putnam also acknowledged that bonding social capital can be negative in the sense that it promotes strong in-group identification and, thus, may foster distrust of outsiders.

Warren (2008) argued that the overly optimistic view of social capital that was prevalent in the past has now largely been corrected, so that there is now widespread agreement that social capital can produce social "bads," even while research has focused primarily on social "goods." Fukuyama (2001) stressed that social capital tends to produce more negative externalities than other forms of capital like human and physical capital. As such, he advocated examining both the positive and negative effects of social capital in an attempt to seek a balance between them and identify ways to offset any negative consequences (see also Warren, 2008).

For Fukuyama (1995, 2001)—and for other writers who focus on the issue (e.g. Herreros, 2004; Uslaner, 2008)—trust is at the heart of this issue. "The wider the radius

of trust reaches beyond a group's membership, the more benign and positive the externalities; the more the radius of trust is confined to the group's own members, the greater the probability of negative externalities" (Fukuyama, 2001, p. 8). Nevertheless, most authors agree that the lack of social capital is much worse than the possible negative effect of having too much of it (e.g. Field, 2003; Fukuyama, 1995; Herreros, 2004; Uslaner, 2008).

Is there a causal link between social capital and different social outcomes?

Numerous authors have pointed out that discussions of social capital tend either to be circular, running together causes and effects, or difficult to "pin down with precision" (Castiglione, 2008, p. 16; see also Morrow, 1999; Portes, 1998). Nevertheless, as advanced statistical methods such as structural equation modeling have become more popular a number of authors have sought to establish that link between social capital and social outcomes (e.g. Arieira, 1999; Arieira & Hayes, 2000). In a study of the effects of participation in voluntary associations on civic engagement, for example, Walker (2008) found evidence in support of a mediating effect of membership in voluntary associations on political participation. Walker also found that negative social capital (in this case, requests for activity targeted at specific individuals to the exclusion of others) mediated the pathway from social joiner to political activist. Key to this analysis of causal effects is deciding on a definition of what constitutes social capital—thereby bringing us back to the questions cited above. Once a definition is reached, researchers can turn their attention to measuring social capital, discussed in the next section.

Measuring Social Capital

> The question of whether social capital should be measured as a single construct or by using different kinds of measurements, depending on the aspect of social capital one wishes to measure remains unanswered (Castiglione et al., 2008, p. 6).

In keeping with the lack of consensus regarding a universal definition of social capital, many writers have pointed to the difficulty establishing a way to measure it (e.g. Arrow, 2000, Castiglione et al., 2008; Narayan & Pritchett, 2000; van Deth, 2008). The OECD (2001) pointed out that "much of what is relevant to social capital is tacit and relational, defying easy measurement or classification" (p. 43). Narayan and Pritchett (2000) stated that a concrete and measurable definition must stem from an "overarching framework" of social capital, whereby researchers (a) decide upon the level of measurement (e.g. individual, household, community, state); (b) determine which dimensions of experience "count as a social relationship"; and (c) establish a rule for combining and weighting these relationships.

Of course, creating this rule for assigning weights will not be simple, given the complexity of relationships and the varied contexts in which social capital can be studied. For example, as other authors have noted (e.g. Fukuyama, 2001; Putnam, 2000), a relationship that constitutes social capital in one situation might not contribute to social capital in another setting. Further still, emphasized Narayan and Pritchett (2000), depending on what level of analysis is being considered (e.g. individual or community) the direct and indirect benefits of social capital may change. Nevertheless, Narayan and

Pritchett made their argument that researchers should develop an "overarching framework" of social capital by pointing out,

> The proliferation of topic-oriented functional definitions of social capital will never lead to a consensus. With functional definitions social capital is what social capital does and what social capital *does* depends on whether the topic is schools, irrigation canals, credit markets, or local politics. This means that the same data could show that what is social capital with respect to collective action is not social capital with respect to capital markets or with respect to cooperation on public goods. But this lack of consensus does not have to be either a criticism of the existing literature or a barrier to the productivity of future research—as long as the choices inherent in the different definitions of social capital are made explicit within their theoretical context and the possibly functional roots of the definitions made clear (2000, p. 281, emphasis in original).

Van Deth (2008) argued that there is little point in trying to reach an agreement on a precise definition of social capital. Rather, a more practical way is to identify some of the common features of these conceptualizations and use them as a basis for empirical research and measurement. After doing this, van Deth concluded that all theories of social capital contain a distinction between structural and cultural [cognitive] aspects and a question of whether social capital is an individual or collective property (the characterization of the assets). Van Deth systematically summarized the primary measures and indicators used in empirical research on social capital, broken down according in two dimensions: structural/cultural [cognitive] capital, and

individual/collective asset. He also categorized each measure based on the data collection method applied and discovered that many of the possible methods of data collection have not been tried in the research (van Deth, 2008, p. 160). He concluded that the most common forms of measurement are surveys and questionnaires.

The World Bank has been on the forefront of the push to better understand social capital and the ways in which it can promote development and reduce poverty. In addition to financing and hosting international conferences and workshops on the subject, it has invested millions of dollars into projects designed to promote social capital formation. One outcome of all this investment was the development of the Social Capital Assessment Tool (SOCAT). Seeking information related to the structural and cognitive dimensions of social capital, the SOCAT integrates quantitative and qualitative instruments to gather data to create community and organizational profiles. In addition, a quantitative instrument collects information at the household level. Data collection is conducted through structured questionnaires and open-ended participatory methods (Grootaert & van Bastelaer, 2002a).

Another tool whose development was informed by the studies conducted with the SOCAT was the Integrated Questionnaire for the Measurement of Social Capital (SC-IQ)—which focuses on applications in developing countries (Grootaert et al. 2004). Designed to provide a "core set of survey questions" for researchers interested in gathering data as part of a larger household survey, each item was drawn from prior survey work. The questionnaire aims to explore: (a) the *types* of groups and networks that poor people can call upon, and the nature and extent of their contributions to other

members of those groups and networks … [and] (b) respondents' subjective *perceptions* of the trustworthiness of other people and key institutions that shape their lives, as well as the norms of cooperation and reciprocity that surround attempts to work together to solve problems (p. 3). As the authors point out, "the distinction between (a) and (b) is sometimes referred to as, respectively, 'structural' and 'cognitive' social capital (e.g. Krishna 2000; Uphoff, 2000)." Additionally, the survey also distinguishes between 'bonding' and 'bridging' social capital. The SC-IQ was designed to be addressed to individuals at the household level and collects data related to group membership, respondents subjective perceptions regarding trust and norms, the main ways in which social capital operates, and major areas of application or outcomes (Grootaert et al., 2004).

Based on previous survey work, extensive reviews of the literature, and input from an advisory group of experts in social capital (including Robert Putnam), the SC-IQ was arranged into six dimensions of social capital: groups and networks, trust and solidarity, collective action and cooperation, information and communication, social cohesion and inclusion, empowerment and political action (Grootaert et al., 2004). I adopted Grootaert et al.'s (2004) dimensions for my study since they appear to encompass all of the indicators of social capital I have seen in the literature (e.g. Grootaert, 2003; Grootaert & van Bastelaer, 2002b; Narayan & Cassidy, 2001; Narayan & Pritchett, 1999; Putnam, 1993, 1995, 2000). In the section below I present the breakdown of those dimensions according to the primary elements (structural and cognitive social capital) that I will be investigating.

Structural social capital.

Groups and networks. This dimension is the one most commonly associated with social capital (Grootaert et al., 2004). Indicators in this category deal with the nature and extent of a person's participation in various types of social organization and informal networks, the range of contributions given and received, diversity of the group membership, selection of leaders, and changes in a person's involvement over time.

Information and communication. This dimension has to do with the ways and means by which people receive information regarding the socioeconomic and political environment, as well as the extent of their access to communications infrastructure.

Empowerment and political action. "Empowered" individuals feel like they have some control over factors that directly affect their well being (Grootaert et al., 2004; World Bank, 2002). Indicators of social capital that relate to this dimension pertain to a person's perceived sense of happiness, personal efficacy, and ability to exert influence on the sociopolitical environment. While this dimension could logically be included under the umbrella of "cognitive" social capital, in this study I include it under structural social capital because the questions pertaining to this dimension in the original questionnaire (Binswanger et al., 2006) related to attendance at public meetings and holding public officials accountable, which I consider to be more associated with the structural element.

Cognitive social capital.

Social cohesion and inclusion. This dimension addresses issues of division, difference, and conflict in a community, as well as the ways in which problems and

conflicts are managed. Other indicators relate to issues of exclusion from public services or from group membership, in addition to different forms of daily social interaction.

Collective action and cooperation. Indicators in this dimension relate to whether and in what ways a person has worked with others in the community on a project or to respond to a problem. In addition, "the consequences of violating community expectations regarding participation" are also included here (Grootaert et al., 2004, p. 5). This is another dimension that could be considered an indicator of either cognitive or structural social capital. I put it under cognitive social capital because the questions related to this dimension in the original questionnaire (e.g. "Before Brazil won World Cup 2002 people in the community helped those in need more, equal or less?") seemed to fit more with the dimensions of "social cohesion and inclusion" and "trust and solidarity" than with dimensions such as "groups and networks" and "information and communication."

In addition, this dimension may prove important for interpretation of the results of this study. As a reminder, each community was *required* to form a community association in order to be eligible to apply for a subproject grant under the World Bank CDD Program. Consequently, the communities participating in the impact evaluation from which the data for this study originated (Binswanger et al., 2006) have already demonstrated this dimension of social capital.

Trust and solidarity. This last dimension pertains to a person's feelings of trust towards neighbors, service providers, political figures, and strangers. Additionally, it relates to a person's willingness to help others (e.g. through charity) and to a person's

sense of reciprocity in interpersonal interactions. The concepts of trust and trustworthiness have received much attention in the literature and there is considerable disagreement regarding whether trust should be considered a form of social capital, a mediating factor, or something else (e.g., Ahn & Ostrom, 2008; Fukuyama, 1995; Herreros, 2004; Portes, 1998; Uslaner, 2008). It is beyond the scope of this work to explore these diverse opinions; for the purposes of this study, I consider trust to be one dimension of social capital, on the same level as the others.

I acknowledge that there is not total agreement in the literature regarding the dimensions in this list—particularly with respect to which ones should be considered inputs, outcomes, or mediating factors in the theory of social capital. Furthermore, the specific indicators characterizing each dimension may vary according to the field of study and depending on the context of an investigation. Nonetheless, it is not within the scope of this study to delve into those differences.

Instead, my purpose in this study is to test whether the data collected in Brazil in 2005 (Binswanger et al., 2006) fit the hypothesized structure of social capital being comprised of two primary elements (cognitive and structural social capital) made up of six secondary dimensions. As outlined above, the dimensions "trust and solidarity," "collective action and cooperation," and "social cohesion and inclusion" will constitute the cognitive element; the dimensions "groups and networks," "information and communication," and "empowerment and political action" will make up the structural element. With that in mind, in this final section I explore some of the literature related to social capital in the context of international education development.

Social Capital and International Education Development

As previously mentioned, the link between social capital and education stems from the very foundation of the concept. Both Bourdieu (1985; 1989; Bourdieu & Passeron, 1977) and Coleman (1988/2000; 1994; Coleman et al., 1966; Coleman & Hoffer, 1987; and Coleman, Hoffer et al., 1982) became interested in the concept after observing differences in educational achievement among children of different social classes. In addition, in his comprehensive study of social capital in the United States, Putnam (2000) concluded that states ranked higher on Putnam's "Social Capital Index" had "measurably better educational outcomes than [did] less civic states" (p. 299). Given the great diversity of research in this area, however, in this section I limit my focus to studies that looked specifically at the relationship between social capital and education in developing countries, since that is the context in which the data for this study were collected.

A study by Arieira (1999) used a path model to look at the relationship between family background and children's achievement levels among Brazilian families. The path model was grounded in Coleman's (1988/2000) work, using family background variables "parent's education, "parent's income," and "number of children" as indicators of access to human, financial and social capital respectively. Additionally, the model had "sibling's[7] education" and "sibling's work experience" as intermediate variables. The dependent variable was urban male sibling's income.[8] The sample came from the Brazilian National

[7] In this case, "sibling" is used to refer to a child in the family, so "sibling's education" and "sibling's work experience" refers to the child in question's *own* education and work experience.

[8] Arieira chose to limit the study to male siblings because of gender differences in workforce participation. He also limited the age range between 15 and 25 years of age to avoid including children who might also

Household Survey (PNAD—*Pesquisa Nacional de Amostra de Domicilios*) conducted by the Brazilian Institute of Geography and Statistics (IBGE—*Instituto Brasileiro de Geografía e Estatística*) for three different time periods (1979, 1989, and 1996). Ariera analyzed the data for all five regions of the country,[9] and compared the "rich" regions of Brazil (South and Southeast) with the "poor" regions of the country (North and Northeast), also broken down by states. Based on the results of the analysis, the author concluded that a child's education was the most important variable impacting his or her income, followed by parents' income, number of children in the family, and parents' education (see also Arieira & Haynes, 2001).

In a study conducted in 1,376 randomly-selected households in rural Tanzania, Narayan and Pritchett (2000) explored social capital using the Social Capital and Poverty Survey (SCPS). The authors defined social capital as the "quantity and quality of associational life and the related social norms"—elements which correspond roughly with the concepts of structural and cognitive social capital. The SCPS asked respondents questions related to three dimensions[10] of social capital: (a) their membership in groups, (b) the characteristics of those groups, and (c) the individuals' values and attitudes. Based on the results of the SCPS, the authors created an index of village associational life, which was then used as a proxy for social capital. This was combined with information

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be parents [although it seems likely that men between 15-25 might already have children]. Moreover, the study was limited to siblings living in urban areas because of differences in "socioeconomic characteristics and labor force participation patterns" in rural areas. Finally, the study only included siblings whose income was positive.

[9] Each region was represented by one large or particularly populous state, with the exception of the Southeast, which included both Rio de Janeiro and São Paulo, since they are the most important states in the country.

[10] These dimensions do not necessarily correspond with the six dimensions presented above.

about values and attitudes, particularly that related to trust towards other social groups and government authorities. In an analysis that included a number of household characteristics such as the average years of school of male and female adults (over 20) in the household and variables related to employment and assets, the authors found that higher levels of social capital were correlated with higher reported levels of parental participation in schools and attendance at community meetings—even among community members not surveyed using the SCPS—as well as with higher levels of school quality.

Shafer (2005) utilized household survey and semi-structured interview data from 686 households spread across 40 villages in Malawi and Kenya to develop a model of family contributions to self-help schooling that integrated a range of theoretical perspectives emphasizing the importance of social capital, family economy, family backgrounds, and family structure. Using logistic regressions to test a number of models, Shafer found that in Kenya families with higher economic status were more likely to contribute to self-help schooling, thereby indicating a relationship between family background, self-help schooling, and educational outcomes of children. In nations where self-help schooling is broadly encouraged, however, family economy factors were not as influential. In Malawi, the role of non-governmental institutions (NGOs) was important to the support of community-based schools and presence of an NGO in a community greatly increased the likelihood of self-help participation by families. Finally, the study underscored "the importance of parental perceptions once schooling has become more integrated into community life" (pp. 90-1).

A study by Adams (2006) pointed out that the quality of student achievement could be partially linked to the strength of the social bonds within communities, or social capital. Adams cited numerous studies that (a) linked socioeconomic and structural differences across communities with student outcomes (e.g. Duncan, 1994; Dornbusch, Ritter, & Steinberg, 1991; and Garner & Raudenbush, 1991); and (b) found that greater parent participation in school activities was associated with improved student achievement and/or increased retention, even for those students whose parents did not participate directly (Brooks-Gunn, et al., 1993; Clark, 1992; Ho and Wilms, 1996; Pong, 1998; Stanton-Salazar & Dornbusch, 1995). Adams explained these results in the following manner:

> Taken as a whole, the existing literature on community effects suggests that the differences in educational outcomes across communities may arise from various characteristics and processes operating at the community level. First, local economic resources influence enrollment, attainment, and achievement. The reviewed research emphasizes that it is not only the economic resources at home that matter, but also the average wealth of the surrounding families. Community economic resources may influence educational outcomes by shaping the quality of local schooling. In addition, community wealth affects the quality of after-school activities available to community youth—activities that may also affect aspirations, effort, and learning. Second, the extent and quality of community social relationships influence the ways communities shape expectations, share information, and enforce rules. In this way, communities with more social

resources are more likely to influence student behavior and beliefs both in and out of the classroom" (p. 19).

Other authors have demonstrated a positive link between social capital and education as well. Ross and Lin (2006) concluded that communities with greater social capital offered better learning opportunities and greater future possibilities. In addition, Park and Sandefur (2006) showed that social class background is an important influence on student achievement in Latin America. Jimenez and Sawada (1998) found that community management and accountability could improve education outcomes. Moreover, greater parental involvement could improve student attendance and put pressure on providers to improve service delivery, while community participation in school management also often resulted in greater community contributions in school financing. Jimenez and Paqueo (1996) found that community-managed primary schools have lower costs while holding enrollment and quality consistent.

Not all of the literature is clear on the existence of a positive link between social capital and education, however. For example, Hyneman & Loxley (1982, 1983) found that school quality and expenditure was linked to higher levels of student achievement than family background. Subsequent research indicated that differences in school quality accounted for differences in student achievement in only the poorest societies (Baker, Goesling, & LeTendre, 2002; Baker & LeTendre, 2005).

Clearly, more research is needed to shed additional light on the relationship between social capital and education. In the chapters that follow I discuss how this study attempts to contribute to knowledge in this area.

Chapter 3. Methodology

As stated in Chapter 1, the main purpose of this study is to provide validity evidence in support of a theory that social capital is composed of two general dimensions that underlie six primary dimensions. The section "Measuring Social Capital" in Chapter 2 presented six dimensions of social capital that encompass the wide variety of indicators of social capital found in the literature. These include: groups and networks, information and communication, empowerment and political action, social cohesion and inclusion, collective action and cooperation, and trust and solidarity. As also mentioned in Chapter 2, three of those dimensions (groups and networks, information and communication, and empowerment and political action) are hypothesized to relate to a secondary—more general—dimension (structural social capital) and the other three relate to another secondary dimension (cognitive social capital; e.g. Grootaert, 2001, 2003; Grootaert et al., 2004; Grootaert & van Bastelaer, 2002a, 2002b; Krishna, 2000; and Uphoff, 2000). This hypothesized structure of social capital is depicted in Figure 1.

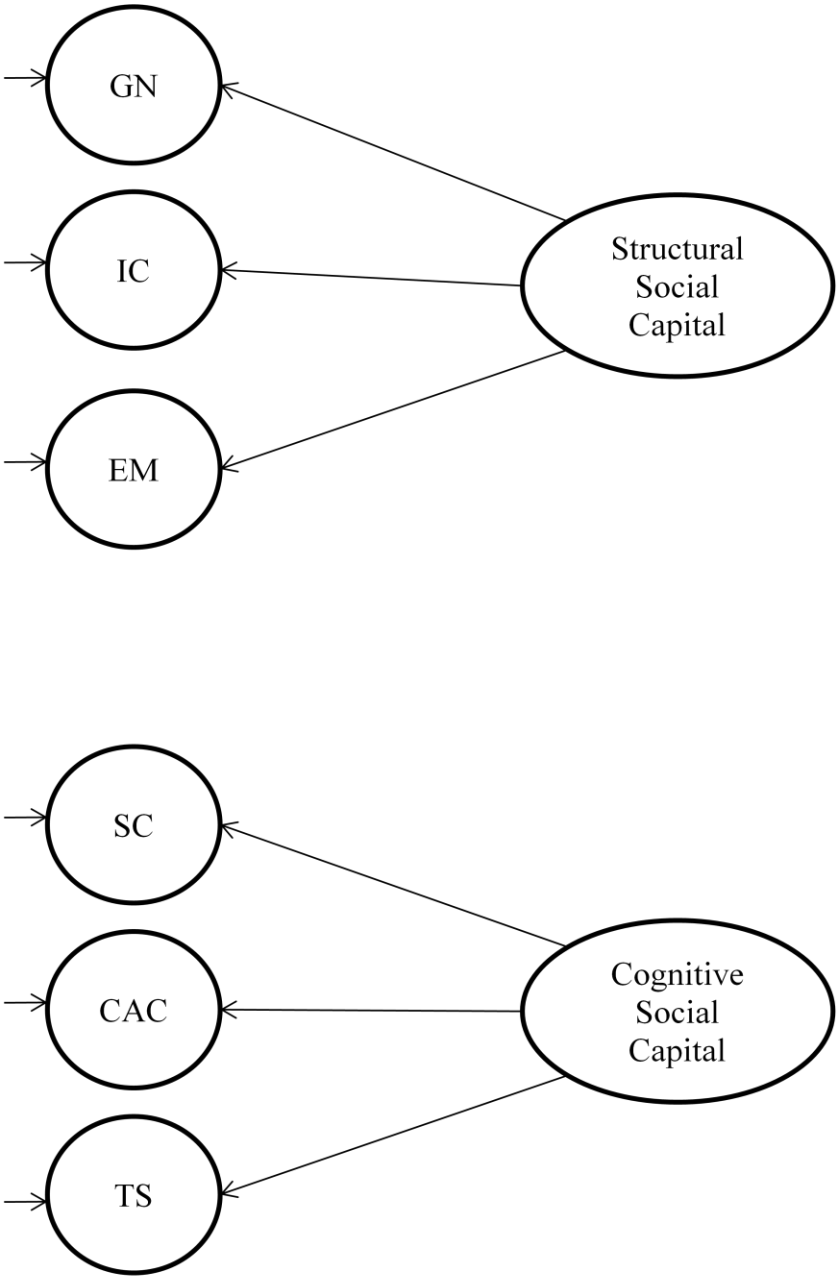

Figure 1. Hypothesized structure of social capital, composed of two general dimensions that underlie six primary dimensions. GN = groups and networks, IC = information and communication, EM = empowerment and political action, SC = social cohesion and inclusion, CAC = collective action and cooperation, TS = trust and solidarity. Not represented in this figure is the measurement part of the analysis linking the individual items to their respective factors (e.g. , GN, IC, EM).

Figure 1. Hypothesized Structure of Social Capital

Ideally, the analyses in this study would include the entire model structure of social capital depicted in Figure 1. However, due to the lack of sufficient numbers of appropriate indicators of those six primary dimensions (constructs) in the dataset utilized for this study, the models presented capture different aspects and measures of this ideal structure. This is discussed more in the Data Analyses section.

After examining the validity of the hypothesized structure of social capital, this study investigates the relationships among social capital, completion of a community-driven development (CDD) subproject and two indicators of education at the household level (parents' education level and enrollment of school-age children in school). The methodology employed is described in the following sections.

Sample

The data used in this study were collected in Brazil in 2005 during a quasi-experimental impact evaluation of the World Bank's CDD program (see Chapter 1 and Appendix A) conducted by Binswanger et al. (2006). That study analyzed data on household and community demographics, health, education, and physical (e.g. appliances, vehicles, agricultural implements, and livestock) and financial assets from 2002 and 2005 to determine the impact of participating in the CDD program on treatment and control communities. In addition, Binswanger et al. compared household-, community-, and municipal-level data on social capital and governance characteristics collected in 2005 with data collected about 2002 and about the time period prior to the establishment of the community association responsible for implementing the CDD

subproject.[11] The methodology of Binswanger et al.'s analysis of social capital is briefly described in Appendix C. The present study differs from the Binswanger et al. study in that I employ a structural equation modeling approach to the analysis of household-level data related to social capital, CDD and education. This is discussed in more detail in the Data Analyses section.

The study sample includes 864 randomly-selected households in 108 communities in 90 municipalities divided equally among three states in rural Northeast Brazil (Piauí, Ceará, and Rio Grande do Norte).[12] The sample was designed to be statistically representative of CDD program's beneficiary population in the three states together (Binswanger et al., 2006).[13] The sample also includes data from treatment and control communities, split evenly into two groups. The treatment communities were randomly selected from those that had a CDD subproject approved between April and September 2002. This meant that no effects of the implementation of the subprojects would have occurred in July 2002, the period to which the recall questions were directed. The control communities were randomly selected from those that had subprojects approved between March and July 2005, so that no impact would yet have been felt by the time the field

[11] The data for 2002 and the period before establishment of the community association are based on recall, since no baseline data were collected for the impact evaluation. The researchers chose to "anchor" the data in 2002 because that was the year that Brazil won the World Cup in soccer for the fifth time. By targeting the questions at an important period in Brazilian history, it was assumed that most of the respondents would be able to remember their situation at that time (Binswanger et al., 2006). This practice is not uncommon in situations when no baseline data exist. For example, Grootaert, et al. (2004) incorporated the use of recall data into their Integrated Questionnaire for the Measurement of Social Capital (SC-IQ).

[12] These three states were chosen because they were the only ones that kept good records of the community profiles which are registered when projects are requested. This information was used for the first stage propensity score matching conducted by Binswanger et al. (2006).

[13] According to Binswanger et al. (2006), "The household sample is statistically representative, with an error of 5% and 95% confidence level, while the community sample was drawn to give an error of 10% at 95% confidence level" (p. 79). However, no information was included in the original evaluation regarding how the representativeness of the sample was established.

research was conducted in September and October 2005 (Binswanger et al., 2006).[14] Tables 2, 3, 4, and 5 present selected characteristics of the households and communities involved in the study.

Table 2

Characteristics of Households and Access to Services in 2002 and 2005

	% of Communities			
	Control		Treatment	
	2002	2005	2002	2005
With ownership of house	78*	85*	89	90
Access to piped water	29*	30*	31	43
Access to sewerage system or septic tank	30	37	34	40
Rubbish collection or rubbish burning	65*	69*	74	75
Access to Electricity	60*	68*	80	89
Indoor bathroom	59*	70*	63	75

Source: Binswanger et al., 2006.
*The difference between treatment and control groups was statistically significant $p < .10$

[14] Binswanger et al. (2006) pointed out that on average it takes six months from time of approval to the completion of subproject implementation.

Table 3

Per capita Value of Household Assets, in 2002 and 2005 (in Brazilian R$ of 2005)[a]

	Control		Treatment	
	2002	2005	2002	2005
Electrical appliances	227*	335*	348	441
Automobiles	405	568	350	450
Tools and Agricultural Machinery	21*	27*	42	47
Animals	328*	345*	562	566
Financial Assets	-60	-236	-50	-247
Total per capita value	921	1,039	1,256	1,257

Source: Adapted from Binswanger et al., 2006.
a. The exchange rate for September 15, 2005, was US$ 0.43 to R$ 1.00. Retrieved from: http://www.oanda.com/currency/historical-rates
*The difference between treatment and control groups was statistically significant $p < .10$[15]

[15] The level of significance $p < .10$ was established by Binswanger et al. (2006).

Table 4

Characteristics of the Communities

	Control		Treatment	
	2002	2005	2002	2005
Distance from the main town (km)	19		18	
Number of houses inhabited	55	--	60	--
Estimated population	263	--	245	--
Church (%)	30	32	37	44
Rural workers' union (%)	28	37	30	39
Police station (%)	6	4	4	6
Farmers' Association (%)	30	32	20	20
Post Office (%)	4	4	6	7
Public Telephone (%)	20	35	30	37
Primary School (%)	63	57	74	70
Secondary School (%)	9*	7*	24	24
Health Clinic (%)	11*	13*	33	32
Total value community assets (2005 Brazilian R$)[a]	65,451	68,810	86,384	73,513

Source: Adapted from Binswanger et al., 2006.
a. The exchange rate for September 15, 2005, was US$ 0.43 to R$ 1.00. Retrieved from: http://www.oanda.com/currency/historical-rates
*The difference between treatment and control groups was statistically significant $p < .10$[16]

[16] The level of significance $p < .10$ was established by Binswanger et al. (2006).

Table 5

Parents' Educational Level in 2002 (percent)

	Head of Household[a]		Spouse	
	n = 863		*n* = 798	
Level of education	Control	Treatment	Control	Treatment
Never attended school	16.5*	12.3*	10.3*	7.5*
Primary incomplete	24.4	24.7	22.1	20.3
Completed primary school (4 years)	5.1	7.2	9.8	11.4
Completed middle school (fundamental)	3.2	3.9	4.3	6.0
Completed high school	0.7*	1.9*	3.6	3.8
Attended/completed higher education	0.1	0.0	0.1*	0.9*

Source: Author
a. In both groups 93% of the heads of household were male.
*The difference between treatment and control groups was statistically significant p < .10.[17]

As can be seen from Tables 2-5, the communities were quite similar on many of the indicators, although in most cases the treatment communities (those that were first awarded the CDD subprojects in 2002) were slightly better off than the control communities (those first awarded a CDD subproject in 2005). Nevertheless, the

[17] In Table 5 a level of significance $p < .10$ was used for consistency with the original report (Binswanger et al., 2006). Also given the relatively general nature of the variables under study, setting a level of significance of $p < .10$ enabled me to increase the power of the tests for differences among groups on the variables under study (D. M. Dimitrov, personal communication, May 25, 2010).

differences were not large and, overall, all of the communities could be considered quite poor (e.g. the total value of community assets in 2002 was approximately US$ 28,143 and US$ 37,145 for the control and treatment communities, respectively, and the difference was not statistically significant). Moreover, there was a generally low level of education of the parents in both the control and treatment groups. In addition, as might be expected according to the theory of social capital (e.g. Coleman 1998/2000), the parents in control communities had *lower* levels of education than those in treatment communities on all of the indicators and these differences were statistically significant for three indicators (percent of heads of household and spouses who had never attended school, percent of heads of household who had completed high school, and percent of spouses who had completed higher education).

Instruments

Binswanger et al. (2006) designed a questionnaire to gather household-level data on demographics, health, education, physical (e.g. appliances, vehicles, agricultural implements, livestock) and financial assets, and social capital and governance characteristics.[18] The questionnaire is included in Appendix D. The questionnaire items related to social capital corresponded with the six dimensions presented by Grootaert et al. (2004) and discussed earlier (see the Measuring Social Capital section in Chapter 2): groups and networks, collective action and cooperation, trust and solidarity, information and communication, social cohesion and inclusion, and empowerment and political action, although they were not specifically organized in this way.

[18] The questionnaire items related to household health and physical and financial assets were not included in the analysis for this study

Reliability and validity. No reliability or validity information was provided with the original data on the questionnaire utilized by Binswanger et al. (2006). However, there is evidence to indicate that this questionnaire adequately addressed the *content aspect* of construct validity outlined by Messick (1995). First, the items related to social capital were developed by one of the authors based on his prior experience researching social capital in other studies (e.g. Costa, 1998, 1999a, 1999b, 1999c, 1999d; Kottak & Costa, 1994; Kottak, Costa et al., 1994; Rizvi & Costa, 2003a, 2003b, 2003c, van Zyl, Sonn et al., 2000) as well as on results from prior field research conducted by the World Bank's "Social Capital Initiative Team" (Grootaert & van Bastelaer, 2002a, 2002b; Grootaert et al., 2004). In addition, an examination of the items revealed that they are similar to items in other field-tested instruments such as the SC-IQ developed by Grootaert et al. (2004). Furthermore, (a) the content of the items was relevant to theory of social capital, (b) there were items representing all six dimensions of social capital highlighted in the literature (Grootaert et al., 2004), and (c) the technical quality of the items appeared adequate for the purpose of the original study (Messick, 1995).

The present study sought to provide evidence in support of the *structural aspect* of validity, which, according to Messick (1995), "appraises the fidelity of the scoring structure to the structure of the construct domain at issue" (p. 6). This is briefly discussed in the Data Analyses section. The other aspects of validity as defined by the unified conception of construct validity (substantive, generalizability, external, and consequential; Messick, 1995) are beyond the scope of this study.

Data Collection

The data used in this study were collected in three states in rural Northeast Brazil (Piauí, Ceará, and Rio Grande do Norte) from September to October of 2005 by field researchers who had been trained to administer the questionnaire (Binswanger et al., 2006). Eight households were randomly-selected from each community. The head of each household participating in the study was interviewed individually. All of the data were entered into a Statistical Package for the Social Sciences (SPSS) database by the field research team and then submitted in electronic format to Binswanger et al. (2006). For the purposes of my study, I contacted via email the persons at the World Bank who had control of the data and requested access. After obtaining permission from the corresponding authorities at the state level—also via email—the World Bank contact person sent me the data file in SPSS format. Copies of the emails as well as the letter from the George Mason University Human Subjects Review Board granting permission to use the dataset are included in Appendix E.

Data from a total of 25 items from the original questionnaire related to all six dimensions of social capital were included in the analyses for the present study. These included questions related to participation in groups and networks (e.g. "What members of the household are currently members of the community association?"); collective action and cooperation (e.g. "If the irrigation system [in the community] were to stop working, how would you resolve the problem?"); information and communication (e.g. "Where did you get your information about the municipality when Brazil won World Cup 2002?"); social cohesion and inclusion (e.g. "Do you meet with people in neighboring

communities to resolve problems?"); empowerment and political action (e.g. "Do you meet with politicians and other authorities to hold them accountable?"); and trust and solidarity (e.g. "Do you trust the mayor of the municipality?"; see Appendix F for a complete list of the items included in the analyses). The analyses, discussed below, included items that were reported for both 2002 and 2005, as well as those that were related to respondents' perceptions of changes in different dimensions of social capital over the time period from 2002 to 2005. Appendix F also includes basic descriptive statistics for and correlations among the different measures of social capital. The analyses also included the following variables: treatment/control group, parents' level of education in 2002 and 2005, and the enrollment of any school-age children in school in 2002 and 2005.

Data Analysis

The statistical data analysis was conducted within the framework of structural equation modeling (SEM). Based on theory or prior empirical findings, structural equation modeling allows researchers to test for statistical significance the hypothesized causal relations among observable variables, latent variables, and/or a mixture of both. SEM is utilized when it is hypothesized that certain constructs *underlie* a person's responses to a particular survey instrument and it provides "an excellent framework for the comparison of group means on latent variables" (Dimitrov, 2008, p. 412). Types of structural equation models include path analysis, latent change models, confirmatory factor analysis (CFA), and structural regression models (Raykov & Marcoulides, 2006).

Path analysis is a statistical method of determining direct and indirect effects in hypothesized causal relations among observable variables. Confirmatory factor analysis is a theory-driven approach that is used when researchers want to test the validity of a hypothesized model of latent factors (constructs)[19] and their relationships to a set of observed variables—that is, when they want to examine the *structural aspect* of validity (Messick, 1995; Dimitrov, 2008). Each factor included in the model is measured by a set of observed indicators, often items on a questionnaire, and no specific relationships are assumed to exist between the constructs (Raykov & Marcoulides, 2006). There are three situations in which CFA can be used:

> "(a) a strictly confirmatory situation in which a single formulated model is either accepted or rejected; (b) an alternative-models or competing models situation in which several models are formulated and preferably one of them is selected; and (c) a model-generating situation in which an initial model is specified and, in case of unsatisfactory fit to the data, is modified and repeatedly tested until acceptable fit is obtained" (Raykov & Marcoulides, 2006, p. 117).

As Raykov and Marcoulides (2006) pointed out, model generation appears to be the most common situation in current research. Additionally, CFA allows researchers to (a) test hypotheses about the validity of the factorial structure using data across different populations (e.g. control/treatment groups) or across time points (e.g. pretest-posttest), and (b) compare alternative ("rival") factorial structures for a set of indicators (Dimitrov, 2008).

[19] In this study the terms "factor" and "construct" are used interchangeably.

Structural regression models include hypothetical relationships between latent factors (Dimitrov, 2008; Raykov & Marcoulides, 2006). As such, structural regression models, hereafter referred to simply as structural equation models (SEM), typically include both a measurement part (CFA for validation and measurement of constructs) and a structural part (investigation of causal relations among constructs and observable variables; Dimitrov, 2008). Raykov and Marcoulides (2006) stated that "one reason for its pervasive use in many scientific fields is that SEM provides researchers with a comprehensive method for the quantification and testing of substantive theories" (p. 1). Major advantages of SEM with latent variables, compared with path analysis models, are that (a) the scores on each construct are "error free" (true scores) and (b) the SEM results remain stable across studies where the constructs are measured by different, yet valid, scales (Dimitrov, 2008, p. 411). Furthermore, in addition to giving researchers a mechanism for explicitly accounting for measurement error in observed variables—which methods such as multivariate analysis of variance do not do, SEM allows researchers to "readily develop, estimate, and test complex multivariate models, as well as to study both direct and indirect effects of variables involved in a given model" (Raykov & Marcoulides, 2006, p. 7). It is this latter type of SEM—structural regression modeling—that formed the foundation of my data analysis.

Before beginning data analysis, however, it was necessary to recode much of the original data so that it could be analyzed via SEM. Using the software program PASW Statistics 18,[20] I recoded the data so that all items had consistent scoring, with lower

[20] PASW Statistics is the new name of the Statistical Package for the Social Sciences – SPSS.

numbers representing lower values of the item being measured (in this case, some dimension of social capital or education) and higher numbers representing higher values. In addition, because many of the items had dichotomous scoring (e.g. yes/no), when appropriate I created aggregate variables that tallied the scores on related items to create a more "stable" measure (D. M. Dimitrov, personal communication, April 22, 2010). Moreover, because many of the items asked questions about the respondents' perceptions of changes in common indicators of social capital since 2002—rather than asking those same questions for each of the two time periods (2002 and 2005)—it was necessary to create a number of variables representing "change" in the different dimensions of social capital over time (Appendix F presents all of the variables that were included in this study). As a result, a number of items related to social capital that were included in the original questionnaire (see Appendix D) were excluded because they were inappropriate for the targeted analyses.[21]

Finally, in order to measure change in educational outcomes at the household level, it was necessary first create two aggregate variables representing the parents' level of education in 2002 and 2005 by combining the scores for the head of household and spouse for each time period into one variable. This was necessary to create a more stable measure of parents' education (D. M. Dimitrov, personal communication, April 22, 2010). I then determined how many children of school-going age in each household were enrolled in school in the years 2002 and 2005. If the children were not enrolled in school

[21] For example, one of the items asked the respondent to identify the "reason for loss or gain of a TV between 2002 and 2005." Since this question would be answered one way in the event of a "loss" of a TV and another way if the TV were "gained," this item could not be included in the analysis.

but were of school-going age, I also examined how many of them were reported as working. The information on school enrollments and work status is reported in Table 6.

Table 6

Number of School-Age Children Enrolled in School or Working 2002 & 2005

	2002	2005
In School	940	839
Working	178	97

As can be seen from the table, the number of school-age children that were working in 2002 and 2005 was not large and therefore was not considered in the analyses. In the sections that follow, the specific data analysis procedures for this study are discussed in the context of each research question.

Research question 1: *Do the data collected in Northeast Brazil in 2005 support the validity of the theory-based model that social capital has two general dimensions—cognitive and structural—that underlie the following primary dimensions: trust and solidarity, collective action and collaboration, social cohesion and inclusion (cognitive elements), groups and networks, information and communication, and empowerment and political action (structural elements)?*

The purpose of this first research question was to test the fit of the data to the theoretical model of social capital being comprised of two general dimensions (cognitive and structural social capital) that underlie six primary dimensions: groups and networks, information and communication, and empowerment and political action (structural social capital), trust and solidarity, collective action and collaboration, social cohesion and inclusion (cognitive social capital; see Figure 1). However, due to the small number of items relating to each primary dimension (construct) for which information was collected for both 2002 and 2005, it was necessary to create two different configurations of the model of social capital guided by the original theoretical model and considering the available data for the different indicators.

First, using the items that were reported for both time periods (2002 and 2005), each item representing a different dimension of social capital (social cohesion-SC, trust and solidarity-TS, groups and networks-GN, empowerment and political action-EM, information and communication-IC, and collective action and cooperation-CAC), I created a measurement model for each of the two time points that would be tested for

data fit using confirmatory factor analysis.[22] Table 7 presents the items that were included in the measurement model of the "general social capital" construct for each of the two time periods (2002 and 2005). The models are depicted in Figure 2 and Figure 3. In these and subsequent figures, two-way arrows (not included in these first two models) indicate expected *correlations* between variables, while one-way arrows indicate that the variable at the end of the arrow is "*explained*" by the variable at the beginning (Raykov & Marcoulides, 2006).

[22] Since the data about 2002 were collected using recall, there was a possibility that there might be a difference in the nature of the questions for each time period that might be reflected in the respondents' answers. To avoid potential problems, I broke this down into two models, one for each time period, then tested data fit for each model separately.

Table 7

Measures of Hypothesized Construct of General Social Capital

Item	Description
SC01_05	Do you meet with people in neighboring communities to resolve problems?
TS01_05	Do you do volunteer work for charity?
GN01_05	Number of people in household that are members of the community association created to implement the CDD subproject, 2005.
EMTOT_05[a]	Aggregate measure of empowerment and political action, 2005.
ICTOT_05[b]	Measure of access to information and communication, 2005.
CAC01_05	If the irrigation system were to stop working, how would you resolve the problem?

Note: The items are the same for 2002.

[a.] This measure is a composite of two items related to participation in public assembly meetings and municipal council meetings, and meeting with local government and other authorities to hold them accountable.

[b.] This measure is a composite of three items related to access to electricity, radio and television.

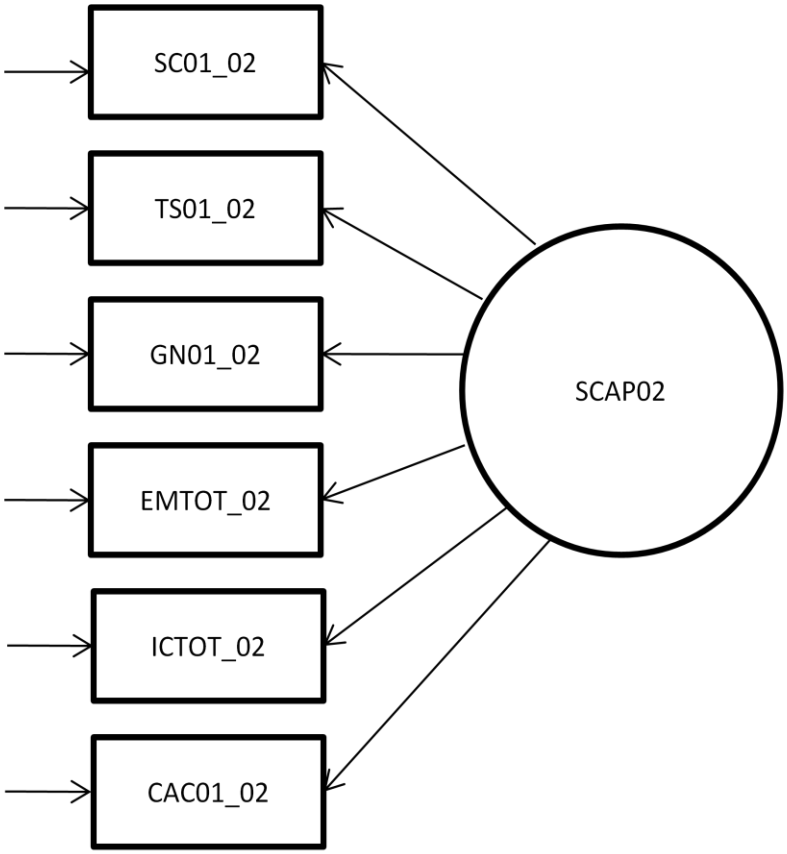

Figure 2. Measurement model for confirmatory factor analysis of hypothesized construct "general social capital" in 2002 (SCAP02). Items correspond to the social capital dimensions "social cohesion and inclusion" (SC), "trust and solidarity" (TS), "groups and networks" (GN), "empowerment and political action" (EM), "information and communication" (IC), and "collective action and cooperation (CAC).

Figure 2. Measurement Model for CFA of General Social Capital in 2002

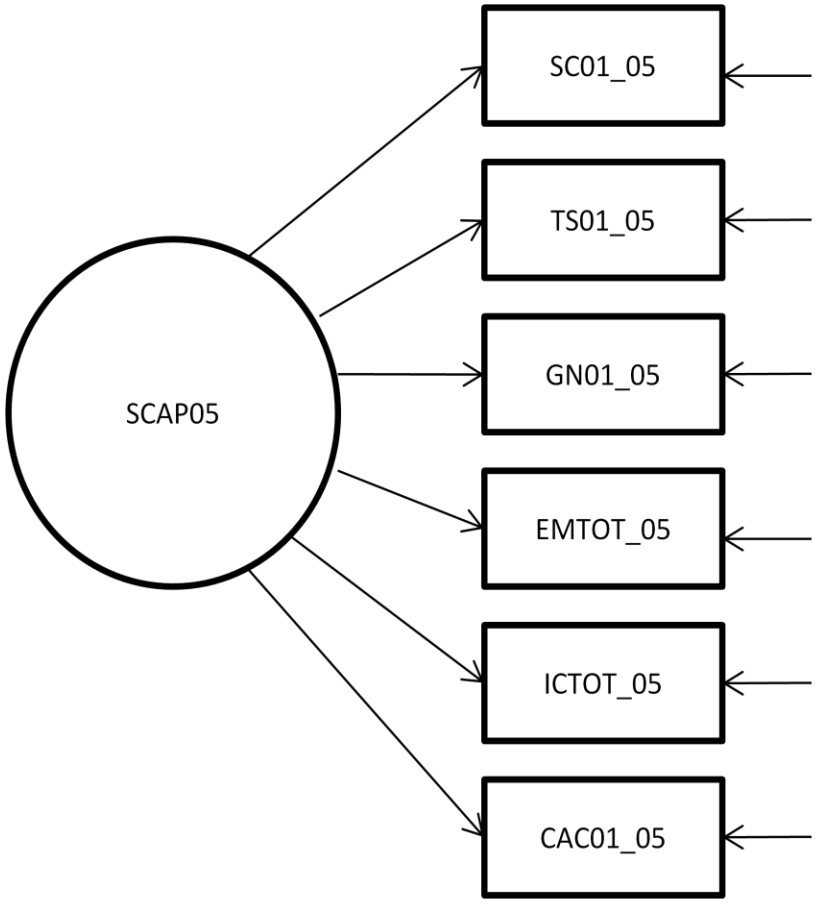

Figure 3. Measurement model for confirmatory factor analysis of hypothesized construct "general social capital" in 2005 (SCAP02). Items correspond to the social capital dimensions "social cohesion and inclusion" (SC), "trust and solidarity" (TS), "groups and networks" (GN), "empowerment and political action" (EM), "information and communication" (IC), and "collective action and cooperation (CAC).

Figure 3. Measurement Model for CFA of General Social Capital in 2005

In the second part of the analysis for Research Question 1, I used 16 items that asked respondents' perceptions regarding change in different dimensions of social capital (collective action and cooperation-DCAC, information and communication-DIC, trust and solidarity-DTS, social cohesion and inclusion-DSC)[23] over the time period between 2002 and 2005 to create a second measurement model labeled "social capital change." It was necessary to create this second model because the items in this model were substantively different from those in the first. That is, while the items in the first model asked questions specific to two separate time points (albeit using recall strategies for the 2002 data), the items in this model asked respondents' perceptions of *change between those same time points*. Consequently, the two types of items could not be used in the same analysis (D. M. Dimitrov, personal communication, April 22, 2010). The items related to each construct in the second model are listed in Table 8.

[23] There were no items in the questionnaire related to change in the dimension groups and networks. There was only one aggregate variable related to change in empowerment and political action (D_EM); therefore, this dimensions was not included in this measurement model since it is not advisable to use a single observed variable as an indicator of a latent variable (Dimitrov, personal communication, April 22, 2010; Raykov & Marcoulides, 2006). This variable (D_EM) is included in a later analysis, however.

Table 8

Measures of Change in Four Hypothesized Dimensions of Social Capital

Item	Description
Information and communication – DIC	
D_IC_03	Change in the availability of information about the municipality since June 2002
D_IC_04	Change in the availability of information about the state since June 2002
D_IC_05	Change in the availability of information about the municipality country since June 2002
D_IC_06	In June 2002 did you listen to the radio more or less frequently than today?
D_IC_07	In June 2002 did you watch TV more or less frequently than today?
Collective Action and Cooperation – DCAC	
D_CAC_01	Before Brazil won World Cup 2002 people in the community helped those in need (more, equal, less).
D_CAC_02	In 2002 did the community members get together more or less often to work in benefit of the community?
D_CAC_03	Change in the way the community responds to the problem of the irrigation system stopping working.

Trust and Solidarity – DTS

D_TS_01	Compared to when Brazil won World Cup 2002, do you have more/less trust in your relatives and neighbors?
D_TS_02	Compared to when Brazil won World Cup 2002, do you have more/less trust in people from other communities and the municipal seat?
D_TS_03	Compared to when Brazil won World Cup 2002, do you have more/less trust in the mayor of the municipality?
D_TS_04	Compared to when Brazil won World Cup 2002, do you have more/less trust in the State, laws, and government institutions?
D_TS_05	Comparing today with 2002, how many community members give you presents?
D_TS_06	Change in the number of people who live in other communities from whom you receive presents between 2002 and 2005.

Social Cohesion and Inclusion – DSC

D_SC_01	Since Brazil won World Cup 2002, the community association leaders participate more or less in the solution of conflicts?
D_SC_02	Change in meeting with people in neighboring communities to resolve problems between 2002 and 2005.

Figure 4 depicts the social capital change measurement model. In this model, there were sufficient numbers of items to serve as indicators of four of the six dimensions of social capital, thus allowing for the representation of these dimensions as latent variables. However, since not all of the six dimensions of social capital were represented in this model, I was not able to include the underlying (more general) dimensions of cognitive and structural social capital. Nevertheless, I did expect a stronger correlation between the dimensions that were thought to relate to cognitive social capital (collective action and cooperation, trust and solidarity, and social cohesion and inclusion), while I believed that the dimension related to structural social capital (information and communication) would be less closely correlated with the other three. The hypothesized correlations between the dimensions of social capital are not illustrated in Figure 4 but were examined in the analysis.

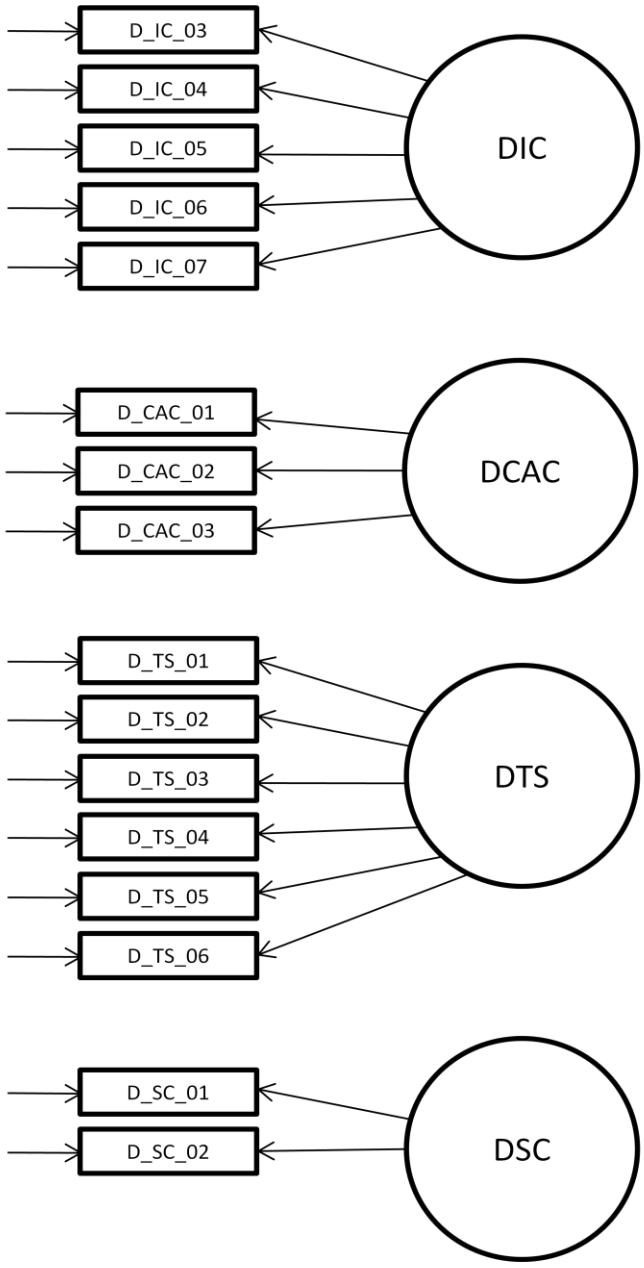

Figure 4. Measurement model for confirmatory factor analysis of hypothesized constructs representing change in the following dimensions of social capital: DIC = change in information and communication over time; DCAC = change in collective action and cooperation over time; DTS = change in trust and solidarity over time; DSC = change in social cohesion and inclusion over time.

Figure 4. Measurement Model for CFA of *Social Capital Change*

As Dimitrov (in press) pointed out, "testing for model fit relates to the structural aspect of validity but does not tap into the generalizability aspect of validity." That is, testing for model fit does not reflect to what extent the "properties and interpretations of scores on the construct of interest [can] generalize across population groups, settings, and tasks" (p. 6). Prior to testing whether the data for the entire sample fit the hypothesized models of social capital described above, I first needed to determine whether social capital had the same meaning for both of the groups in my study (control and treatment communities) in the different models ("general" and "change"). In the context of CFA these questions are typically addressed through testing for factorial invariance of the targeted construct across groups, which includes examining the configural invariance, measurement invariance, and structural invariance of the model (Dimitrov, in press).

> Invariance of the model configuration (the pattern of free and fixed model parameters) across groups is referred to as configural invariance….In testing for configural invariance, it is necessary first to identify a baseline model, which is estimated for each group separately. Specifically, the most parsimonious, yet substantively most meaningful and best fitting model to the data for a group is referred to as the baseline model for this group. … Measurement invariance refers to (a) metric invariance—equal factor loadings across groups, (b) scalar invariance—equal item intercepts across groups, and (c) invariance of item uniquenesses—equal item error variances/covariances across groups. Typically, measurement invariance is addresses at three levels—weak, strong, and strict measurement invariance. [Finally], structural invariance refers to invariance of

> factor variances and covariances. In the context of construct validation, a decision regarding whether testing for structural invariance should be conducted would depend on whether the variability of target constructs and/or correlational relationships among them are deemed relevant to the generalizability aspect of validity (Dimitrov, in press, pp. 7-8).

In a conversation with Dimitrov (April 19, 2010), it was decided that for the purposes of this study it would only be necessary to establish configural invariance for the baseline "general" and "social capital change" measurement models. Consequently, I began data analysis by using the software program *M*plus 4.21 (Muthén & Muthén, 1998-2007) to conduct a maximum likelihood confirmatory factor analysis to test the fit of the data to the models for each of the two groups (treatment and control) separately. I then proceeded to test the validity of the fit of the data for the entire sample to the models. The results of these and subsequent tests are discussed in Chapter 4. The *M*plus input instructions for all research questions are included in Appendix G.

Research question 2: *Does living in a community that has completed implementation of a CDD sub-project lead to greater levels of social capital among households participating in the study?*

After testing the fit of the data to the social capital measurement models, I sought to investigate whether having completed implementation of a community-driven development (CDD) subproject led to increases in social capital among participating communities. To answer this second research question I built on the original general social capital and social capital change models to create two group-code structural

equation models comparing the two groups (control/treatment community)[24] on the latent constructs of social capital.

> Group-code modeling … keeps the data from the two groups *together* and is based on the idea of using dummy coding in regression analysis for group comparisons. The construct of interest is regressed on a dummy variable, *X*, which assumes values of 0 and 1" (Dimitrov, 2008, p. 417).

General social capital group-code model. Figure 5 depicts the path diagram of the group-code structural equation model looking at the impact of group membership on general social capital in 2002 and 2005. The two-way arrow in Figure 5 indicates the assumption that general social capital in 2002 (SCAP02) correlates with membership in the control/treatment group (COMM_CT), whereas the one-way arrow indicates the assumption that group membership (0 = control, 1 = treatment) has a direct effect on general social capital in 2005 (SCAP05). I also expected that the level of general social capital in 2002 would directly affect the level of general social capital in 2005. Finally, since the items were the same for each time period (e.g. GN01_02 and GN01_05; SC01_02 and SC01_05), I expected that their error terms (residual variances) would be correlated. The correlations among error terms are not depicted in the figure, but were included in the analysis.

[24] As a reminder, the treatment communities were those that had completed implementation of their CDD subproject in 2002; the control communities were those that had been awarded CDD subproject grants in early 2005 but that had not completed their implementation by the time the data were collected in the fall of 2005.

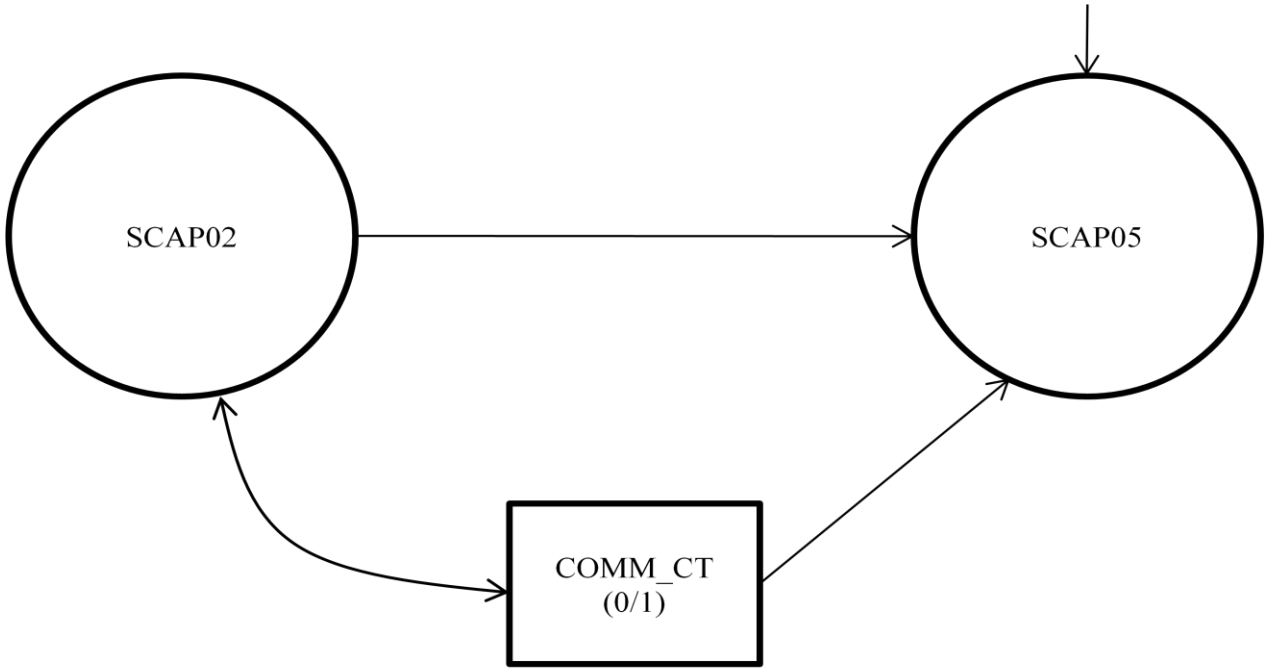

Figure 5. Group-code structural equation model for CFA of relationship between social capital in 2002 and 2005 and group membership. SCAP 02 = "general" social capital in 2002; SCAP05 = "general" social capital in 2005; COMM_CT = control (0) or treatment (1) group code. Not represented in this figure is the measurement part of the analysis linking the individual items to their respective factors. Also not shown here are the correlations between the error terms for the different items at the two time points (2002 and 2005; e.g. GN01_02 and GN01_05).

Figure 5. General Social Capital Group-Code SEM

Social capital change group-code model. In Figure 6, the path diagram for the group-code model of social capital change includes one aggregate variable (D_EM-change in empowerment and political action over time) that was not included in the original measurement model. This is because it is not advisable to use a single observed variable as an indicator of a latent variable, given that the observed variable may contain unreliable information (D. M. Dimitrov, personal communication, April 22, 2010; Raykov & Marcoulides, 2006). The hypothesized correlations between the different dimensions of social capital are not represented in the figure but were examined in the analysis. In this model I expected that group membership would directly affect respondents' perceptions of change over time in each of the dimensions of social capital.

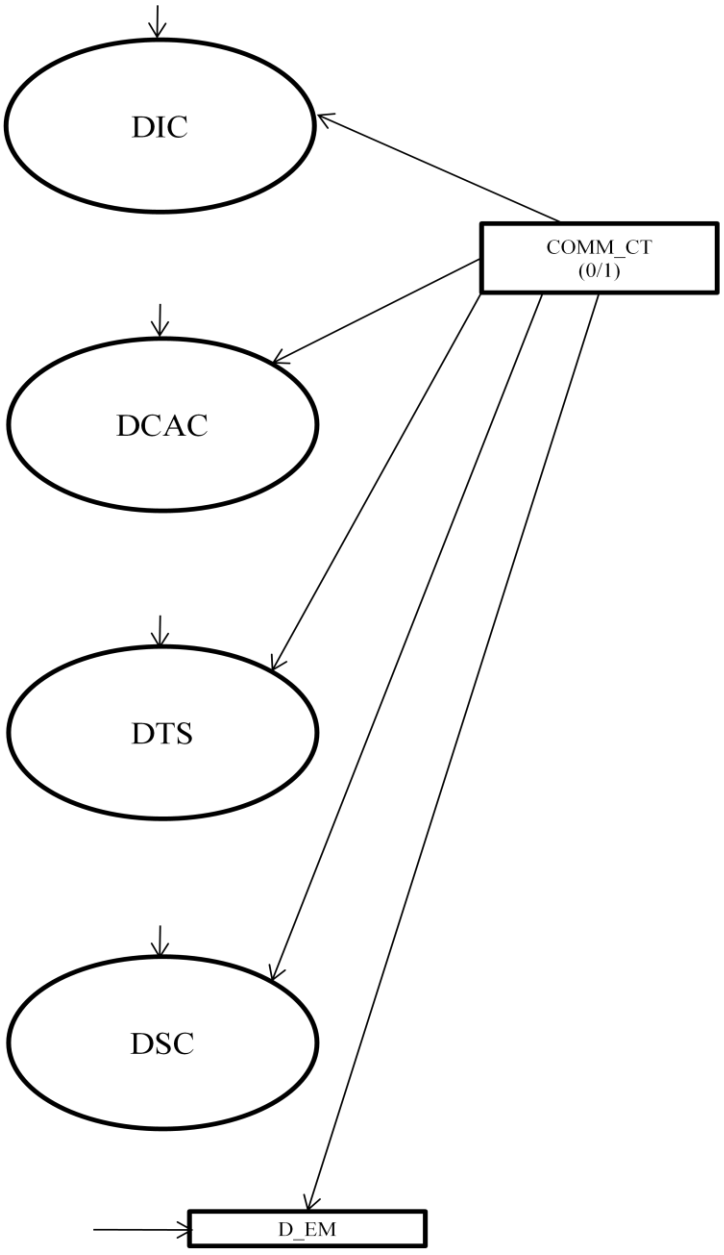

Figure 6. Group-code structural equation model for CFA of the impact of group membership on different dimensions of social capital between the period 2002 and 2005. DIC = change in information and communication over time; DCAC = change in collective action and cooperation over time; DTS = change in trust and solidarity over time; DSC = change in social cohesion and inclusion over time; COMM_CT = control (0) or treatment (1) community; D_EM = aggregate variable of change in empowerment and political action over time. Not represented in this figure is the measurement part of the analysis linking the individual items to their respective factors. Also not shown are the hypothesized correlations between the different change factors.

Figure 6. Social Capital Change Group-Code SEM

Research question 3: *Is there a relationship between the level of social capital, completion of CDD subproject implementation, the parents' level of education, and the educational enrollment of children among households participating in this study?*

Building on the group-code models presented above, I created two final models to explore the relationships among social capital, completing implementation of a CDD subproject, and two indicators of education among the households participating in the study. These models are depicted in Figure 7 and Figure 8. Unfortunately, the number of education variables that were included in the dataset was quite limited and related only to the level of education and school enrollment of the different family members. To create variables that could be analyzed appropriately within the context of SEM, I created aggregate variables combining the level of education of the head of household and spouse at each of the two time points (PARED_02 and PARED_05) and the number of school-age children[25] enrolled in school at the two time points (CH_SH_02 and CH_SC_O5; D. M. Dimitrov, personal communication, April 22, 2010). These variables were then incorporated into the group-code models depicted in Figure 5 and Figure 6.

General social capital group-code and education model. For this model (see Figure 7) I sought to understand the relationships among parents' level of education, the enrollment of school-age children in school, membership in the control/treatment group and general social capital at the household level. Before conducting the SEM analyses, however, I first conducted a crosstabs analysis using PASW Statistics 18 to test for differences between the control and treatment groups on the level of education of the

[25] The number of parents enrolled in school in the sample was so small that I did not consider this variable in the analysis.

head of household and spouse in 2005 (see Table 5 for information on parents' education levels in 2002).

In Figure 7, the additions to the group-code model for general social capital reflect my expectation that the parents' educational level in 2002 (PARED_02) would directly affect general social capital in 2002 (SCAP02), the number of school-age children in the household enrolled in school in 2002 (CH_SC_02), and the parents' educational level in 2005 (PARED_05). In addition, I expected that PARED_02 would correlate with membership in the control/treatment group (COMM_CT), while group membership would directly affect PARED_05 and general social capital in 2005 (SCAP05). In addition, I hypothesized that PARED_05 would directly affect the enrollment of school-age children in 2005 (CH_SC_05) as well as SCAP05. Further, I also expected that SCAP02 and SCAP05 would directly affect CH_SC_02 and CH_SC_05, respectively. Finally, I expected that CH_SC_02 would directly affect CH_SC_05.

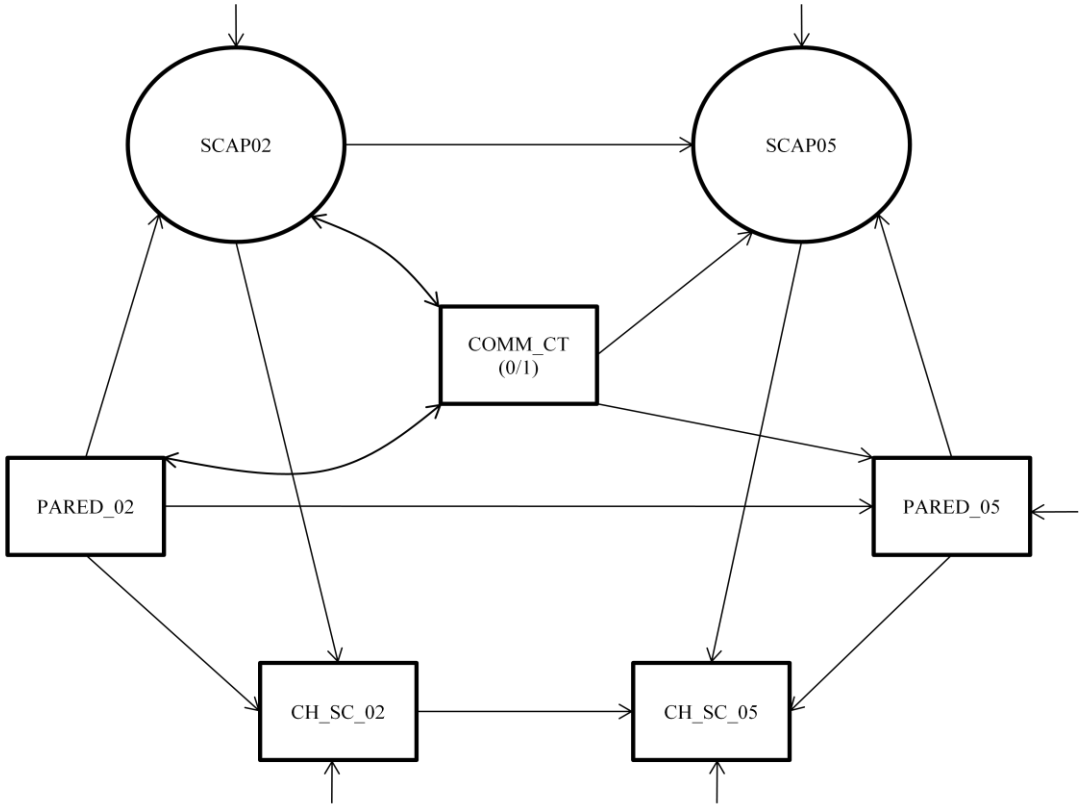

Figure 7. Structural equation model to test the impact of group membership and parents' levels of education on social capital and children's enrollment in school in 2002 and 2005. SCAP02 = social capital 2002; SCAP05 = social capital 2005; COMM_CT = control (0) or treatment (1) group; PARED_02 = parents' level of education 2002; PARED_05 = parents' level of education 2005; CH_SC_02 = number of school-age children enrolled in school 2002; CH_SC_05 = number of school-age children enrolled in school 2005. Not represented in this figure is the measurement part of the analysis linking the individual items to their respective factors. Also not shown here are the correlations between the error terms for the different items at the two time points (2002 and 2005; e.g. GN01_02 and GN01_05).

Figure 7. SEM Exploring Links between Social Capital, CDD Subproject Implementation and Education

Social capital change group-code and education model. In the last model (see Figure 8), I did not include variables related to the enrollment of children in school. This is because in the context of the model I did not believe these variables were relevant. Specifically, the items in this model sought information about the perceptions of each head of household related to change in the different dimensions of social capital over the period between 2002 and 2005, so I did not believe including measures of children's enrollment in school was appropriate. I did, however, feel that exploring the relationships between parents' level of education in 2002 and 2005 and head of households' perceptions of change in social capital over time would be appropriate in this model.

As can be seen in Figure 8, the two-way arrow between PARED_02 and COMM_CT indicates that I expected a correlation between parents' education in 2002 and membership in the control/treatment group. The one-way arrow between PARED_02 and PARED_05 indicates that I expected that the parents' education level in 2002 would directly affect their education level in 2005. Finally, I also hypothesized that COMM_CT would have a direct effect on PARED_05. The results of the analyses for each research question are presented in the next chapter. In addition, the *M*plus input instructions for all research questions are included in Appendix G and selected *M*plus output are included in Appendix H.

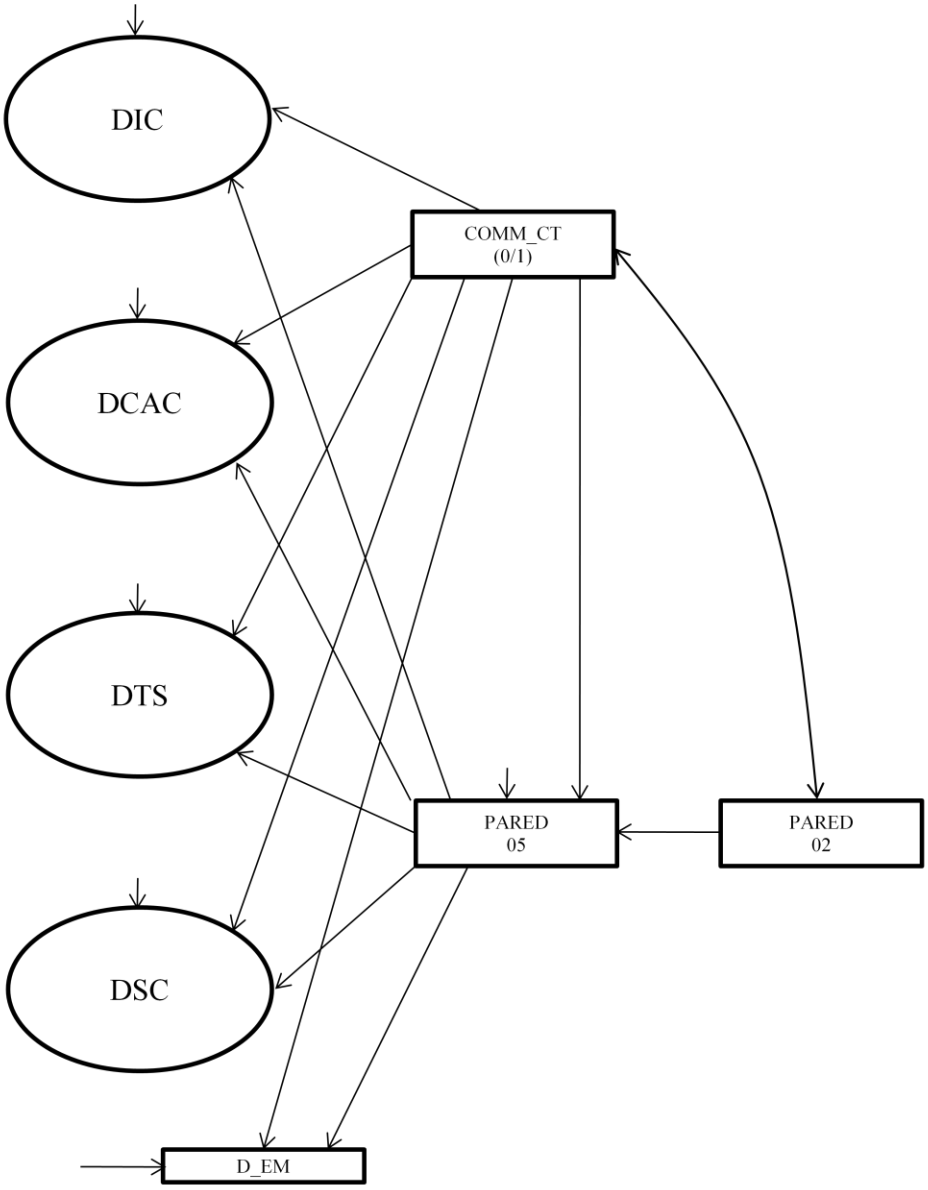

Figure 8. Structural equation model exploring the relationship between parents' education, group membership, and perceptions of change in five dimensions of social capital between 2002 and 2005: DIC = change in information and communication over time; DCAC = change in collective action and cooperation over time; DTS = change in trust and solidarity over time; DSC = change in social cohesion and inclusion over time; COMM_CT = control (0) or treatment (1) community; D_EM = aggregate change in empowerment and political action over time PARED_02 = parents' level of education 2002; PARED_05 = parents' level of education 2005. Not represented in this figure is the measurement part of the analysis linking the individual items to their respective factors.

Figure 8. SEM Exploring Links between Five Dimensions of Social Capital, CDD Subproject Implementation and Education

Chapter 4. Results

This chapter presents the results of the data analyses discussed in Chapter 3. The purpose was to evaluate the fit of data collected in Brazil in 2005 (Binswanger et al., 2006) to the different models created for this study. Confirmatory factor analyses (CFA) are typically tested for data fit using maximum likelihood tests in the context of structural equation modeling (SEM). The evaluation of model fit is based on an inferential goodness-of-fit index, the *chi-square (χ^2) value*, combined with several descriptive indexes. The data are said to fit a model when the corresponding chi-square value is *not* statistically significant. Since the chi-square value is sample-dependent,[26] Hu and Bentler (1999) recommended that the assessments of model fit should be based on a joint evaluation of several fit indexes such as the *comparative fit index* (CFA; Bentler, 1990), *Tucker-Lewis Index* (TLI; Tucker & Lewis, 1973), *standardized root mean square residual* (SRMR), and *root mean square error of approximation* (RMSEA, Steiger, 1990). They suggested that a reasonably good fit is supported when the following fit criteria are met: SRMR $\leq$ .08, RMSEA $\leq$ .06, CFI $\geq$ .95, and TLI $\geq$ .95. Dimitrov (in press) pointed out that the recommendation for a joint evaluation of goodness-of-fit

[26] E.g., as the sample size increases the chi-square value tends to artificially demonstrate statistical significance, thereby falsely indicating a poor model fit. Conversely, when sample size is small there is an artificial tendency to support model fit (Dimitrov, 2008).

indexes in making decisions regarding model fit is in line with findings and discussions on this issue in numerous empirical studies. These guidelines will be helpful to interpretation of the results of this study, presented below.

Results Research Question 1

RQ1: Do the data collected in Northeast Brazil in 2005 support the validity of the theory-based model that social capital has two general dimensions—cognitive and structural—that underlie the following primary dimensions: trust and solidarity, collective action and collaboration, social cohesion and inclusion (cognitive elements), groups and networks, information and communication, and empowerment and political action (structural elements)?

As described in Chapter 3, I analyzed two separate models of social capital in this study: one looking at general social capital in 2002 and 2005, and another examining change in different dimensions of social capital over that same time period. Before testing these models for data fit, however, I first tested for configural invariance of the baseline models (Dimitrov, in press). The results of these analyses are presented in Table 9, Table 10, and Table 11.

Testing for configural invariance. Table 9 and Table 10 show the results of the maximum likelihood confirmatory factor analyses conducted to test for data fit of the 2002 and 2005 general social capital measurement models. As can be seen in the tables, the chi-square values for each of the tests (Group 0 = control, Group 1 = treatment) were *not* statistically significant and the values for CFI, TLI, RMSEA and SRMR were all very close to the fit criteria mentioned above (CFI $\geq$ .95, and TLI $\geq$ .95, RMSEA $\leq$ .06, and

SRMR ≤ .08) thus indicating a good data fit for each model across the two groups. Although in the 2002 model the RMSEA (0.06) and SRMR (0.03) values were higher for the treatment group (Group 1) than for the control group (Group 0), those values were still within the recommended ranges, and combined with the other indexes indicated a good fit of the data to the model. The results of the 2005 model were almost identical across the two groups and indicated a very good fit of the data to the model.

Table 9

Testing for Configural Invariance 2002 General Social Capital Model

	Group 0	Group 1
Chi-Square	χ^2 (2) = 0.57	χ^2 (2) = 4.85
CFI	1.00	0.99
TLI	1.04	0.96
RMSEA	0.00	0.06
90% CI	[0.00, 0.07]	[0.00, 0.13]
SRMR	0.01	0.03

*Statistically significant, $p < .05$

Table 10

Results, Tests for Configural Invariance 2005 General Social Capital Model

	Group 0	Group 1
Chi-Square	χ^2 (2) = 1.45	χ^2 (2) = 0.73
CFI	1.00	1.00
TLI	1.01	1.02
RMSEA	0.00	0.00
90% CI	[0.00, 0.09]	[0.00, 0.07]
SRMR	0.02	0.01

*Statistically significant, $p < .05$

The results of the CFAs for the social capital change model in Table 11 also indicated a reasonable data fit for each group separately. Although the chi-square statistics were statistically significant for each group in this model, the values of CFI, TLI, RMSEA and SRMR were within acceptable ranges for the validation purposes of this study (D. M. Dimitrov, personal communication, April 22, 2010). In this model the results of the RMSEA and SRMR were also higher for the treatment than for the control group, but they were within acceptable ranges to support adequate fit of the data.

Table 11

Results, Tests for Configural Invariance Social Capital Change Model

	Group 0	Group 1
Chi-Square	χ^2 (98) = 228.81*	χ^2 (98) = 329.05*
CFI	0.86	0.82
TLI	0.83	0.79
RMSEA	0.05	0.07
90% CI	[0.046, 0.07]	[0.07, 0.08]
SRMR	0.06	0.07

*Statistically significant, $p < .05$

Based on the test results for data fit, I concluded that there was sufficient evidence to support the assumption of configural invariance across the two groups for each of the models.

Testing for data fit. Once configural invariance had been established I could proceed with testing for data fit using both groups together. The results are presented separately for each model.

General social capital measurement model. The results of the confirmatory factor analyses of the 2002 and 2005 general social capital models are presented in Figure 9 and Figure 10, respectively (see Appendix G for *M*plus input instructions and Appendix

H for selected *M*plus output). As can be seen in the figures, the goodness-of-fit tests indicated excellent fit of the data for the two models. Specifically, the chi-square values, χ^2 (2) = 1.67, p = .44 and χ^2 (2) = 0.31, p = .86, respectively, were *not* statistically significant, and the other fit indexes were also very close to the recommended values (CFI ≥ .95, and TLI ≥ .95, RMSEA ≤ .06, and SRMR ≤ .08. Based on these results I concluded that there was sufficient evidence to support (or at least "fail to disconfirm;" Dimitrov, 2008) the existence of a construct of general social capital for the study population for each of the two time points (2002 and 2005).

In Figure 9 and Figure 10 the number associated with the arrow going from the factor (e.g. SCAP02) to its indicators (items; e.g. SC01_02) is the "SEM estimate of the *regression slope* in the linear regression of the item scores on the (error-free) construct scores" (Dimitrov, 2006, pp. 430-431, emphasis in original). These regression slopes are also called factor loadings or structural coefficients. It should be pointed out that the estimated factor loadings for two items that were represented in Figure 2 (EMTOT_02 and ICTOT_02) and Figure 3 (EMTOT_05 and ICTOT_05) did not show statistical significance so they were removed from the final models depicted in Figure 9 and Figure 10. Removing these items did not affect data fit. The estimates of factor loadings for all remaining items were statistically significant.

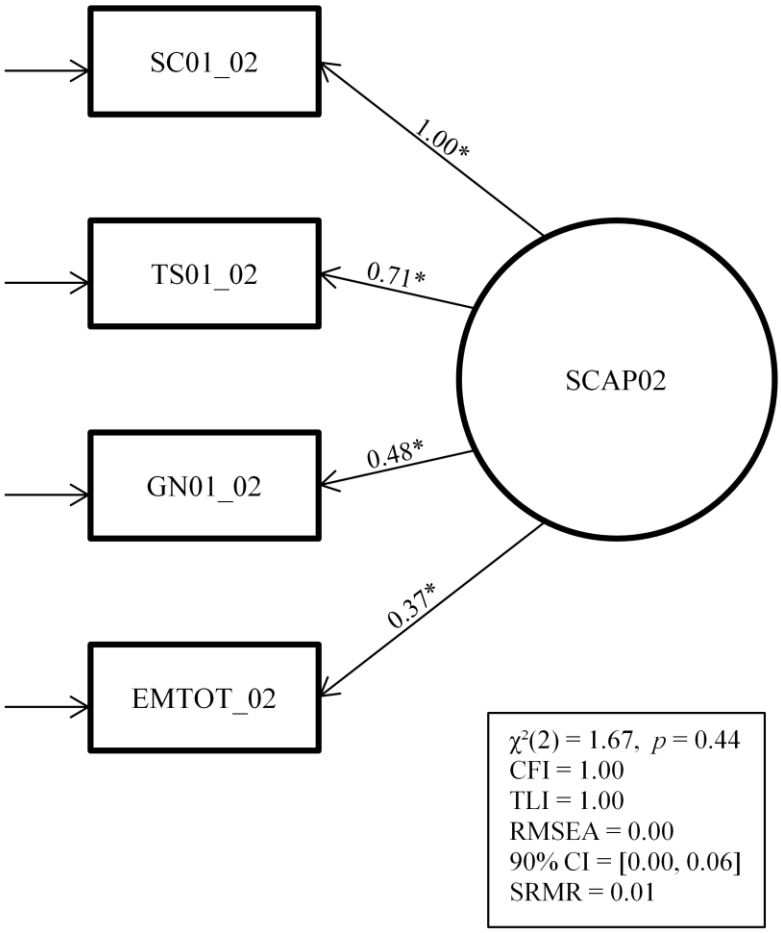

Figure 9. Results of measurement model for confirmatory factor analysis of hypothesized construct "general social capital" in 2002 (SCAP02). Items correspond to the social capital dimensions "social cohesion and inclusion" (SC), "trust and solidarity" (TS), "groups and networks" (GN), and "empowerment and political action" (EM).
* Statistically significant $p < .05$

Figure 9. Results, CFA 2002 General Social Capital Model

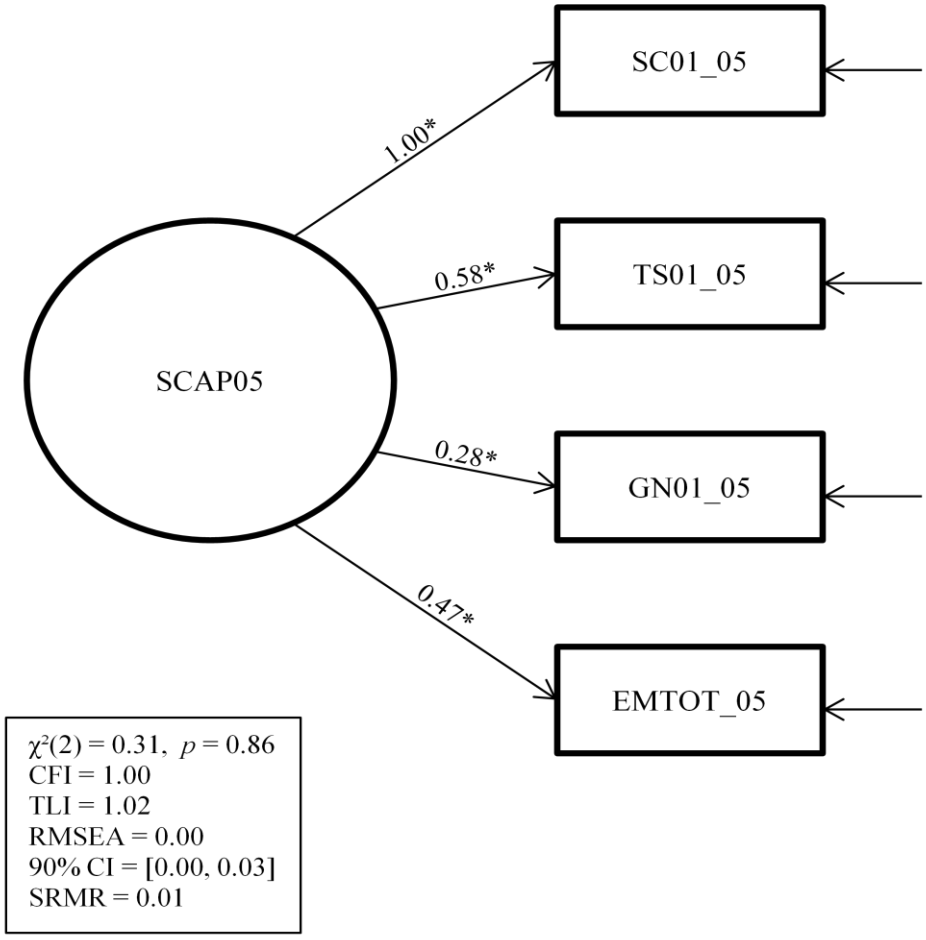

Figure 10. Results of measurement model for confirmatory factor analysis of hypothesized construct "general social capital" in 2005 (SCAP05). Items correspond to the social capital dimensions "social cohesion and inclusion" (SC), "trust and solidarity" (TS), "groups and networks" (GN), and "empowerment and political action" (EM).
* Statistically significant $p < .05$

Figure 10. Results, CFA 2005 General Social Capital Model

The unstandardized and standardized factor loadings provided in the *M*plus output (see Table 12 and Appendix H) help researchers to better understand the relationship between the factors and their indicators (items; Dimitrov, 2008; Muthén & Muthén, 1998-2007). As Dimitrov (2008) pointed out, "the unstandardized loadings are more useful for *interpretations*, whereas the standardized loadings indicate the relative *importance* of indicators in defining the construct to which they relate in the hypothesized model" (p. 393, emphasis in original). Table 12 presents the estimates of the unstandardized factor loadings, *b*, their standard errors, *SE*(*b*), and the squared standardized factor loadings, β^2, for each of the items in the model for both time periods.

Table 12

CFA Results, General Social Capital Measurement Model, 2002 and 2005

	2002			2005		
	b	*SE*(*b*)	β^2	*b*	*SE*(*b*)	β^2
SCAP02 BY						
SC01_02	1.00	(0.00)	0.69	1.00	(0.00)	0.77
TS01_02	0.71	(0.10)	0.36	0.58	(0.10)	0.30
GN01_02	0.48	(0.08)	0.07	0.28	(0.07)	0.03
EMTOT_02	0.37	(0.08)	0.04	0.47	(0.09)	0.07

Note: All estimates of factor loadings are statistically significant at $p < .05$. SCAP02= general social capital in 2002. The 2005 labels are not represented here. See Table 7 for a description of the individual items.

In Table 12 the unstandardized loadings, *b*, indicate how much the score on an item will change as a result of a one-unit increase in the factor score (e.g. Dimitrov, 2008). For example, the unstandardized factor loading for item GN01_02 (the number of household members who were members of the community association in 2002) equals 0.48. This shows that as the *general social capital* factor score (SCAP02) increases by one unit the score on the item GN01_02 will increase by 0.48. So, in 2002 the households with higher levels of social capital would have a higher number of household members involved in the community association. In addition, the lower factor loading for the item

TS01_05 (doing volunteer work for charity in 2005) compared with TS01_02 indicates that in 2005 general social capital had less of an effect on the dimension trust and solidarity than in 2002.

It is also interesting to note that for the items GN01_02 and EMTOT_02 (measure of empowerment and political action in 2002) the order of the magnitude of the regression coefficients is reversed across the two years. This indicates that in 2005 general social capital had a lesser effect on the dimension groups and networks than in 2002. Specifically, in 2005 the influence of general social capital on the number of household members who were members of the community association was less than in 2002. Additionally, in 2005 general social capital had a greater effect on empowerment and political action than in 2002. By examining the items that were combined to create the aggregate variable EMTOT for each year (2002 and 2005; participation in municipal council meetings and other public assembly meetings, and meeting with politicians and other authorities to hold them accountable), we can conclude that in 2005 households with higher levels of general social capital were more likely to participate in civic meetings and to seek out local politicians and other authorities to hold them accountable than they were in 2002.

The standardized factor scores, β, for each item also provide important information for interpretation of the CFA results. Specifically, squaring these standardized scores, β^2, tells us the proportion of the variance in the indicator (item) that is explained (accounted for) by the construct (Dimitrov, 2008). In this case, the squared standardized score for GN01_02 = 0.07. Consequently, this tells us that 7% of the

variance in item GN01_02 is accounted for by general social capital in 2002. Overall, the dimension social cohesion and inclusion (defined by items SC01_02 and SC01_05—meeting with people in neighboring communities to resolve problems in 2002 and in 2005) contributes the most to defining the construct general social capital in these two models. That is, 69% and 77% of the variance in the dimension social cohesion and inclusion is accounted for by general social capital in 2002 and 2005, respectively.

Social capital change measurement model. Figure 11 illustrates the results of the CFA of the social capital change measurement model. In this case the results indicated a reasonable fit of the data to the model. Although the chi-square value was statistically significant and the CFI and TLI values were lower than desirable (CFI $\geq$ .95, and TLI $\geq$ .95), the other fit indices were within the acceptable ranges (RMSEA $\leq$ .06, and SRMR $\leq$ .08). Therefore, there is sufficient evidence to support the existence of four latent constructs representing change in the following dimensions of social capital over the time period from 2002 to 2005 among the households participating in the study: information and communication (DIC), collective action and cooperation (DCAC), trust and solidarity (DTS) and social cohesion and inclusion (DSC).

As mentioned in Chapter 3, I had expected that the items thought to be related to cognitive social capital (DCAC, DTS, and DSC) would be more closely correlated to each other and that the structural social capital item (DIC) would be less closely correlated to the other three (although still correlated). However, while these dimensions *were* correlated (with the exception of DIC and DTS), the coefficients were extremely small (all of them less than 0.03), and the relative "strength" of the correlations did not

break down into the aforementioned general dimensions, cognitive- and structural social capital. Consequently, this model provided no evidence to support the existence of these two general dimensions of social capital for this sample.

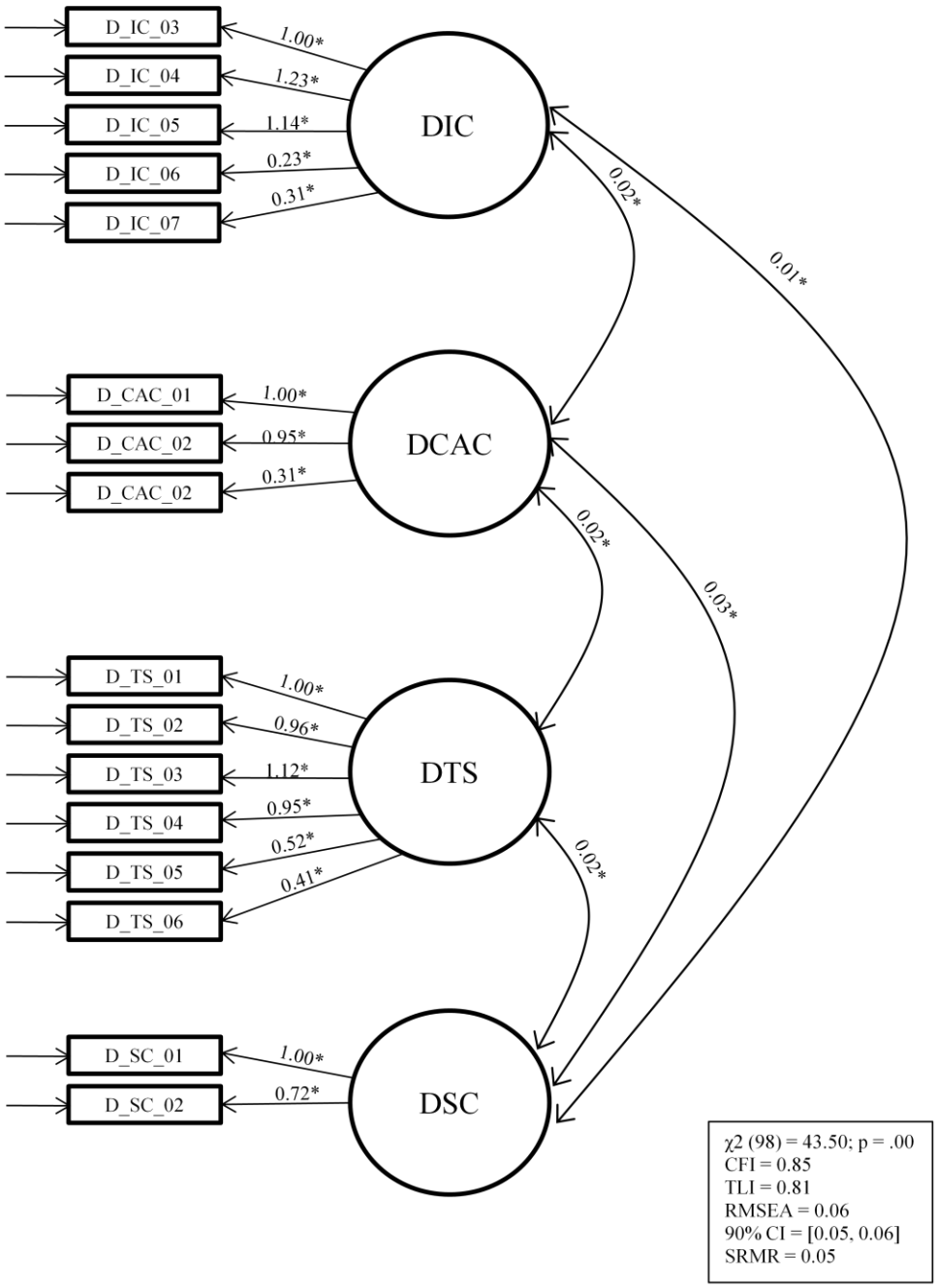

Figure 11. Results, measurement model for confirmatory factor analysis of hypothesized constructs representing change in the following dimensions of social capital: DIC = change in information and communication over time; DCAC = change in collective action and cooperation over time; DTS = change in trust and solidarity over time; DSC = change in social cohesion and inclusion over time.
*Statistically significant at $p < .05$.

Figure 11. Results, CFA of Social Capital Change Model

In Figure 11 all of the estimated factor loadings were statistically significant and positive ($p < .05$). These results are presented in Table 13, along with the estimated standard errors, *SE*(*b*), and squared standardized factor loadings, β^2, for each item.

Table 13

CFA Results, Social Capital Change Measurement Model

	b	*SE*(*b*)	β^2
DCAC BY			
D_CAC_01	1.00	(0.00)	0.25
D_CAC_02	0.95	(0.24)	0.18
D_CAC_03	0.31	(0.12)	0.03
DIC BY			
D_IC_03	1.00	(0.00)	0.55
D_IC_04	1.23	(0.05)	0.79
D_IC_05	1.14	(0.05)	0.67
D_IC_06	0.23	(0.09)	0.00
D_IC_07	0.31	(0.10)	0.01

DTS BY			
D_TS_01	1.00	(0.00)	0.39
D_TS_02	0.96	(0.08)	0.40
D_TS_03	1.12	(0.10)	0.29
D_TS_04	0.95	(0.09)	0.25
D_TS_05	0.52	(0.08)	0.07
D_TS_06	0.41	(0.07)	0.06
DSC BY			
D_SC_01	1.00	(0.00)	0.04
D_SC_02	0.72	(0.21)	0.09

Note: All estimates of factor loadings are statistically significant at $p < .05$. DIC = change in information and communication over time; DCAC = change in collective action and cooperation over time; DTS = change in trust and solidarity over time; DSC = change in social cohesion and inclusion over time. See Table 8 for a description of the items.

As mentioned above, the coefficients in Table 13 give us important information regarding the interpretation of the CFA results and show us the relative importance of each indicator. For example, the unstandardized coefficients, *b*, for item D_IC_04 (change in availability of information about the state between June 2002 and 2005; 1.23), and item D_IC_05 (change in availability about the country between June 2002 and

2005; 1.14) tell us that for each one-unit increase in the respective social capital change factor (DIC-change in information and communication) the score on these items will increase by 1.23 and 1.14, respectively. So, the factor DIC had the greatest effect on the respondents' perceptions of a positive change in the availability of information about the state over the time period between 2002 and 2005 (D_IC_04), followed by perceptions of change in the availability of information about the country (D_IC_05) and the municipality (D_IC_03).

Examining the items for the other change factors (see Table 13) we see that the factor change in trust and solidarity (DTS) had the greatest effect on respondents' perceptions of a positive change in trust in the mayor of the municipality (item D_TS_03), closely followed by change in trust in relatives and neighbors (D_TS_01), change in trust in people from other communities and the municipal seat (D_TS_02), and change in trust in the State, laws, and government institutions (D_TS_04).

The factor change in collective action and cooperation (DCAC) had the greatest effect on respondents' perceptions of a change in whether community members helped those in need (D_CAC_01), followed by whether community members got together more or less often in 2002 than in 2005 to work in benefit of the community (D_CAC_02). Finally, the factor change in social cohesion and inclusion (DSC) had the greatest effect on whether respondents perceived a change in whether community association leaders participated more in the solution of conflicts in 2005 than in 2002.

Looking at the squared standardized factor loadings, β^2, in Table 13 we see that items D_IC_04 and D_IC_05 were the most important indicators defining the construct

DIC. That is, approximately 79% and 67% of the variance in availability of information about the state and the country, respectively, is explained by the variability in the construct change in information and communication between 2002 and 2005. Likewise, items D_TS_01 and D_TS_02 were the most important indicators of the factor DTS. From this we know that 39% and 40% of the variance in the respondents' perceptions of change in trust in relatives and neighbors and people from other communities and the municipal seat, respectively, is explained by variability in the construct change in trust and solidarity. The item D_CAC_01 was the most important indicator of the factor change in collective action and communication, with 25% of the variance explained by variability in the construct.

Although the other estimated factor loadings were also statistically significant, their relative importance compared to the other indicators was much smaller. For example, we see that the relative importance of the item D_IC_06 (listening to the radio more frequently in 2005 than in June 2002; as indicated by its squared standardized coefficient, 0.008) was very small compared to the other items. The same holds true for D_IC_07 (watching TV more frequently in 2005 than in June 2002),[27] and D_CAC_03 (change in the way the community responds to the problem of the irrigation system not working between 2002 and 2005) which had squared standardized coefficients of only 0.011 and 0.025, respectively.

[27] This result actually does not come as a surprise, given that the only items measuring the dimension information and communication for the two time periods 2002 and 2005 (which related to owning a radio or a television) did not show statistical significance in the general social capital model and were therefore taken out of the model.

Having found evidence to support the existence of factors representing general social capital and change in four dimensions of social capital over the period between 2002 and 2005 among the households participating in this study, I was able to proceed to the next level: looking at the effects of having completed a community-driven development (CDD) subproject on the levels of social capital in participating communities. The results are discussed below.

Results Research Question 2

RQ2: Does living in a community that has completed implementation of a CDD sub-project lead to greater levels of social capital among households participating in the study?

The results of the SEM analyses for this research question are presented in Figure 12 and Figure 13. The *M*plus input and selected output are presented in Appendix G and Appendix H, respectively.

General social capital group-code model. Looking at the results of the general social capital group-code SEM represented in Figure 12, the goodness-of-fit indices indicate that there was a satisfactory data-model fit. Although the chi-square value was statistically significant, χ^2 (21) = 152.872, p = .000, and the RMSEA value was higher than recommended, RMSEA = .085 (with RMSEA $\leq$ .06 requested), the other indexes indicated a satisfactory model fit: CFI = .96 (with CFI > .95 requested), TLI = .94 (with TLI > .95 requested), SRMR = .07 (with SRMR < .08 requested).

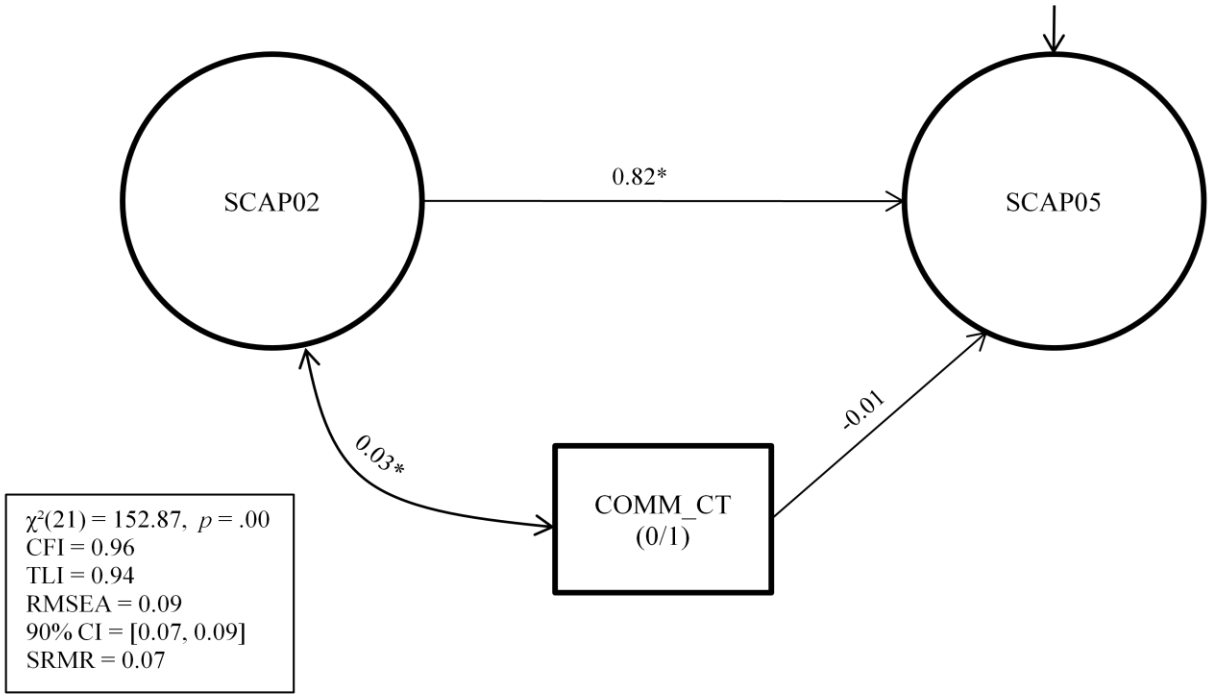

Figure 12. Results, Group-code structural equation model for CFA of relationship between social capital in 2002 and 2005 and group membership. SCAP 02 = "general" social capital in 2002; SCAP05 = "general" social capital in 2005; COMM_CT = control (0) or treatment (1) group code; CI = confidence interval. Not represented in this figure is the measurement part of the analysis linking the individual items to their respective factors. Also not shown here are the correlations between the error terms for the different items at the two time points (2002 and 2005; e.g. GN01_02 and GN01_05). *statistically significant at $p < .05$.

Figure 12. Results, General Social Capital Group-Code SEM

Also in Figure 12 we see that the coefficient for the two-way arrow from SCAP02 (general social capital in 2002) to COMM_CT (control/treatment community) was statistically significant ($p < .05$), thereby indicating a positive correlation between general social capital in 2002 and group membership. However, it must be pointed out that the coefficient was quite small ($r = 0.03$). The standardized structural coefficient ($\beta = 0.82$) for the path from SCAP02 to SCAP05 (general social capital in 2005) was also statistically significant ($p < .05$), thus indicating that the level of general social capital in 2002 had a direct effect on the level of general social capital in 2005. Since the sign of the coefficient was positive, we know that higher levels of general social capital in 2002 were associated with higher levels of general social capital in 2005. The path coefficient from COMM_CT to SCAP05 was not statistically significant, thus indicating that the two groups did not differ in the level of general social capital in 2005.

Social capital change group-code model. Moving on to the social capital change group-code model, the goodness-of-fit indices presented in Figure 13 indicate an adequate fit of the data to the model. Although chi-square value, $\chi^2 (122) = 473.52$, $p = .00$, was statistically significant and the CFI (.85) and TLI (.81) values were lower than desired, the other indexes were within appropriate ranges: SRMR = .05 (with SRMR < .08 requested), RMSEA = .05 (with RMSEA ≤ .06 requested), and 90% confidence interval for RMSEA = [.05, .05].

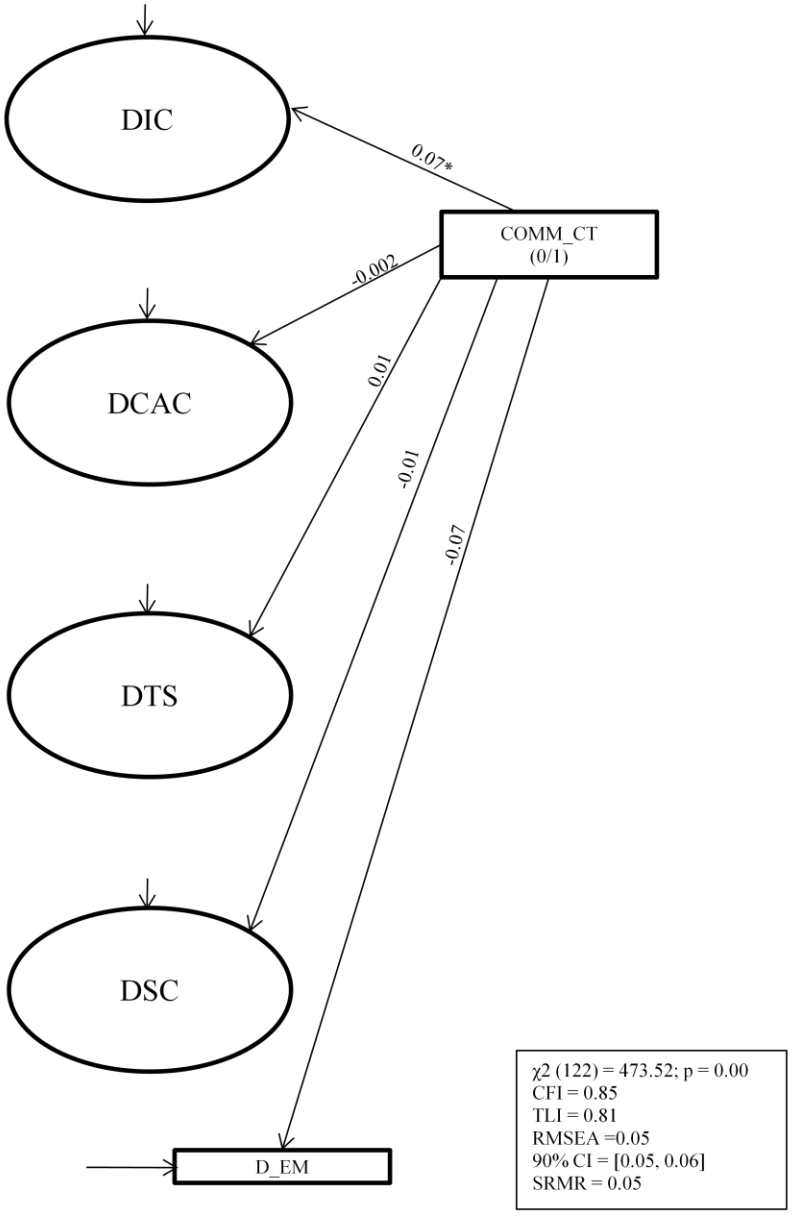

Figure 13. Results, group-code structural equation model for CFA of the impact of group membership on different dimensions of social capital between the period 2002 and 2005. DIC = change in information and communication over time; DCAC = change in collective action and cooperation over time; DTS = change in trust and solidarity over time; DSC = change in social cohesion and inclusion over time; COMM_CT = control (0) or treatment (1) community; D_EM = aggregate variable of change in empowerment and political action over time. Not represented in this figure is the measurement part of the analysis linking the individual items to their respective factors. Also not shown are the hypothesized correlations between the different change factors.
*statistically significant at $p < .05$

Figure 13. Results, Social Capital Change Group-Code SEM

In this model there was only one statistically-significant structural coefficient for the paths from the grouping variable (COMM_CT) to the different dimensions of social capital. Specifically, the structural coefficient from COMM_CT to DIC (the factor representing a change in information and communication over the time period between 2002 and 2005) was 0.07 ($p < .05$), thus indicating that the two groups differed on this dimension of social capital. Given the group coding (0 = control, 1 = treatment), the positive sign of this coefficient shows that the treatment group scored higher than the control group on this factor, thereby indicating that households in the treatment group perceived higher levels of change in access to information and communication over the period between 2002 and 2005 (with higher levels representing *positive* changes in terms of greater availability of information and communication).

Taking the results of the two models together, we can conclude that the treatment communities had slightly higher levels of general social capital in 2002, that their levels of general social capital in 2002 had a positive, direct effect on their levels of general social capital in 2005, and that the treatment communities also perceived more of a positive change in information and communication over the time period from 2002 to 2005 than the control communities.

Results Research Question 3

RQ3: Is there a relationship between the level of social capital, completion of CDD subproject implementation, the parents' level of education, and the educational enrollment of children among households participating in this study?

This last research question addressed the relationship between social capital, having completed implementation of a CDD subproject, and selected education indicators. Table 14 presents the results of the crosstabs analyses comparing control and treatment groups on the level of education of heads of household and spouses in 2005 (see Table 2 for corresponding data for 2002).

Table 14

Parents' Educational Level in 2005 (percent)

	Head of Household[a]		Spouse	
	n = 863		*n* = 798	
Characteristic	Control	Treatment	Control	Treatment
Never attended school	15.4*	12.1*	9.3*	7.0*
Primary incomplete	25.4	24.9	22.3	20.3
Completed primary school (4 years)	4.8*	7.2*	10.0	10.5
Completed middle school (fundamental)	3.5	3.7	4.0*	6.0
Completed high school	0.9*	2.1*	4.3	4.4
Attended/completed higher education	0.1	0.0	0.3*	1.5*

[a.] In both groups 93% of the heads of household were male.
*Statistically significant at the $p < .10$ level. [28]

The chi-square values for the differences in education level for the heads of household, $\chi^2(5) = 12.77$, $p = .026$, and their spouses, $\chi^2(5) = 13.60$, $p = .018$, indicated that, overall, in 2005 the differences between educational levels of households in the

[28] In Table 5 a level of significance $p < .10$ was used for consistency with Table 2. Also given the relatively general nature of the variables under study, setting a level of significance of $p < .10$ enabled me to increase the power of the tests for differences among groups on the variables under study (D. M. Dimitrov, personal communication, May 25, 2010).

control and treatment groups remained statistically significant. Further, the educational levels of the parents in both the control and treatment groups remained essentially the same as in 2002 (see Table 5). The parents in control communities continued to have *lower* levels of education than those in treatment communities. Statistically-significant differences were found at the same levels of education as in 2002 (see Table 5), but the 2005 analyses also found a statistically-significant difference in the percent of heads of household in the two groups who had completed primary school (with the control group continuing to be lower than the treatment group).

The results of the SEM analyses for this final research question are presented in Figure 14 and Figure 15. See Appendix G and Appendix H for the *M*plus input and selected output, respectively.

General social capital group-code and education model. The goodness-of-fit indices presented in Figure 14 indicate that this model also resulted in a good data fit. Specifically, although the chi-square value, χ^2 (53) = 212.94, p = .00, was statistically significant, the other indexes demonstrated good data-model fit: CFI = .98 (with CFI > .95 requested), TLI = .97 (with TLI > .95 requested), SRMR = .06 (with SRMR < .08 requested), RMSEA = .06 (with RMSEA ≤ .06 requested), and the 90% confidence interval for RMSEA = [.05, .06].

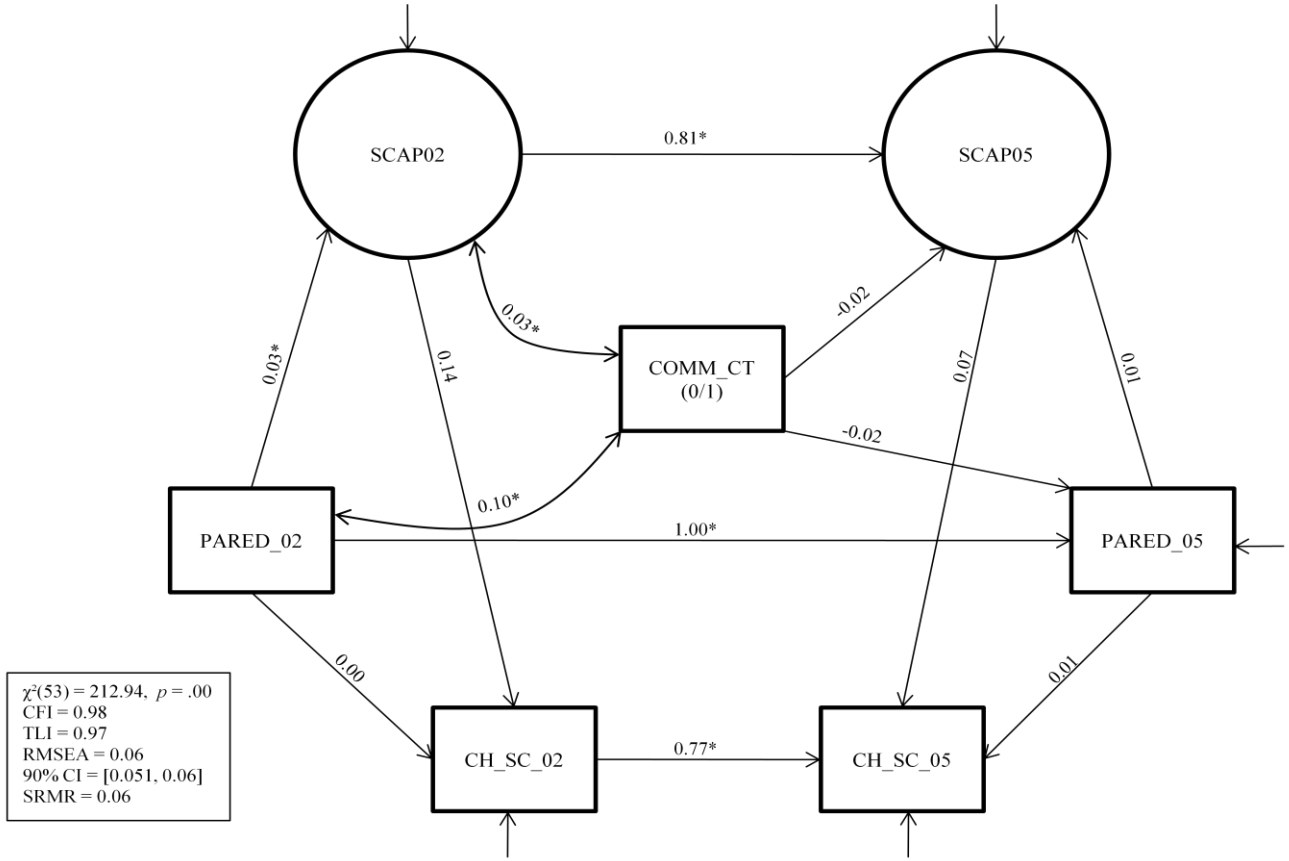

Figure 14. Results, structural equation model to test the impact of group membership and parents' levels of education on social capital and children's enrollment in school in 2002 and 2005. SCAP02 = social capital 2002; SCAP05 = social capital 2005; COMM_CT = control (0) or treatment (1) group; PARED_02 = parents' level of education 2002; PARED_05 = parents' level of education 2005; CH_SC_02 = number of school-age children enrolled in school 2002; CH_SC_05 = number of school-age children enrolled in school 2005. Not represented in this figure is the measurement part of the analysis linking the individual items to their respective factors. Also not shown here are the correlations between the error terms for the different items at the two time points (2002 and 2005; e.g. GN01_02 and GN01_05). * statistically significant at p < .05.

Figure 14. Results, General Social Capital and Education Group-Code SEM

This model reproduced the results of the group-code model represented in Figure 12 and discussed above, albeit with slightly different structural coefficients. Furthermore, the structural coefficient for the path from PARED_02 (parents' education level in 2002) to SCAP02 (general social capital in 2002) was statistically significant ($p < .05$) and positive, indicating a positive, direct effect of parents' education on social capital in 2002, such that households with higher levels of parents' education in 2002 would also have slightly higher levels of social capital in 2002. The structural coefficient for the two-way arrow between PARED_02 and COMM_CT (control/treatment group) was also statistically significant and positive, indicating a positive correlation between parents' education in 2002 and group membership, although this coefficient was quite small ($r = 0.10$).

The structural coefficient for the path between PARED_02 and PARED_05 (parents' level of education in 2005) indicates a statistically-significant, positive, direct effect of the parents' level of education in 2002 on their level of education in 2005. Finally, the statistically-significant coefficient for the path between CH_SC_02 (the number of school-age children enrolled in school in 2002) and CH_SC_05 (the number of school-age children enrolled in school in 2005) shows that children's enrollment in school in 2002 had a direct, positive, effect on school enrollments in 2005. None of the other structural coefficients were statistically significant, thereby indicating that (a) the level of social capital and parents' education in 2002 and 2005 did not affect children's enrollment in school in either year, (b) group membership did not affect general social

capital or parents' education in 2005,[29] and (c) parents' education in 2005 did not affect the level of general social capital in 2005.

Social capital change group-code and education model. Looking at the last model in Figure 15, the goodness-of-fit indices indicate a satisfactory fit of the data to the model. Although the chi-square value was statistically significant, χ^2 (152) = 515.45, p = .00, the combined values of the other indexes show a satisfactory data-model fit: CFI = .92 (with CFI > .95 requested), TLI = .91 (with TLI > .95 requested), SRMR = .05 (with SRMR < .08 requested), RMSEA = .05 (with RMSEA ≤ .06 requested), and the 90% confidence interval for RMSEA = [.04, .05].

The results of the social capital change group-code SEM (see Figure 13) were reproduced in this model, but with an important change: the structural coefficient between COMM_CT (control/treatment group) and D_EM (change in empowerment and political action; β = -0.08) was statistically significant (p < .05) in this new model. However, the value has a *negative* sign, thereby indicating that membership in the treatment group would have a negative effect on respondents' perceptions of change in this dimension of social capital. The value was also negative in the simpler group-code model (see Figure 13) but it was not statistically significant in that model.

[29] Given that the results of the crosstabs analyses presented above *did* find a statistically-significant difference between control and treatment groups on these variables, after running the analysis for this model I ran a test of a different model which included only the variables related to the educational level of the head of household in 2005 and 2002, rather than the composite variables PARED_02 and PARED_05. The estimated factor loading for the path from the grouping variable to the 2005 educational level variable was still not statistically significant, but the ratio between the estimate and its standard error was -1.95—very close to statistically-significant. However, in this model the *M*plus output stated that "the standard errors of the model parameter estimates may not be trustworthy for some parameters due to a non-positive definite first-order derivative product matrix" so I did not keep this model in my analysis.

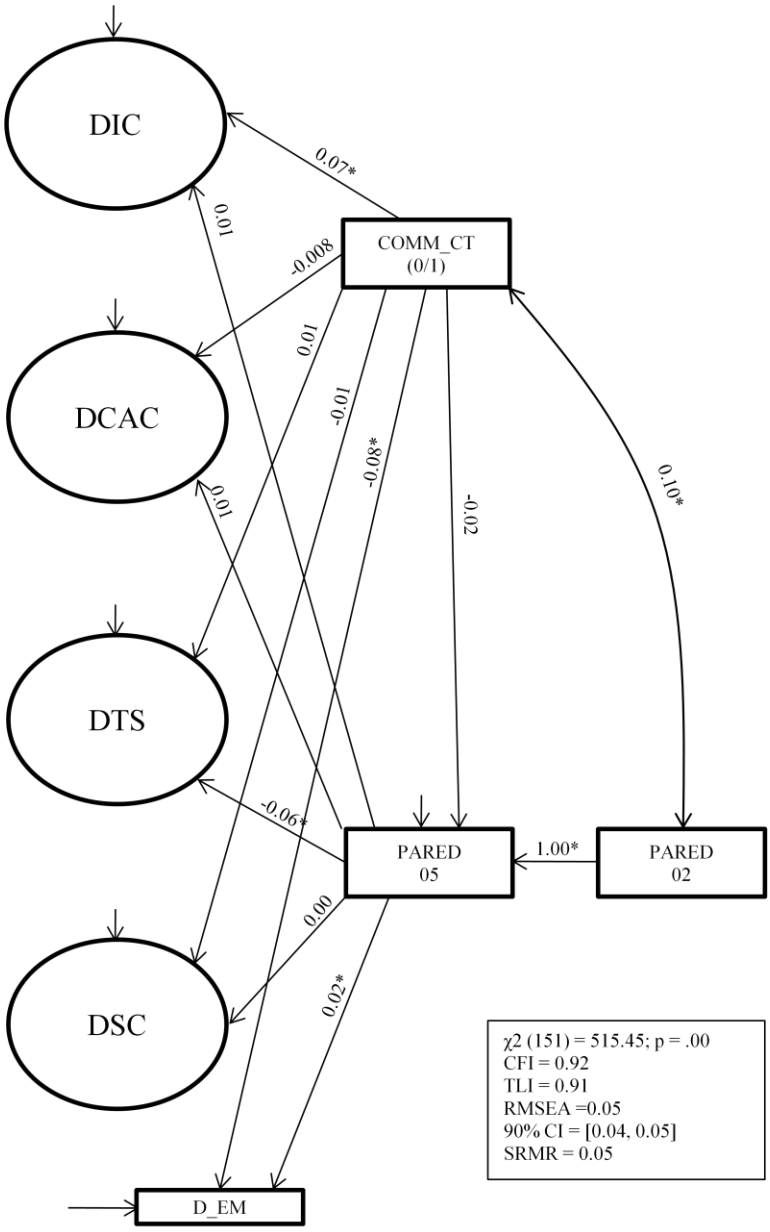

Figure 15. Results, structural equation model exploring the relationship between parents' education, group membership, and perceptions of change in five dimensions of social capital between 2002 and 2005: DIC = change in information and communication over time; DCAC = change in collective action and cooperation over time; DTS = change in trust and solidarity over time; DSC = change in social cohesion and inclusion over time; COMM_CT = control (0) or treatment (1) community; D_EM = aggregate change in empowerment and political action over time PARED_02 = parents' level of education 2002; PARED_05 = parents' level of education 2005. Not represented in this figure is the measurement part of the analysis linking the individual items to their respective factors. *statistically significant at $p < .05$.

Figure 15. Results, Social Capital Change Group Code and Education SEM

The values of the structural coefficients for the paths between PARED_02 and PARED_05 and PARED_02 and COMM_CT that were depicted in Figure 14 above, were reproduced in this model as well. In addition, the structural coefficients for the paths from PARED_05 to DTS (change in trust and solidarity, β = -0.02) and from PARED_05 to D_EM (change in empowerment and political action, β = 0.02) were both statistically significant (p <.05). This means that households with higher levels of parents' education in 2005 perceived *less* change in trust and solidarity and *more* change in empowerment and political action over the period from 2002 to 2005.

To sum up, the results of the analyses of these two final models indicate that membership in the treatment group was correlated (albeit very slightly) with general social capital and parents' education in 2002. Group membership did not affect the level of general social capital or parents' education in 2005. The parents' level of education in 2002 had a direct, positive effect on their level of education in 2005. Moreover, the parents' level of education had a direct, positive effect on the level of general social capital in 2002, but in 2005 parents' education had no effect on general social capital. Further, members of the treatment group perceived *more* change in information and communication (as seen in the group-code model presented under Research Question 2) and *less* change in empowerment and political action over the time period from 2002 to 2005—something not seen in the results of the analysis of the earlier model. Additionally, households with higher levels of parents' education in 2005 perceived *less* change in trust and solidarity and *more* change in empowerment and political action over the same time period.

Regarding the enrollment of school-age children in school, the only variable that had any statistically-significant impact on outcomes was the number of school-age children enrolled in school in 2002, which had a direct, positive effect on enrollments in 2005. The levels of parents' education and general social capital in 2002 and 2005 did not affect children's enrollment in school in either year. The results of this and the other two research questions are discussed in the next chapter.

Chapter 5. Discussion and Conclusions

Discussion

Through the use of confirmatory factor analysis (CFA) within the context of structural equation modeling (SEM) this study sought to test the fit of data collected in three states in Northeast Brazil in 2005 to a theory of social capital and then to investigate the relationships among social capital, having completed implementation of a community-driven development (CDD) subproject, and selected educational indicators among participating households. The results of the different analyses are discussed below.

Testing the models of social capital. In Research Question 1 I sought to test the theory that the construct social capital is composed of two general dimensions (cognitive and structural) that underlie six primary dimensions: groups and networks, information and communication, and empowerment and political action (structural elements), trust and solidarity, collective action and collaboration, social cohesion and inclusion (cognitive elements; e.g. Grootaert, 2001, 2003; Grootaert et al. 2004; Grootaert & van Bastelaer, 2002a, 2002b; Krishna, 2000; and Uphoff, 2000). Due to limitations in the data available, however, it was not possible to test this theory as outlined above. Instead, I had to break the analyses down into two separate models: one looking at general social capital in two time periods (2002 and 2005) and one looking at change in the following

dimensions of social capital over the period between 2002 and 2005: information and communication, collective action and cooperation, trust and solidarity, social cohesion and inclusion, and empowerment and political action.

Since the data were broken down into two groups (control and treatment communities) I first had to determine whether the constructs of social capital under study had the same meaning for both of the groups. The results of the tests of configural invariance indicated this to be the case.

***General social capital model*.** Based on the results of the confirmatory factor analysis for the first, general social capital, model, I concluded that there was sufficient evidence to support (or at least "fail to disconfirm," Dimitrov, 2008) the existence of a construct of general social capital for the study sample for each of the two time periods (2002 and 2005). The results demonstrated that in 2005 general social capital had a lesser effect on the dimension groups and networks than in 2002. From this we know that in 2002 the households with higher levels of social capital had more household members involved in the community association responsible for implementing the CDD subproject than in 2005.

This result appears to be consistent with what we know about the nature of the data used for this study and of the CDD program itself. The household data used in this study were broken down into two groups: control and treatment communities. However, the control and treatment groups were not "traditional" in the sense that *both groups had received at least part of the "treatment" at the time the data were collected* (Binswanger et al., 2006). That is, while the treatment group constituted those communities that had

first been awarded a CDD subproject grant in 2002, the control communities had also *applied* for a subproject grant in 2002 but they had not been awarded funding until 2005 (meaning that the community association was already established for both groups in 2002).

Additionally, since the rules of the World Bank CDD program require that interested community members establish a community association that will be responsible for the entire process of subproject preparation, implementation and monitoring *prior to submitting an application*, it is clear that all of the communities participating in the program would already have demonstrated a certain level of social capital, particularly in the dimensions of collective action and cooperation and groups and networks. Since by 2005 the community associations in both the treatment and control groups had already gone through the process of preparing and submitting a proposal for CDD subproject funding—and the control group communities had already completed implementation of their subproject—it may not be surprising that not as many household members would continue to be part of the CDD community association.

In fact, this result seems to support findings from a study of the predecessor to the current CDD program—the World Bank's Northeast Rural Development Program. In that study, Kottak, Costa et al. (1994) concluded that "as soon as members have got everything they want personally, their interest in the association tends to dwindle" (p. 14). Of course, since the analysis for this measurement model only included one item related to the dimension groups and networks, it is possible that the results would have been very different if more items had been included. Additional investigation is therefore needed.

The general social capital models also demonstrated that in 2005 general social capital had a greater effect on empowerment and political action than in 2002. Specifically, in 2005 households with higher levels of social capital were more likely to participate in civil society meetings and to seek out local politicians and other authorities to hold them accountable. This result is consistent with prior research that found a link between social capital and civic participation (e.g. Grootaert et al., 2004; Putnam, 1995, 2000), as well as with one of the explicit purposes of the CDD program—to increase community participation and improve local governance (Binswanger et al., 2006; Coirolo & Lammert, 2008, in press).

The model results also indicate that in 2005 general social capital had less of an effect on the dimension trust and solidarity than in 2002. Given the nature of the indicator for trust and solidarity (whether household members did work for charity), however, it is difficult to know whether the difference was truly related to trust and solidarity, or to some other variable, such as lack of free time. This brings up the issue of construct-irrelevant variance, which relates to the issue of validity. Specifically, construct-irrelevant variance indicates that an instrument may be too broad, "allowing for variance generated by sources unrelated to the construct(s) of interest (e.g., item difficulty or bias unrelated to the target construct or, conversely, extraneous clues in the presentation of some items that unduly facilitate responses on these items"; Dimitrov, 2008). Consequently, this result should be interpreted with caution.

***Social capital change model*.** Data analysis related to the social capital change model also provided evidence to support the existence of four latent constructs

representing change in four dimensions of social capital over the time period from 2002 to 2005 among the households participating in the study: information and communication (DIC), collective action and cooperation (DCAC), trust and solidarity (DTS) and social cohesion and inclusion (DSC). However, this model provided no evidence to support the existence of the two primary constructs of social capital (cognitive and structural) for this sample. This could be due in part to the construction of the items in the questionnaire, to the limited number of items for each construct (and particularly for social cohesion-DSC), or it could be an indication that the theory of the existence of two primary constructs of social capital simply did not fit the data in this sample. Clearly, more investigation is needed.

Of the four dimensions of social capital included in this model, the factor change in information and communication (DIC) had the greatest effect on the respondents' perceptions of a positive change in the availability of information about the state, followed by a change in the availability of information about the country and the municipality. The factor change in trust and solidarity (DTS) had the greatest effect on respondents' perceptions of a positive change in trust in the mayor of the municipality, closely followed by change in trust in relatives and neighbors; in people from other communities and the municipal seat; and in the State, laws, and government institutions. The factor change in collective action and cooperation (DCAC) had the greatest effect on respondents' perceptions of a positive change in whether community members helped those in need, followed by whether community members got together more or less often in 2002 than in 2005 to work in benefit of the community. Finally, the factor change in

social cohesion and inclusion (DSC) had the greatest effect on whether respondents perceived a positive change in whether community association leaders participated more in the solution of conflicts in 2005 than in 2002.

Unfortunately, at this point we do not know whether the increase in the availability of information about the state and the municipality leads to perceptions of greater trust in the mayor, for example, or if the perceptions that community association leaders participate more in the solution of conflicts in 2005 corresponds with a positive change in the community members getting together to help those in need. Future studies could explore the linkages between these different elements (using an instrument with more items related to each dimension of social capital) to learn more about how the different dimensions interact.

Linking social capital and community-driven development (CDD). The group-code models presented under Research Question 2 examined the link between social capital and having completed a CDD subproject. Taking the two models together, the results of this study indicate that the treatment communities (those that were first awarded the CDD subproject in 2002) had slightly higher levels of general social capital in 2002 than the control communities (that were first awarded the CDD subproject in 2005). This result supports the findings of Kottack, Costa et al. (1994) who concluded that "participatory projects have more of a chance of being successful in communities that are already organized and in which the local population is aware of its obligations vis-à-vis associations" (p. 11). The results also indicated that the level of general social

capital in 2002 had a statistically-significant, positive, effect on level of general social capital in 2005.

Group membership did not affect general social capital in 2005. So, while a higher level of social capital was correlated with being awarded a CDD subproject in 2002, according to the results of this study, this did not translate into increased social capital over time. This is inconsistent with the findings of the original impact evaluation (Binswanger et al., 2006) which concluded that the CDD program "has had a positive and sustainable impact on social capital.…[and] the social capital generated continues to increase even subsequent to project implementation, thereby demonstrating the sustainability of the impact caused" (p. 8). However, two points must be emphasized here. First, this study adopted a broader definition of social capital than Binswanger et al. (2006), whose "limited definition of social capital" focused primarily on "the capacity of a social group or community to act collectively when collective action is needed" (p. 110). Second, while using a broader definition of social capital, this study included far fewer items from the social capital questionnaire than the original study due to limitations in the data available. Consequently, the results of this study should not be taken as an indication that the conclusions of the original study were incorrect.

Households in the treatment communities perceived greater access to information and communication over the time period from 2002 to 2005 than households in the control communities. This result is consistent with Binswanger et al.'s (2006) conclusion cited above and with the nature and purposes of the CDD program itself. Specifically, the Program seeks to increase transparency at all levels (community, municipal, state, and

national) and to increase rural communities' access to information about local development activities and opportunities for greater civic participation (Coirolo & Lammert, 2008, in press). That households in the treatment communities would perceive greater access to information and communication than those in control communities indicates that the Program is achieving this objective at least to some degree. Moreover, it would suggest that having completed implementation of a CDD subproject results in the establishment of mechanisms for increased access to information and communication—possibly through greater contacts with people outside the community or in the municipalities—that persists over time (e.g. Helliwell & Putnam, 2000; Grootaert et al., 2004; Putnam, 2000). The specific mechanisms for increasing access to information could not be examined in this study but Garrison et al. (2000) and Couto Soares et al. (2000) stated that the Program has a positive impact on the organization and mobilization of participating communities (both cited in Binswanger et al., 2006). Further, Binswanger et al. (2006) concluded that

> the greater impact of the PCPR lies in the use of new institutional arrangements to help communities become more active, to engage them in networks of inter-community collaboration, as well as to transform their relations with the State from one of dependency into a partnership, from one of mutual risk to one of mutual trust (p. 122).

Linking social capital, CDD and education. Research Question 3 sought to investigate the relationships between social capital, completion of a CDD subproject, and selected educational indicators. In both 2002 and 2005 there was a statistically-significant

difference in the educational levels of the parents in the control and treatment communities. Specifically, there was (a) a higher percentage of households in the control group in which the heads of household and spouses had never attended school, (b) a lower percentage in which the heads of household had completed high school, and (c) a lower percentage in which the spouses had attended or completed higher education. In addition, in 2005 the percent of heads of household that had completed primary school and the percent of spouses that had completed middle school in the control group was lower than in the treatment group. Unfortunately, it was not possible to explore the causes for the changes in educational level for heads of household and spouses between 2002 and 2005; a future study could revisit the households included in the original study to conduct further investigation into this issue.

The results of the SEM analysis conducted for the first (general social capital) model in this study indicated that membership in the treatment group was correlated (albeit only slightly) with a higher level of parents' education in 2002—meaning that community associations with more educated members were more likely to be awarded a CDD subproject in 2002. Group membership did not affect the level of parents' education in 2005. Further, the parents' level of education in 2002 had a direct, positive effect on their level of education in 2005.

The parents' level of education also had a direct, positive effect on the level of general social capital in 2002—a finding consistent with the literature on social capital (e.g. Bourdieu, 1985, 1989; Bourdieu & Passeron, 1977; Coleman, 1988/2000, 1994; Putnam, 2000). However, in 2005 parents' education had no effect on general social

capital. Consequently, these findings are inconclusive regarding the effect of parents' educational level on general social capital among the households participating in this study.

This study also found that the only variable that had any statistically-significant impact on children's school enrollment was the number of school-age children enrolled in school in 2002, which had a direct, positive impact on enrollments in 2005. It is important to note here that the variables for school enrollment used in this study were aggregate variables that reflected the total number of school-age children from a household enrolled in school at a given time. The variables did not track the enrollment of a specific child over time, since a child might be either too young or too old to be eligible for enrollment in either year. So, it can be understood from this result that the enrollment of *any* school-age children in school in 2002 was directly and positively related to the enrollment of *all* school-age children in school in 2005. The levels of parents' education and general social capital in 2002 and 2005 did not affect children's enrollment in school in either year.

The results of the final model indicated that households in the treatment group scored *higher* than the control group on the factor change in information and communication over the time period from 2002 to 2005 (as discussed in the group-code model presented under Research Question 2), but they also scored *lower* than the control group on the factor change in empowerment and political action—something not seen in the results of the analysis of the earlier model. The fact that survey respondents from the control communities expressed perceiving greater changes in empowerment and political

action between 2002 and 2005 than respondents from the treatment communities may be a result of the fact that the control communities were in the midst of implementing their subproject investments at the time data were collected. Consequently they may have been feeling the positive effects of the results of working together towards achieving a common goal (a so-called "euphoria effect," Binswanger et al., 2006). Furthermore, the CDD program strives to make participants aware of their rights and responsibilities as citizens; therefore, it makes sense that they might report greater change in empowerment and political action than before they began implementation of their CDD subproject (e.g. Binswanger et al., 2006; Coirolo & Lammert, 2008, in press; World Bank, 2005b). It is possible that upon completion of their subproject investments in 2002 the treatment communities might have reached a "ceiling" with regard to their feelings of empowerment and political action—which would explain why they reported not perceiving much change in that dimension of social capital since 2002—but that is highly unlikely. Clearly, further investigation in this area is needed.

As in the case of the other model, the parents' level of education in 2002 had a direct, positive effect on their level of education in 2005. Further, the results of the final model indicated that households with higher levels of parents' education in 2005 perceived *less* change in trust and solidarity and *more* change in empowerment and political action over the period from 2002 to 2005. This finding was not related to group membership, since there was no statistically-significant relationship between those two variables in 2005. Unfortunately, the data available did not allow for an investigation into these results.

Conclusions

A major advantage of structural equation modeling over "classical linear modeling approaches" is that it "allows for a better examination of the variables under study" (D. M. Dimitrov, personal communication, June 4, 2010). This is accomplished by explicitly accounting for measurement error in observed variables, thereby allowing researchers to "readily develop, estimate, and test complex multivariate models, as well as to study both direct and indirect effects of variables involved in a given model" (Raykov & Marcoulides, 2006, p. 7). Consequently, the results inform both theory and practice, regardless of the statistical significance and the implications of any causal relationships among variables.

Through the use of confirmatory factor analysis in the framework of SEM, this study provides evidence in support of the existence of a latent construct of general social capital and four latent dimensions of social capital (information and communication, collective action and cooperation, trust and solidarity, and social cohesion and inclusion) among the households in the sample. However, the results do not support the breakdown of social capital into two broader elements of cognitive and structural social capital. Further investigation is needed to determine whether this result is evidence of the fact that this theory of the structure of social capital does not apply to the context in which the data for this study were collected, or whether it is an artifact of the particular instrument used to collect the data. This is discussed a bit more in the section "Limitations of This Study."

The results of the SEM analysis examining the relationships between the construct general social capital, CDD, and selected indicators of education in participating households provided support for Binswanger et al.'s (2006) conclusion that community associations with higher levels of general social capital, and whose members had higher levels of education, were able to obtain the benefits of the CDD program more quickly, as indicated by their having been awarded a CDD subproject in 2002. These results were obtained while controlling for key covariates (e.g. group membership, level of social capital in 2002, parents' education in 2002 and number of school-age children enrolled in school in 2002). On the other hand, this study found that having completed implementation of a CDD subproject had no impact on general social capital in 2005—a result that conflicts with the original impact evaluation. The level of general social capital existing in a household in 2002 had a direct and positive effect on the level of general social capital in 2005.

In 2002 the parents' level of education had a direct, positive effect on the level of general social capital—a finding consistent with the literature on social capital (e.g. Bourdieu, 1985, 1989; Bourdieu & Passeron, 1977; Coleman, 1988/2000, 1994; Putnam, 2000). However, parents' education had no effect on general social capital in 2005. Consequently, this study's findings are inconclusive regarding the effect of parents' educational level on general social capital among participating households. The reader should be reminded, however, that the educational level of the participants in this study was generally low; consequently, it may not be appropriate to expect large magnitudes of differences in social capital. Further study is clearly warranted. Finally, the study found

no relationship between parents' level of education or general social capital and the enrollment of school-age children in school in either year. Only the number of school-age children enrolled in school in 2002 was directly related to children's school enrollments in 2005.

The SEM analysis of the "social capital change" constructs indicated that having completed implementation of a CDD subproject impacted respondents' perceptions of a change in three dimensions of social capital (information and communication, trust and solidarity, and empowerment and political action) over the time period from 2002 to 2005. However, the results were not necessarily what I would have expected. That is, the treatment households perceived *more* change in information and communication and *less* change in empowerment and political action than the control households, whereas I would have expected both dimensions to increase. Nevertheless, taking into account how the control and treatment groups were selected in the original study (Binswanger et al., 2006) and the nature of the CDD program itself, the findings may not be quite so surprising. Still, further investigation may prove useful.

Implications for education. In both 2002 and 2005 the parents in the control communities had lower levels of education than those in the treatment communities. Given the nature of the selection of control and treatment groups for the original study, the result was that community associations with more educated members were more likely to be awarded a CDD subproject in 2002, thereby obtaining access to a much-needed infrastructure or productive investment earlier than those community associations with less educated members. This result seems in line with the conclusions reached in the

cross-country studies of drivers of sustainable rural growth in Central America (World Bank, 2004a, 2004b, 2004c) mentioned in Chapter 1. That is, while education "has the most consistently positive impact on household welfare of all of the assets included in the study … the impacts of education on poverty reduction depend on other key productive assets, such as land, infrastructure, productive capital, and location" (World Bank, 2004c, p. xv, italics added). Similarly, Hannum and Buchmann (2005) found that "educational opportunities enhance, but do not necessarily ensure, the future economic security of the world's most vulnerable children" (p. 347). The implication of these findings is that future investments and development policies should be targeted at increasing the education level of members of rural communities so that they may better capitalize on development investments such as the CDD program that are simultaneously targeted at improving the economic development of rural areas.

However, Adams (2006) pointed out that "the differences in educational outcomes across communities may arise from various characteristics and processes operating at the community level" (p. 19). For example, economic resources have been found to influence enrollment, attainment and achievement, and the resources available in the community (not just at home) are an important part of this influence. In addition, community economic resources can influence the quality of education provided (in terms of being able offer better salaries to teachers, higher quality materials, extra tutoring, etc.), as well as the availability of after-school activities and educational support. Similarly, social relationships in the community (one dimension of social capital) can influence the ways that the communities "shape expectations, share information, and enforce rules", such

that communities with higher levels of social capital are more likely to influence students' attitudes and behaviors inside and outside of the classroom (Adams, 2006, p. 19).

The only variable in the analyses that had any statistically-significant impact on children's school enrollments among the households in this study was the number of school-age children enrolled in school in 2002, which had a direct, positive impact on enrollments in 2005.[30] Specifically, in the households participating in this study the enrollment of *any* school-age children in school in 2002 was directly and positively related to the enrollment of *all* school-age children in 2005. The implication of this result is that educators and policy makers must make a concerted effort to ensure that school-age children enroll in school as early as possible. Even though in a given household the parents may not have a high level of education, if they make a decision to enroll a child in school, it is more likely that their other children will be enrolled as well. As Hannum and Buchman (2005) pointed out, "countries with better-educated citizens . . . have healthier populations, as educated individuals make more informed health choices, live longer, and have healthier children" (p. 347).

Nevertheless, as mentioned in Chapter 1, children's enrollment in school in rural areas largely depends on geographical isolation and the need for children to work to help support the family. Inadequate supply of educational services can also play a role (World Bank, 1999, 2003b). Among the communities participating in this study, in 2002 only 63% of control communities and 74% of treatment communities had primary schools. More troubling is the fact that by 2005 those percentages had *decreased* to 57% and 70%

[30] It was not possible to investigate the availability of schooling among the communities participating in this study due to limitations in the data

respectively.[31] Similarly, only 9% of control and only 24% of treatment communities had a secondary school (this difference was statistically significant) in 2002. In 2005 the percentage of control communities with a secondary school also decreased to 7%, while the percentage of treatment communities remained the same. Neither this study nor the original impact evaluation examined the reasons behind the decrease in access to schooling among the communities participating in the study, but the decline is definitely disturbing and worth investigating, since availability of educational services is an important prerequisite to increasing the educational level of rural inhabitants.

Limitations of this study. A key limitation of this study is the fact that the data were not collected with the purpose of conducting this type of analysis in mind. A related problem is that the data were collected in 2005 and asked respondents *recall* questions about 2002. While the use of recall data that has been anchored to a specific "notable" date—in this case, when Brazil won the World Cup in soccer for the fifth time in June 2002—has its rationale (see, for example, Grootaert et al., 2004), data analysis would have been more straightforward, and the results probably more robust, if the data had actually been collected at each of the two time points included in this analysis.

Furthermore, given the limitations of human memory, the need to collect recall data for 2002 required that the questionnaire contain items that could be "accurately" remembered, thereby affecting the nature of the data collected. For example, rather than asking the question "How many people from other communities gave you gifts this year?" (a question related to the trust and solidarity dimension of social capital) in both

[31] The difference in percentages between control and treatment communities was not statistically significant.

2002 and 2005, the researchers had to ask: "Is the number of people from other communities who give you gifts in 2005 more or less than the number who gave you gifts in 2002?." The first question, if asked in both 2002 and 2005, would generate two separate values, while the second question—the type most frequently used in the Binswanger et al. (2006) study—would generate only one. Indeed, there were not many items that had separate values for the two time periods (2002 and 2005) that could be utilized in the SEM analysis conducted on the general social capital model discussed above (See Chapter 3 and Chapter 4). Consequently, rather than including all of the items related to social capital into one comprehensive model, I needed to create a separate model looking at respondents perceptions of change in the different dimensions of social capital over time. It is not clear how this might have affected the results I obtained. However, since there were more items related to the different dimensions of social capital that were included in the "social capital change" model, I suspect that if data for these items had been available for the two time points (2002 and 2005) I might have been able to test my original model of social capital being composed of two general dimensions (cognitive and structural social capital) that underlie six primary dimensions (e.g. trust and solidarity, information and communication, groups and networks, etc.).

The composition of the treatment and control groups for the original study may also have affected the results of the analyses conducted here. That is to say, despite the names (treatment and control), *both groups had received at least part of the "treatment" (implementation of a community-driven development, CDD, subproject) at the time of the original study*. Specifically, the treatment communities implemented their subprojects in

2002 while the control communities were awarded the subproject grants in early 2005 and were in the process of beginning implementation at the time data were collected in the fall of that same year. Since the process of obtaining a CDD subproject grant required that participating communities form a community association *prior* to applying for the subproject grant, social capital theory would indicate that *both* types of communities (treatment and control) already had preexisting levels of social capital that might have affected the results of these analyses. The composition of the sample may also have affected the results due to the relatively low education level of participants. In both treatment and control communities a majority of participants had not even completed primary school. Due to this limited variation, the effects of higher levels of parents' education on social capital and children's enrolment in school could not be discerned by this study. Finally, Binswanger et al. (2006) did not include many indicators of education in their questionnaire, thereby limiting the type of analyses that could be conducted in this study.

Recommendations for further investigation. Some suggestions for further investigation were already mentioned in the discussion of the results. In addition, future studies could re-survey the same households to compare the results of the questionnaire items related to 2005 with the new survey results. Alternatively, researchers might adopt a questionnaire such as the SC- IQ (Grootaert et al., 2004), which contains many more items and therefore would enable a more robust analysis. In addition, future studies could include additional questions related to availability of educational services; to specific educational outcomes such as completion, repetition, and drop-out rates; and/or a broader

sample that includes greater variation in the level of education of household members in order to better assess the linkages between social capital and these different indicators of education.

Appendix A

CDD Program Design[32]

Main Actors. The main actors involved in the implementation of the World Bank's CDD Program in Northeast Brazil are the community associations (CAs), the participatory project municipal councils (MCs), the state technical unit for the project (STU), the local government, non-governmental (NGOs) and other civil society organizations, and the World Bank.

Community association. The Program defines a community association as a self-selected group of people who identify common needs. A CA does not necessarily coincide with a town or village, but rather is formed based on group priorities. For instance, 50 families located at one end of a village may create a CA to build a water supply system, while 30 families at the other end of the village might establish another CA to invest in a small rice processing facility or to access electricity. This definition of a CA—a voluntary association based on common interests—distinguishes the Program from many CDD projects elsewhere. Failure to understand this difference has complicated numerous prior efforts to evaluate the program in Brazil (van Zyl, Sonn et al., 2000, see also Binswanger et al., 2006). The CA is responsible for all aspects of subproject implementation: prioritizing, preparing and submitting the subprojects for approval; contracting goods, services and works; operating and maintaining investments; and accounting for all resources used.

Municipal council. Most participating municipalities in the Northeast have established Municipal Councils (MCs) which are responsible for enforcing the "rules of the game" during the subproject prioritization process (see Box 1 below), for providing technical assistance and other guidance to CAs throughout the subproject cycle, and for preliminary approval of the subprojects for financing. The MC is composed of 80% representatives of local CAs and other civil society organizations (e.g., rural labor unions, religious groups); the remaining 20% comes from the local government. This is a second feature which differentiates the Northeast Brazil Program from many other CDD and local development programs, in which municipal authorities predominate in the decision-making process. This design feature has been instrumental in ensuring that the investments financed by the Program reflect the expressed needs of local communities, the needs of the municipality and the fit of Program activities with the municipality's overall local investment program. Furthermore, involving local authorities in the MCs helps ensure the institutional sustainability of the Program (van Zyl, Sonn et al., 2000).

State technical unit. The State Technical Unit (STU) is responsible for overall project administration, oversight, coordination and promotion, often delegating supervisory tasks to the MCs. In large states, the STUs establish regional offices to give participating communities more direct local support and technical assistance. STUs are

[32] This section adapted from Coirolo and Lammert (in press).

usually situated in the State Planning Secretariats, though some sit in others such as Local Planning or Rural Development.

Local government. As mentioned above, representatives of local governments serve as members of the MC, comprising as much as 20% of its membership. This participation is extremely important for several reasons. First, it fosters the long-term institutional sustainability of the Program. Second, it helps to ensure that the subproject investments form part of the overall municipality development program, complementing—rather than substituting for—other investments. Finally, and perhaps most important, it is helping to change the way that rural citizens and local authorities interact with each other. This happens through encouraging transparent, demand-driven decision making and accountability and creating opportunities for the various actors to participate in institutional arrangements that do not replicate traditional patterns of dominance[33] (Binswanger et al., 2006; van Zyl, Sonn et al., 2000).

NGOs and other civil society organizations. NGOs and other civil society organizations help mobilize and provide technical assistance to communities, but the nature of NGO involvement is different than in prior development programs. This is a third feature distinguishing the Northeast Brazil Program. At the beginning of project implementation in each state, NGOs receive information about the project to disseminate to rural communities, but they are not hired by the Program. Instead, if an NGO wants to provide technical assistance or other services to participating CAs, it must convince them that it has something of value to offer, as the CAs control the funding for technical assistance for community subprojects. In some states STUs and MCs contract technical assistance from NGOs.

***World Bank*.** As previously mentioned, the World Bank first opened an office in Recife, Pernambuco, in 1974 to begin working on rural development issues in the Northeast. At that time, and for the next 13 years, this was the only Bank office in Brazil staffed by World Bank Headquarters specialists (other smaller offices in Rio de Janeiro, Brasilia and São Paulo provided only logistical support to visiting missions). For three decades, Bank task managers—including both international staff and Brazilian nationals employed by the Bank—have worked closely with government officials, STU staff, rural communities and civil society in all aspects of Program implementation and supervision.

Basic Principles. The CDD program in Brazil follows the basic principles of CDD projects worldwide, but its emphasis is on six key elements: decentralization, beneficiary management of resources, community responsibility in all aspects of implementation, partnership with local authorities and civil society, transparency, and the use of simple and clear targeting mechanisms. Experience and ongoing supervision and evaluation of Program implementation have demonstrated that these elements are key aspects of Program success. They are briefly presented below.

Decentralization. Decision-making is decentralized to community associations which act through representative, participatory municipal councils. This increases ownership of the process and outcomes by all actors, and helps ensure that Program

[33] Chilcote (1990) gives an interesting discussion of power and decision making in Northeast Brazil

activities actually match the needs which beneficiaries have determined, leading to stronger overall results on the ground.

Beneficiary management of resources. Funds to implement subprojects are transferred directly from a project special account at state level to the CAs' bank accounts. This is not the case in all CDD projects around the world, but is considered one of the main elements of success of the Brazil program. It reinforces decentralization, reduces transaction time and costs, and ensures that all funds intended to support subprojects reach the intended beneficiaries.

Community responsibility for implementation. Beneficiaries take the lead in setting their own priorities, and participate actively through their CAs in all phases of planning, cost sharing, execution, operations, and maintenance of investments. This fosters beneficiary ownership of the development process and its outcomes, while building their capacity to solve future problems through cooperative action.

Partnership with local government and civil society. Local authorities and civil society are also encouraged to participate actively in the Program. This creates an environment in which citizen participation gradually becomes the rule of civil discourse rather than the exception to it.

Transparency. Decisions are made in an open, transparent manner, at every level and at each stage in the process of the Program. Information about the Program is disseminated widely and is easily accessible. This increases confidence in the system and helps ensure that funds are use appropriately.

Simplicity and clarity. Simple, explicit and verifiable poverty-targeting mechanisms are used. This helps ensure that the Program actually reaches the rural poor and that funds are not captured by elite groups. Program operating rules are simple and clear so that beneficiaries can readily understand and manage them.

The basic "rules of the game" are designed to ensure that the Program targets the poorest rural communities; that all potential beneficiaries know about the Program; that the investments represent the communities' expressed priorities; that selection and approval of subproject proposals is transparent and participatory; that Program resources end up in the hands of the beneficiaries and are applied for the intended purposes; and that subproject implementation is effective and cost-efficient.

Appendix B

Summarized Results of the World Bank CDD Program Impact Evaluation[34]

Results. To carry out the impact evaluation Binswanger et al. (2006) conducted a "meta"-study of the Program by reviewing all relevant pre-existing studies of the Program and designing and executing an entirely new quasi-experimental impact evaluation. They classified 73 of the studies reviewed based on the methodology used to report the results. Additionally, the team chose a quasi-experimental research design to carry out a quantitative impact evaluation in three states in Northeast Brazil. They made this decision for a number of reasons. First, the Program relies on self-selection of beneficiaries. Second, in the context of development, there are ethical and political issues related to withholding potential benefits from a control group—especially when participation in the Program would give that group access to much-needed basic infrastructure and services. Third, there was no consistent and reliable baseline data with which to conduct a truly experimental impact evaluation of the Program. The main conclusions of the Binswanger et al. (2006) study of Program impacts are briefly presented below.

Bringing essential small-scale infrastructure to rural areas. The Program is operating on a large scale and has developed an impressive capacity to implement much-needed community investments very cost-effectively. Between 1993 and 2005 the Program financed roughly 50,120 community subprojects (28,500 rural electrification and water supply subprojects; 10,000 other infrastructure subprojects; 12,000 productive subprojects and 4,000 social/cultural subprojects), benefiting 2.54 million households participating in 37,600 community associations. Approximately 10% of these households benefited from two or more subprojects. MCs are currently functioning in approximately 1,500 of the 1,686 municipalities in the Northeast region.

Community demand for subproject investments focused primarily on water and electricity supply and preliminary estimates indicate the Program's enormous impact on access to these services in the Northeast region overall. Based on calculations using data from the IBGE (Brazilian Institute of Geography and Statistics) 2000 Census, 34% of households obtaining electricity in the Northeast were served by the CDD Program. Moreover, between 29% and 32% of all residences that obtained access to piped water in 2000 got it through the Program. Consultoria Econômica e Planeamento (2005) compiled data from the National Household Survey (Pesquisa Nacional por Amostra de Domicílios-PNAD) and found that between 1992 and 2003 at least three-fifths of all rural households in the Northeast that obtained access to water and electricity during that period, had done so through the CDD Program.

These findings support the conclusions of other studies—namely that the CDD Program has had a statistically positive impact on access to water and electricity in the

[34] Adapted from Coirolo and Lammert (in press).

rural Northeast (Hydros Engenharia e Planejamento Ltda., 2004; INTERCOOP, 1998; van Zyl, Barbosa et al., 1995; van Zyl, Sonn et al., 2000). These results point to two important conclusions. First, they support related findings that the subprojects are sustainable, because households could have lost the service in the period after initial implementation. Secondly, they indicate that the Program reaches rural families who, in its absence, probably would not have gained access to water and electricity.

Delivering services at lower costs. Studies suggest that average unit costs in the Program are about 30% lower than costs obtained through other types of service delivery (van Zyl, Barbosa et al., 1995; van Zyl, Sonn et al., 2000). There are various possible reasons for this. The subprojects may reflect better choices made by the beneficiaries or the financial mechanisms used may encourage savings because leftover funds stay in the hands of the CAs to finance other activities of their choosing. Program procedures such as local shopping for materials, equipment and services by the CAs also results in more cost-efficiency (World Bank, 2000; Hydros Engenharia e Planejamento Ltda., 2004; Cooperativa Interdisciplinar de Serviços Profissionais Ltda., 1998; Faculdade Latino-Americana de Ciências Sociais, 1998; and van Zyl, Sonn et al., 2000).

Reaching the rural poor. Studies show almost unanimously that the CDD Program is in fact reaching the rural poor in the Northeast. For example, Buainain and Fonseca (2005b) indicate that 75% of beneficiary families had a per-capita income below US$1 a day before project implementation. Many studies indicate that beneficiaries also have poor access to services and housing and low educational attainments (see, for example, Argôlo de Souza, 2004; Associação de Pesquisa e Estudos Científicos em Administração, 1999; Federação dos Trabalhadores na Agricultura do Rio Grande do Norte & Inter-American Institute for Cooperation in Agriculture, 1999; Fonsêca & Caminha de Melo, 1999; Hydros Engenharia e Planejamento Ltda., 2004; Inter-American Institute for Cooperation in Agriculture, Federação dos Trabalhadores na Agricultura do Rio Grande do Norte & Associação de Apoio às Comunidades do Campo, 1999; Instituto Civitas, 2004; Cooperativa Interdisciplinar de Serviços Profissionais Ltda., 1998; Sampaio, Cabra, Vilar, Sampaio, & Vital, 1999). Moreover, findings from the quasi-experimental impact evaluation indicate that the Program continues to improve targeting over time: recent beneficiaries were slightly worse-off before participating in the Program than earlier beneficiaries (Binswanger et al., 2006). Therefore, instead of falling into elite capture the Program is reaching increasingly poorer families over time. This improved targeting appears to result from the involvement of participatory Municipal Councils (van Zyl, Sonn et al., 2000).

Encouraging inclusion. Inequality of opportunities among minority groups, such as quilombolas (communities of descendents of Afro-Brazilian freed or escaped slaves) and indigenous communities, and issues constraining women's full participation in development activities, constitute important challenges for development programs in Northeast Brazil. For this reason, the Program takes various measures to these groups. Currently, close to 30% of project beneficiaries are women, and women are becoming more active in community associations and Municipal Councils. All states with indigenous populations already have specific plans for reaching them, and quilombolas are specially targeted in the states where they live (Binswanger et al., 2006).

Satisfying beneficiaries with high-quality subprojects. Project quality and beneficiary satisfaction are high. More than 90% of the individual beneficiaries consulted by van Zyl, Sonn and Costa (2000) said they were happy with the quality of construction materials and with overall project quality. Similarly, the studies analyzed by Binswanger et al. (2006) indicate that beneficiaries' perceptions of the quality of Program investments were fairly positive. Other studies corroborate these findings (Buainain & Fonseca, 2005a, 2005b, 2005c; Faculdade Latino-Americana de Ciências Sociais, 1998; Federação dos Trabalhadores na Agricultura do Rio Grande do Norte & Inter-American Institute for Cooperation in Agriculture, 1999; Matos Filho, 2002).

Achieving subproject sustainability. Investment sustainability is also high. On average 80% of projects, excluding certain types of productive projects, are still operational three to five years after completion (Binswanger et al., 2006; see also Matos Filho, 2002; Matos Filho et al., 2005a). Only more complex productive projects that depend on markets outside the community are less sustainable. Various studies concluded that, to improve the success rate of productive projects, links to markets have to be strengthened, and pre-project analysis of technical, economic, financial, and environmental viability has to be improved (see, for example, Buainain & Fonseca, 2005a; Fonseca de Melo, 1999; Matos Filho, 2002).

Improving beneficiaries' quality of life. The Program significantly improves its beneficiaries' quality of life in terms of health, housing conditions, and access to services (Binswanger et al., 2006; Buainain & Fonseca, 2005a) Access to water and electricity affect many aspects of beneficiaries lives, including improving health and reducing physical effort and financial expenses to obtain water. The quasi-experimental study obtained statistically significant results that the Program reduces asthma, hepatitis, and trypanosomiasis in participating communities; results suggests that child mortality and various diseases such as diarrhea and verminoses decline in these communities as well (Binswanger et al., 2006).

Possibly impacting income and physical capital accumulation. Numerous studies—and countless accounts from participants and beneficiaries—suggest that the Program positively impacts income and capital accumulation, but none are conclusive thus far (Buainain & Fonseca, 2005a; Consultoria Econômica e Planejamento, 2004; Faculdade Latino-Americana de Ciências Sociais, 1998; van Zyl, Sonn et al., 2000). The results from Binswanger et al.'s (2006) quasi-experimental study are also inconclusive, although they also suggest that the impact of the Program on income and assets is positive. Further investigation of this issue is needed to reach definitive conclusions about the impact of the Program on income and capital.

Creating social capital and improving local governance. Binswanger et al. (2006) also found that the Program has strong, positive, and sustainable impacts on social capital and helps to improve governance in participating states. The results from the quasi-experimental study strongly indicate the Program empowers beneficiaries and builds significant social capital within communities and municipalities. Moreover, the social capital created continues to increase even after subproject completion. The Program's institutional arrangements and transparency mechanisms promote social control over the public sector and minimize elite capture, political interference, and

corruption (Dongier et al., 2002; Fundação de Apoio ao Trabalhador Rural da Região do Sisal, Pólo Sindical da Região do Paraguaçu & Sindicato dos Trabalhadores Rurais de Araci, do Coité, de Nova Fátima, de Pé de Serra, de Pintadas, de Queimadas, de Retirolândia, do Jacuipe de Tucano and Valente, 2003; van Zyl, Barbosa et al., 1995; van Zyl, Sonn et al., 2000). In the majority of Northeast states participating local governments and communities are now committed to the approach and many are using the Program's Municipal Councils to make decisions regarding non-project-related municipal investments and to channel funds from other programs to local and community development activities (Faculdade Latino-Americana de Ciências Sociais, 1998; Tendler, 1993; van Zyl, Sonn et al., 2000). There is potential to expand this mechanism further and integrate it into public policies at local, state, and federal levels (van Zyl, Sonn et al., 2000).

Appendix C

Summary of the Binswanger et al. (2006) Study of Social Capital

Conceptual framework. Binswanger et al. (2006) chose to narrow their definition of social capital "to refer to the capacity of a social group or community to act collectively when collective action is needed. In order for this concerted action to be possible there must be the motivation and the available institutional arrangements to do so" (p. 110). Further, the authors hypothesized that answers to the questionnaire would break down into two broad constructs: the "inputs" and "outputs" of social capital, which correspond to other authors' conceptions of "cognitive" and "structural" social capital (e.g. Esser, 2008; Grootaert & van Bastelaer, 2002a, 2002b; Krishna, 2000; and Uphoff, 2000). The inputs to social capital consisted of "motives for acting collectively and institutional arrangements that facilitate collective action" (e.g. trust, solidarity and cooperation), while the outputs referred to "participation in community activities, civil participation, and the reconfiguration of relations between the community and the government, or relations of governance" (p. 112). To develop an index of social capital, Binswanger et al. identified four components of social capital:

- Cognitive social capital—participation of families in community or voluntary activities, serving as an indicator of intra-group solidarity and cooperation.
- Structural social capital—level of access to relevant information regarding the public sector, and participation in inter-community cooperation activities.
- Community participation—involvement of the majority of community residents in collective responses to crisis situations that require concerted group action.
- Civil participation—participation in public fora for deliberation and decision-making and the intensity of regular contacts between family members and the authorities to demand action to benefit the community in which they live.

In addition, they outlined the following framework of social capital:

- Inputs (Cognitive social capital):
    - motivation for collective action
        - mutual solidarity
        - cooperation
    - institutional arrangements that permit
        - access to information
        - decision making
        - taking action
- Outputs (Structural social capital):
    - Community participation = solve community problem, satisfy need
    - Civil participation = action related to interaction with government, social control

Methodology.

Sample Selection. The sample in the Binswanger et al. (2006) study included 864 randomly-selected households in 108 communities in 90 municipalities divided equally among three states in rural Northeast Brazil (Piauí, Ceará, and Rio Grande do Norte)[35]. The sample was designed to be statistically representative of World Bank's community-driven development (CDD) program's beneficiary population in the three states together. "The household sample is statistically representative, with an error of 5% and 95% confidence level, while the community sample was drawn to give an error of 10% at 95% confidence level" (Binswanger et al., 2006, p. 79). The sample also includes data from treatment and control communities, split evenly into two groups.[36] "The treatment communities were selected from those that had a CDD subproject approved between April and September 2002. This meant that no effects of the projects would have occurred in July 2002, the period to which the recall questions were directed. The control communities were selected from those that had projects approved between March and July 2005, so that by September and October 2005, when the field research was carried out, no impact would yet have been felt" (Binswanger et al., 2006, p. 79).

It was assumed that since both the treatment and control communities had requested and obtained a CDD subproject they could be considered similar in most of the features that make a community sufficiently organized to be successful in receiving a subproject, but Binswanger et al. nonetheless utilized a number of econometric tools in order to minimize the possibility of self-selection bias.[37] These included pipeline sampling (i.e., selecting a control sample from among communities that had received preliminary approval for the requested CDD subproject but had not yet received financing or begun implementation); two-stage propensity score matching[38] (i.e., using data collected at the time the subproject was requested and after the questionnaire was administered in 2005); and fixed-effects analysis "to compare the difference between the situation in 2002 and in 2005 of the control and treatment groups, thus adjusting for the additive effects of non-observable features" (Binswanger et al., 2006, p. 82).[39]

Data analysis. Binswanger et al. created aggregated indices for two inputs (cognitive and structural social capital) and two outputs (community and civil

[35] These three states were chosen because they were the only ones that kept good records of the community profiles which are registered when projects are requested. This information was used for the first stage propensity score matching.

[36] The sample included communities that had obtained both infrastructure and productive subprojects, but the type of subproject corresponding to each community is not included in the database used in this analysis.

[37] The rules of the CDD program serve in a way to "encourage" self-selection bias, since any community that wants to participate in the program must first form a community association.

[38] The variables used for the first stage propensity score varied a little from State to State, owing to the kind of information available, but always included a variant of the following: distance from the municipality's main town; presence of health clinic and schools in the community; traffic conditions on the main access road; number of inhabitants per health clinic for the municipality, population density of the municipality; relation between the population of the community and that of the municipality; average level of education of the population of the municipality; the various indices that make up the municipal HDI; log of municipal GDP.

[39] These methods are described in more detail in Binswanger et al. (2006).

participation) of social capital (see Table C1) to measure the evolution of social capital for beneficiaries of the CDD program over time. Given that the control group used in the analysis of the impact of the CDD program on physical assets and health could not serve as a control for social capital—as mentioned previously—this analysis controlled for the effect of factors other than the CDD program on social capital via estimating the time trend for social capital that occurred exogenously to the CDD program.

The estimation of this time trend used data from the same communities investigated, but from a time prior to the effects of the CDD program. Specifically, it used information on the stock of social capital existing before community associations were established—which must have occurred before the CDD program projects could be obtained. In this sample this covered a period of 26 years (1979 to 2005). Since information on social capital in the period before the formation of associations was obtained by recall and, it is likely that memories of specific periods in the remote past can be considered very unreliable, the analysis only used observations in communities whose associations had been set up after 1993 (when the CDD program adopted the CDD approach).

The time trend analysis looked at changes in social capital between (a) the period prior to establishment of the community association, (b) the year 2002, when the projects were implemented in the communities that first had access to the CDD program (in this section referred to as the Communities 2002), and (c) the date the Binswanger et al. study was carried out—September and October 2005—when the projects were being implemented in the most recently benefited communities (in this section referred to as Communities 2005). The analysis was based on intervalar indices [0, 1] that were additive and reflected each of the dimensions of social capital described above, as well as a general index. Table C1 presents the different dimensions of social capital incorporated in the analysis.

Table C1

Indicators of Stock of Social Capital and Its Four Basic Components

Indicators	Variables Measured at each of the three points in time
Cognitive social capital	Participation of families in community or voluntary activities, serving as an indicator of intra-group solidarity and cooperation
Structural social capital	Level of access to relevant information regarding the public sector, and participation in inter-community cooperation activities
Community participation	Involvement of the majority of community residents in collective responses to crisis situations that require concerted group action
Civil participation	Participation in public fora for deliberation and decision-making and the intensity of regular contacts between family members and the authorities to demand action to benefit the community in which they live
Index of social capital	Simple mean of the four basic components

Source: Binswanger et al., 2006, p. 118.

Based on the indices at each point in time, three indices for changes over time were created for each of the household units: (1) the change between the year the community association was established and 2002 (ΔT1); (2) the change between the year the association was established and 2005 (ΔT2); and (3) the change between 2002 and 2005 (ΔT3). Based on these, the researchers identified five types of impact:

- Total Short-Term Impact (STI), which could be measured in Communities 2002 and Communities 2005 and corresponded to the cumulative impact of setting up the community association and implementation of the CDD subproject; Total Long-Term Impact (LRI), only measured for the Communities 2002; corresponded to the cumulative impact of setting up the community association, implementation of the CDD subproject, and the additional variation that occurred until 2005;
- Additional Variation (AG), only measured for the Communities 2002, corresponded to the evolution in the period between implementation of the CDD subproject and 2005;
- Direct Impact of the Implementation of the subproject (PI), which could only be measured for the 2005 group in which associations were set up before 2002; and,
- Impact due to the Setting up of the Community Association (AFI), could only be measured for the Communities 2005 which set up their associations before 2002.

For each one of the two types of communities (Communities 2002 and Communities 2005), each variation over time related to a distinct type of impact. Table C2 outlines the types of impact and the source of data used for each type of community.

Table C2

Measurement of Impact of CDD Program on Social Capital

	Time interval used	
Measurable Impacts	Communities 2002	Communities 2005
Total Short-Term Impact (*STI*)	ΔT_1	ΔT_2
Total Long-Term Impact (*LRI*)	ΔT_2	
Additional Variation (*AG*)	ΔT_3	
Impact of Implementation of PCPR Sub-project (*PI*)		ΔT_3
Impact of Setting Up of Community Association (*AFI*)		ΔT_1

Source: Binswanger et al., 2006, p. 119.

Results. The time trend estimation used information on the stock of social capital before the establishment of community associations; the year these organizations were set up (from 1993 to 2005); and a propensity score index estimated specifically for the analysis of social capital. The time trend results for the mean index of social capital indicated that over the period between 1993 and 2005—the period in which the CDD program has been in operation—social capital did not change in the communities participating in the study independently of the CDD program. The time trend estimation was repeated separately for each of the dimensions of social capital and obtained identical results (see Table C3). Therefore, Binswanger et al. (2006) concluded that measured variations in social capital over time among beneficiaries could be attributed to the establishment of community associations and the implementation of CDD subprojects.

Table C3

Estimates of the Time Trend of Social Capital

	Number of obs = 780
Regression with robust standard errors	F(2.78) = 2.60
	Prob > F = 0.07
	R^2 = 0.00
	Root MSE = 0.25

Dependent Variable = 'index of social capital - isc'	Robust Coef.	Std. Error	*t*	P>|t|	95% CI
Trend	0.00	0.02	0.90	0.93	[-0.01, 0.01]
ptreat[1]	0.88	0.389	2.28	0.02	[0.01, 0.17]
Constant	0.85	0.58	4.90	0.00	[0.17, 0.39]

[1.] The variable ptreat is an estimate of the probability of belonging to the 2002 group of communities, a result of the propensity-score analysis specific to social capital.
Source: Binswanger et al., 2006, p. 119.

Table C4

Stocks of Social Capital According To Time Period and Type of Community[1]

		Overall		Group of 2002 communities		Group of 2005 communities	
Indicators	Point in Time	Mean	T of T-test	Mean	T of T-test	Mean	T of T-test
Social capital index	T_1	0.37	-13.33	0.40	-7.75	0.35	-11.12
	T_2	0.45	-4.64	0.47	-2.21	0.44	-4.30
	T_3	0.52	1.72	0.52	1.54	0.51	0.89

[1]. T-tests of hypothesis: mean = 0
T_1 = Time of formation of community association
T_2 = Time of 2002 World Cup
T_3 = Time of research (2005)
Source: Binswanger et al., 2006, p. 120.

Binswanger et al. (2006) found that among participating communities, social capital had a general tendency to grow and that the stock of social capital existing at the time of the formation of the community association was greater in the Communities 2002 (see Table C4). This suggests that communities with greater social capital were able to organize and access the CDD program's resources faster and earlier—a finding that is consistent with social capital theory. Nevertheless, the authors found that in 2005 both groups of communities had similar stocks of social capital, thereby indicating that the Communities 2005 group "caught up" to its Communities 2002 counterparts.

Table C5

Measurement of Impact of PCPR on Social Capital

	2002 Group of Communities		2005 Group of Communities	
Impact	Mean	T of T-test	Mean	T of T-test
STI	26.4%	8.05	45.7%	12.67
LRI	42.8%	10.82		
AG	19.3%	6.50		
AFI			19.9%	6.54
PI			33.2%	8.97

Note: See Table C2 for a list of abbreviations.
Source: Binswanger et al., 2006, p 120.

Table C5 presents the results of Binswanger et al.'s (2006) analysis of the impact of the CDD Program on social capital among participating communities. Based on the results of their analysis, the authors concluded that a process of intensive growth in the stock of social capital was underway and impacted greatly by the CDD program. They stated that the formation of social capital reached its peak rate of growth during the implementation of community subprojects (as expressed by the high value for *PI* in the 2005 Communities), when community participation and relations of co-responsibility with structures of government in the execution of public policy intensified. After that initial phase, social capital growth continued but at a slower pace (as suggested by the value of AG for the 2002 group), indicating that the social capital created was used less than it could or should have been, but that it still did not revert to earlier levels.

Binswanger et al also compared over time each of the four components of social capital and the social capital inputs and outputs (see Tables C6 and C7). In relation to cognitive social capital, the results revealed a higher rate of growth between the time the community association was set up and 2005, than between 2002 and 2005, and it was higher in the Communities 2005 group than in the Communities 2002 group. The results also revealed that structural social capital increased steadily starting with the implementation of the subprojects, though more rapidly during the actual implementation period.

Table C6

Measurement of the Impact of the PCPR on Social Capital Inputs

	2002 Group of Communities		2005 Group of Communities	
Impact	Mean	T of T-test	Mean	T of T-test
STI	4.2%	2.72	14.6%	5.43
LRI	7.5%	3.92		
AG	3.7%	2.72		

Note: See Table C2 for a list of abbreviations.
Source: Binswanger et al., 2006, p. 121.

The findings regarding social capital outputs demonstrated increases as well. Community participation grew in all communities benefiting from the CDD program, albeit at a faster pace in the communities that were currently implementing a subproject than in those that implemented one in 2002. Furthermore, the indicators for change over time in levels of civil participation revealed consistently positive growth rates.

Table C7

Measurement of Impact of PCPR on Social Capital Outputs

Impact	2002 Group of Communities		2005 Group of Communities	
	Mean	T of T-test	Mean	T of T-test
STI	16.4%	4.46	22.1%	5.39
LRI	31.4%	6.11		
AG	12.8%	3.73		

Note: See Table C2 for a list of abbreviations.
Source: Binswanger et al., 2006, p. 121.

Finally, a comparison of the results in Tables C6 and C7 reveals that the relative impact of the CDD program was greater on social capital outputs than on inputs.

Appendix D

Household Questionnaire[40]

Name of head of household[41]

2. Number of people currently living in household _____

Number living in household at the time of the 2002 World Cup[42] _____

[40] Translated from Portuguese by the author.
[41] This data is not included in the database.
[4242] This date was selected because it was considered an event that most Brazilians would be able to remember without much difficulty. The use of a major event in the history of a community/state to "anchor" recall data is considered appropriate when a baseline was not established. An example can be found in Grootaert, et al. (2004).

3. Demographic characteristics:

Code for each household member*	Currently living in household? (Y/N)	Lived in household during World Cup 2002? (Y/N)	Sex	Age	Level of education**		Currently attending school Yes/No		Employment status and location***		Reason for entering or leaving household between 2002 and 2005 ****	Which of these household members were members of the Community Association X [Identify the association by name]	
					Today	June 2002	Today	June 2002	Today	June 2002		Today	June 2002

*Options
1. Head of household
2. Spouse
3. Son/daughter
4. Grandfather/grandmother
5. Uncle/Aunt
6. Son/daughter-in-law
7. Other

** Options
1. Never went to school
2. Didn't finish primary (1^{st} – 4^{th} grade)
3. Finished primary school (completed 4^{th} grade)
4. Completed elementary education (completed 8^{th} grade)
5. Completed secondary education (completed 3rd year of secondary ed.)
6. Attended or completed higher education

*** Options
0. Does not work
1. Works in the community
2. Works outside the community but inside the municipality
3. Works in another municipality

**** Options
0. Has not left the household
1. Died
2. Born
3. Went to work in another place
4. Married and moved out
5. Married and came to live in the household
6. Other

4. Why is the Community Association [use the name of the association] important to you? [Open-ended question, but check for the alternatives below]

Check for:	1 Yes	2 No
Strengthens the friendships between the members of the community		
Helps people in need and during emergency situations		
Promotes collaboration between communities		
Represents the interests of the community to the authorities		
Obtains development projects and other benefits for the community		
Contributes to improve the income of the family		

5. Participation of household members in groups, associations, etc.

Options: 1- Unions, 2- Cooperatives and rural producers' organizations, 3- Other social groups (religious, women's, youth, etc.).	Is anyone from the household a member today?		Was anyone from the household a member during the time of the 2002 World Cup Finals?	
	Yes	No	Yes	No
Unions				
Cooperatives and rural producers' organizations				
Other social groups (religious, women's, youth, etc.)				

[Only for households that have at least one member of the PCPR beneficiary Community Association]

6. How was the Community Association formed?
   1 Spontaneous mobilization and organization by community members
   2 Initiative by a local leader, religious group or union
   3 Initiative by a NGO
   4 Initiative by a municipal political leader
   5 Initiative of a government program
   6 As part of the requirements to obtain a subproject from the PCPR
   7 Other (specify:) _____

7. How frequently do you participate in the community association meetings?
   0 Never participate
   1 Irregularly or sporadically
   2 Three or four times per year
   3 One or more times per month

8.Do you attend the community associations more frequently today than during the time of the 2002 World Cup Finals?
   1 More frequently
   2 As frequently
   3 Less frequently
   4 In 2002 I/we didn't attend the community association meetings
   5 Today I/we don't attend the community association meetings

9. How would you describe your participation in the decisions and activities of the community association?
   1 At least one of the household members is part of the leadership of the association and participates actively in the decisions and activities of the association.
   2 At least one of the household members participates very actively in the decisions and activities of the association.

3 At least one of the members of the household participates regularly in the decisions and activities of the association.
4 I/we participate very little or not at all in the decisions and activities of the association.

10. How are the leaders of the community association chosen today, and how were they chosen during the time of the 2002 World Cup Finals? [Mark one option for today and one for 2002]

	Today [mark with an X]	June 2002 [mark with an X]
1 By a person or entity outside of the community		
2 Each leader chose his/her successor		
3 A decision was made by some of the association members		
4 By a vote among association members		
5 Other (specify:_____)		

11. Why was the current President of the association chosen to lead the association? [Open-ended question]

Check for [More than one option may be selected]:

- He/she is very respected within the community
- He/she is more knowledgeable and educated
- He/she has more time and willingness to dedicate to the community
- He/she has more contacts with influential people
- He/she has a little more financial resources

12. When a decision needs to be made in the community, how is this done?
1 The leaders decide what to do
2 The leaders consult with some association members and then decide
3 The association members meet, discuss the situation and decide collectively what to do
4 Other (specify) _____?

[For all households:]
13. In your opinion, today, is the community association and its leaders capable of resolving the problems that arise in the community?
1 Yes
2 No

14. Were they able to resolve the problems that arose in the community during the time of the 2002 World Cup Finals?
1 Yes
2 No

15. Do you trust in the decisions that the leaders of the community association make to resolve the problems that arise in the community?

1 = Trust a lot
2 = Trust a little
3 = Don’t trust

16. Household characteristics

	Today	June 2002
The house you live in is: 1. Owned 2. Rented (alugada) 3. Rented (arrendada) 4. On loan/borrowed/a favor (Cedida/emprestada/de favor) 5. Invaded 6. Under mortgage (Financiada) 7. Other condition		
Number of rooms (including bathroom and kitchen)		
Type of wall material: 1. Masonry work 2. Mud 3. Other		
The source of drinking water is predominantly: 1.Piped water (with working connection) 2.Household cistern 3.Community water fountain 4. Community water fountain with desalization 5.Other (dam,cacimba, barreiro, river/spring) 6. Water truck		
Does it have a bathroom? 1. Yes, inside 2. Yes, outside 3. No		
Sewer: 1.Connected to municipal sewer system 2. Septic Tank 3. Sewer canal 4. Other		
Waste disposal: 1. Trash collection 2. Burning 3. Buried 4. Dump (Terreno Baldio) 5. Other		
Energy source 1. Electricity 2. Solar 3. Other 4. None		

17. Assets/wealth

Which assets do you have today and which did you have in June 2002? (e.g: electric appliances, vehicles, agricultural implements, animals)*	Quantity today	Quantity at the time of the 2002 World Cup finals	How much would you be able to sell it for today?	Reason for loss or gain of assets between 2002 and today**

* Options		**Options
1.TV	17. Tractor trailer	1.Received/gave as a present
2. Radio	18. Plough	2.Inherited
3. Stove/cooker	19. Cultivador	3.Household member left to establish another household (married) and took it with him/her
4. Refrigerator	19. Hoe	4. Household member came to live in the house and brought it with him/her
5. Freezer	19. Irrigation equipment	5. Purchased
6. Blender	19. Cistern	6. Sold
7. Sewing machine	20. Service animal	7. Lost
8. Bed	20. Ox cart	8. Got old and was thrown away
9. Sofa	21. Horse	9. Died morreu
10. Table	22. Donkey	10. Born
11. Chair	23. Lamb	
12. Bicycle	24. Goat	
13. Motorcycle	25. Pig	
14. Car	26. Milk cow	
15. Truck	27. Beef cattle	
16. Tractor	28. Chicken	

18. Total cultivated area, including land that is owned, leased, or shared with others (hectares):
    Today _____
    June 2002_____

19. Was this a good winter (was there a lot of rain)?
    1. Yes
    2. No

20. In 2002, during the last World Cup, was the winter good?
    1. Yes
    2. No

21. Speaking only of the land on your property (Even if part of it is being leased or lent to someone else), list the area of each type of land:

Type of use 1.Land aráveis de sequeiro not-cultivated	(Hectares) today	(Hectares) in June 2002	Why did the number of hectares of your property decrease/increase? 1.Inheritance 2. Gave to son/daughter or other relative for his/her cultivation 3. Bought 4. Sold 5. Other
2.Cultivated land de sequeiro			
3.Cultivated, irrigated land			
4.Pasture			
5.Yard			
6. Land not able to be cultivated			
7. Other			

Note: 1 hectare = 3.3 tarefas

21*) How much would you be able to sell your land for today (considering everything)?

21**) How much would you be able to rent your land for today (considering everything)?

22. Financial assets (value in Brazilian Reales R$): Today June 2002

Savings account _____
Loans to others _____
Other _____

23. Debts (Value R$): Today June 2002

Crédito Pronaf _____
Loans from other people _____
Bank credit _____
Store credit/account _____
Other _____

24. Do you receive some type of governmental assistance?

Type of assistance*	Total monthly value today	Total monthly value that you received during the time of the 2002 World Cup final

*Options

Retirement/Pension	Vale-Gás
Bolsa-Família	Unemployment
Fome Zero	PETI
Bolsa Escola	Other

25. Considering only the people living in the house at this time, what is the most important source of income today and what was it during the time of the 2002 World Cup final?

Today _____

June 2002 _____

26. Combining all of the sources of income of all household members, what was the household income last month? And what was it at the time of the 2002 World Cup final?

Today _____

June 2002 _____

Now we're going to ask you a few questions about the type of cooperation and collective action between people in the community.

27. Here in your community, what kind of help do community members give to those people who are in a moment of need? [Open-ended question]

28. Type of assistance offered

How frequently do people/families in the community help each other when:	Today 1 = Most of the time they will help 2 = Sometimes they will help 3 = They never help	Before the 2002 World Cup final, did the people in the community help each other more or less? 1 = More 2 = Same amount 3 = Less	Before the community association was formed, did the people in the community help each other more or less? a 1 = More 2 = Same amount 3 = Less
They need seeds to plant their crops			
They're sick and need help preparing the land and planting the crops			
They need to borrow some amount of money			

29. If other community members asked you to give them money or work on a project that you may not benefit from directly, would you do it?

1 Yes
2 No

30. Today, would you work with other community members on an activity that benefits the entire community?

1 Yes
2 No

31. At the time of the 2002 World Cup final, did you join together with other community members to do activities that benefitted the community more or less than now?

1 = More frequently
2 = As frequently
3 = Less frequently

32. Before the community association was formed, did you join together with other community members to do activities that benefitted the community more or less than now?

1 = More frequently
2 = As frequently
3 = Less frequently

33. Here at home, how often do you listen to the radio today:
1 Every day
2 A few times per week
3 A few times per month
5 Never

34. At the time of the 2002 World Cup final, did you listen to the radio more or less frequently than you do today?
1 More frequently
2 As frequently
3 Less frequently
4 Didn't listen to the radio

35. Here at home, how often do you watch TV today?
1 Every day
2 A few times per week
3 A few times per month
4 Never

36. At the time of the 2002 World Cup final, did you watch TV more or less frequently than today?
1 More frequently
2 As frequently
3 Less frequently
4 Didn't watch TV

37. Does anyone here in the house have access to the Internet?
1.Yes
2.No

38. Did this person have access to the Internet during the 2002 World Cup final?
1. Yes
2. No

39. Today, how many friends living in the community do you have?
1 Many friends
3 Few friends
4 No friends

40. Comparing today with the time of the 2002 World Cup final, would you say that you have more or fewer friends living here in the community?
1 More
2 The same amount
3 Fewer

41. Comparing today with the time before the community association was formed, would you say you have more or fewer friends living here in the community?
1 More

2 The same amount
3 Fewer

42. Imagine that two community members have a very serious disagreement or dispute. How would this dispute normally be resolved here in the community? [open-ended question]
[If necessary, give some examples, such as: when a community member's goats invade another community member's field, or when a community member builds a fence or other structure that keeps other people from getting to the irrigation water, etc.]

Check for:

- The leaders of the association step-in and help to resolve the majority of the disputes.
- The political leaders of the community step-in and help to resolve the majority of the disputes.
- The incidents are reported to the police

43. Today, have the community association and its leaders been able to resolve the problems that have arisen between community members?

1 They have been able to resolve the majority of the problems between community members.
2 They have been able to resolve some of the problems between community members.
3 They have not been able to resolve the problems between community members.
4 There aren't any disputes between community members.

44. Since the time of the 2002 World Cup final, do the leaders of the community association participate more or less in the resolution of these types of conflicts?

1 More
2 The same amount
3 Less

45. Who makes the decisions that need to be made here in the community??

1 The community association leaders decide what to do.
2 The community association leaders decide after consulting with the community members.
3 The community members meet and decide collectively what to do.
4 Other (specify) _____?

46. Do you trust that the decisions that the community association leaders take benefit everyone in the community or do you believe that they (the leaders) are the primary beneficiaries of the decisions that are made?

1 Their decisions benefit everyone
2 Their decisions benefit the majority
3 Their decisions benefit a few people. Why?
4 Their decisions benefit only themselves

47. Participation in community activities (Yes/No)

	Today	2002 World Cup finals	Before the community association was formed
Do you participate in meetings of the municipal council, assemblies, or in town hall meetings?			
Do you meet or communicate frequently with politicians and/or other authorities to try to make sure they act on behalf of the community?			
Do you meet with members of neighboring communities to resolve problems that affect your communities?			
Do you volunteer your time to do charity work or other kinds of activities that benefit the community?			
Do you have access to other government programs besides the PCPR?			

48. Did you participate in the community association meeting during which the PCPR subproject was chosen?

1 Yes
2 No
3 There was no meeting held to choose the PCPR subproject

49. If yes, were you in favor of the choice of subproject?

1 In favor
2 Opposed
3 We weren't able to voice our opinion

50. **[Only for those communities where a subproject was implemented]**
Are you satisfied with the way the subproject is functioning?

1 Very satisfied
2 Satisfied
3 Not satisfied

51. **[For all respondents]**
If one day there were a problem of operation and maintenance of the water supply system in the community, would any of you help to resolve it?

1.Yes
2.No

52. If this problem had occurred around the time of the 2002 World Cup final, do you think you would have contributed to help resolve it?

1. Yes
2. No

53. And if this problem had occurred before the community association was formed, do you think you would have contributed to help resolve it?

1. Yes
2. No

Appendix E

Email Permission to Use World Bank Data[43]

All, I have finally reached the stage where I am going to start working on my dissertation and I am interested in seeing whether it would be possible to obtain access to the database used in the Brazil CDD Impact Evaluation. I am particularly interested in further exploring the concept of social capital development using a special type of analysis called Structural Equation Modeling (SEM). Basically, SEM allows me to look at the different variables that contribute to concepts/constructs such as social capital. Through this analysis, it will be possible to identify which particular variables/characteristics about a community, project implementation experience, etc., are most important to the creation of social capital. Obviously, this information would be very beneficial to the Bank because it would allow the Bank to know where to focus investment dollars (e.g. more education for communities, better training to local governments, etc.). If I am able to obtain access to the data, I will write up a formal proposal during the next few months that you can look at.

I would greatly appreciate your consideration of this request. As I mentioned, I think it can give valuable information to the Bank, as well as help me to finish my Ph.D. already! I would also greatly appreciate it if you could get back to me as soon as possible, because if I'm unable to obtain this data I need to locate another dataset.

Thanks, I hope you are all doing well and I look forward to hearing from you soon!

Jill

08/06/2008
Forwarded by Maria de Fatima Amazonas/Person/World Bank on 08/22/2008 08:50 AM
Maria de Fatima Amazonas
To: gercinosaraivamaia@yahoo.com.br, prodesenvolvimento@rn.gov.br, jfarias@sda.ce.gov.br, Fernando Danda <fernandodanda@hotmail.com>, gercinosaraivamaia@yahoo.com.br
Cc: jgilberto@gmail.com, silvanamara@sda.ce.gov.br, anaoguedes@hotmail.com, Tulio Barbosa, Jorge A. Munoz, clauromano@terra.com.br, tobeh@terra.com.br, Yanny Pollyny do Nascimento Rocha

[43] Translated by the author.

Subject: Estudo de Desenvolvimento de Capital Social no âmbito dos PCPRs [Study of Social Capital Formation in the PCPR]

Prezados Gercino, Josias e Fernando, [Dear Gercino, Josias and Fernando]

Recebemos um pedido da Jill Lammert, que trabalhou durante algum tempo como consultora do Banco Mundial em Washington/Recife, inclusive na preparação, em conjunto com o Luis Coirolo, de um livro contendo a análise da trajetória dos Projetos de Combate à Pobreza Rural na Região Nordeste do Brasil, que deverá ser publicado brevemente. [We have received a request from Jill Lammert, who worked for a time as a consultant to the World Bank in Washington/Recife, and who, in conjunction with Luis Coirolo, prepared a forthcoming book documenting the history of the Rural Poverty Reduction Projects [PCPR] in the Northeast Region of Brazil.

O referido pedido, trancrito abaixo, trata em essência da solicitação para acesso às bases de dados do estudo quase-experimental de avaliação de impacto dos PCPRs do Rio Grande do Norte, do Ceará e do Piaui que foi realizado em 2005. A intenção dela é fazer um estudo para a sua dissertação de doutorado no qual irá explorar um pouco mais o conceito de desenvolvimento de capital social, usando um tipo especial de análise designada Modelo de Equação Estrutural, com vistas a tentar mensurar a contribuição de diferentes variáveis sobre o referido desenvolvimento de capital social (vejam mais detalhes na nota original da Jill). A equipe do Banco considera o estudo bastante interessante e muito útil, inclusive para as UTs dos Projetos. Portanto, de nossa parte não teríamos objeções ao uso dos dados do estudo quase-experimental. [Her request, transcribed below, asks permission to have access to the databases related to the quasi-experimental impact analysis of the PCPRs that was conducted in 2005 in Rio Grande do Norte, Ceará and Piauí. Her intention is to conduct a study as part of her doctoral dissertation to explore a bit more the concept of social capital development, using a special kind of analysis called structural equation modeling, in an effort to measure the contribution of different variables to the development of social capital (see Jill's message for more information). The World Bank team thinks this study could be very interesting and very useful, including for Project Technical Units. For this reason, the World Bank has no objection to her use of the data collected during the quasi-experimental impact evaluation.]

Assim, gostaria de lhes pedir autorização para permitir o acesso da Jill aos referidos dados, cujas bases temos em nosso poder. Na certeza de contar com o apoio de vocês, antecipo agradecimentos. [Therefore, I would like to request your permission to allow Jill to have access to the databases, which are currently maintained by the World Bank. I would like to thank you in advance for your support of this request.]

Atenciosamente, [Sincerely,]

Fatima Amazonas
The World Bank
LCSAR
Cell: +55.81.9601.8478
Email: mamazonas@worldbank.org

22/08/2008 09:54
De: mamazonas@worldbank.org
Para: jfarias@sda.ce.gov.br
cc: silvanamara@sda.ce.gov.br, jgilberto@gmail.com, Tbarbosa@worldbank.org
Assunto: Fw: Estudo de Desenvolvimento de Capital Social no âmbito dos PCPRs [Study of Social Capital Formation in the PCPR]

Prezado Josias, [Dear Josias]

Não consegui localizar nos meus arquivos, a sua resposta ao email abaixo. Assim, estou reenviando o pedido, pedindo que por favor, nos informe, caso concorde respondendo a este email. [I am not able to find in my email archives your response to the email below. For this reason, I am resending the request, and ask you to please inform us whether you agree with the request in the email below].

Agradeço a sua habitual atenção. [I appreciate your habitual attention]

Abraços, [Regards]

Fatima

Fatima Amazonas
The World Bank
LCSAR
Cell: +55.81.9601.8478
Email: mamazonas@worldbank.org

08/27/2008 10:04 AM
To mamazonas@worldbank.org
Subject Re: Estudo de Desenvolvimento de Capital Social no âmbito dos PCPRs [Study of Social Capital Formation in the PCPR]

Prezada Fátima, [Dear Fatima]

Conforme solicitado em email abaixo, nada temos a opor com relação a permissão de acesso aos referidos dados. [Per the request listed in the email below, we give our permission for the use of the database in question for this study]

Atenciosamente, [Sincerely]

Josias Farias Neto
Coordenadoria de Programas e Projetos Especiais Secretaria do Desenvolvimento Agrário [Coordinator of Special Programs and Projects, Secretariat of Agrarian Development]
Av. Bezerra de Menezes, Nº 1820 - São Gerardo CEP. 60.325-901 Fortaleza - CE
Fone: [0xx85] 3101-8112 Fax: [0xx85] 3101-8116

Prezado Josias, [Dear Josias]

Muito obrigada pela sua atenção e concordância. [Thank you very much for your attention and permission]

Abraços, [Regards]

Fatima

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Email: mamazonas@worldbank.org

Permission from GMU HSRB to Use World Bank Data

GEORGE MASON UNIVERSITY

Office of Research Subject Protections

Research 1 Building, 4400 University Drive, MS 4C6, Fairfax, Virginia 22030
Phone: 703-993-4121; Fax: 703-993-9590

TO: Dr. Dimiter Dimitrov, College of Education and Human Development

FROM: Sandra M. Sanford, RN, MSN, CIP
Director, Office of Research Subject Protections

PROTOCOL NO.: 6830 Research Category: Doctoral Dissertation

PROPOSAL NO.: N/A

TITLE: Does Participation in Community-Driven Development Activities Help Create Social Capital? Findings from Rural Brazil

DATE: March 9, 2010

Cc: Jill Lammert-Posadas

Under George Mason University (GMU) procedures, this project is exempt from review by the GMU Human Subjects Review Board (HSRB) since it falls under DHHS Exempt Category 4, research involving the collection or study of existing data, documents, records, pathological specimens or diagnostic specimens.

You may proceed with data collection. **Please note that all modifications in your protocol must be submitted to the Office of Research Subject Protections for review and approval prior to implementation.** Any unanticipated problems involving risks to participants or others, including problems regarding data confidentiality must be reported to the GMU Office of Research Subject Protections.

GMU is bound by the ethical principles and guidelines for the protection of human subjects in research contained in The Belmont Report. Even though your data collection procedures are exempt from review by the GMU HSRB, GMU expects you to conduct your research according to the professional standards in your discipline and the ethical guidelines mandated by federal regulations.

Thank you for cooperating with the University by submitting this protocol for review. Please call me at 703/993-4015 if you have any questions.

Appendix F

Descriptive Statistics for Variables Included in the Analyses

Table F1

Descriptive Statistics for Variables in the Analyses

Variable	Label	*n*	*M* (*SD*)
GN01_05	Number of HH member of CA 2005	864	1.07 (0.64)
GN01_02	Number of HH member of CA 2002	864	0.94 (0.71)
SC01_05	Do you meet with people in neighboring communities to resolve problems: Currently	860	0.55 (0.49)
SC01_02	Do you meet with people in neighboring communities to resolve problems: 2002	858	0.46 (0.50)
TS01_05	Do you do volunteer work for charity: Currently	861	0.70 (0.46)
TS01_02	Do you do volunteer work for charity: 2002	861	0.63 (0.48)
EMTOT_05	Measure of empowerment and political action 2005	862	0.63 (0.78)
EMTOT_02	Measure of empowerment and political action 2002	862	0.51 (0.73)
ICTOT_05	Measure of access to information and communication, 2005	864	2.47 (1.07)

Variable	Label	*n*	*M* (*SD*)
ICTOT_02	Measure of access to information and communication, 2002	864	1.98 (1.13)
CAC01_05	If the irrigation system were to stop working, how would you resolve the problem?	840	1.98 (1.20)
CAC01_02	When Brazil won World Cup 2002 if the irrigation system had stopped working how would you have resolved the problem?	841	1.89 (1.21)
D_CAC_01	Before Brazil won World Cup 2002 people in the community helped those in need	853	1.05 (0.59)
D_CAC_02	In 2002 did the community members get together more or less often to work in benefit of the community?	847	1.18 (0.65)
D_CAC_03	Change in way community responds to problem of irrigation system stopping working	837	0.09 (0.59)
D_IC_03	Availability of information about the municipality: June 2002	864	1.74 (0.48)
D_IC_04	Availability of information about the state: June 2002	862	1.73 (0.50)
D_IC_05	Availability of information about the country: June 2002	861	1.73 (0.50)
D_IC_06	In June 2002 did you listen to the radio more or less frequently than today?	864	1.59 (0.92)
D_IC_07	In June 2002 did you watch TV more or less frequently than today?	861	1.29 (1.03)
D_TS_01	Compared to when Brazil won World Cup 2002, do you have more/less trust: Your relatives and neighbors	863	1.20 (0.48)

Variable	Label	*n*	*M* (*SD*)
D_TS_02	Compared to when Brazil won World Cup 2002, do you have more/less trust: People from other communities and the municipal seat	858	1.08 (0.45)
D_TS_03	Compared to when Brazil won World Cup 2002, do you have more/less trust: The mayor of the municipality	856	1.03 (0.63)
D_TS_04	Compared to when Brazil won World Cup 2002, do you have more/less trust: The State, laws and government institutions	856	1.06 (0.57)
D_TS_05	Comparing today with 2002: How many community members give you presents?	861	1.18 (0.56)
D_TS_06	Number of people who live in other communities from whom you receive presents: 2002-2005	853	1.04 (0.48)
D_SC_01	Since Brazil won World Cup 2002, the CA leaders participate more or less in the solution of conflicts?	812	1.14 (0.58)
D_SC_02	Change in meeting with people in neighboring communities to resolve problems 2002-2005	858	0.08 (0.31)
D_EM	Change in EM 2002-2005 (participation in MC and public assembly meetings, meeting with politicians and authorities to hold them accountable)	862	0.12 (0.50)

Variable	Label	*n*	*M* (*SD*)
COMM_CT	Control/Treatment	864	0.50 (0.50)
PARED_05	Measure of parents' education 2005	864	2.53 (1.87)
PARED_02	Measure of parents' education 2002	864	2.45 (1.82)
CH_SC_05	Number of school age children enrolled in school 2005	864	0.86 (1.17)
CH_SC_02	Number of school age children enrolled in school 2002	864	0.88 (1.20)

Table F2

Correlations among Measures of General Social Capital (Pearson R)

	GN01_05	GN01_02	CAC01_05	CAC01_02	ICTOT_05	ICTOT_02	TS01_05	TS01_02	EMTOT_05	EMTOT_02	SC01_05	SC01_02
GN01_05	1.00	.75 **	.07 **	0.06	0.00	-0.05	.11 **	.12 **	0.06	.10 **	.16 **	.19 **
GN01_02		1.00	0.06	0.05	0.00	0.02	.12 **	.16 **	0.01	.09 **	.19 **	.23 **
CAC01_05			1.00	.88 **	0.03	0.03	.10 **	0.04	.19 **	.17 **	0.04	-0.01
CAC01_02				1.00	0.01	0.02	.10 **	.08 **	.15 **	.16 **	0.00	0.00
ICTOT_05					1.00	.70 **	-0.02	-0.02	.11 **	.12 **	0.00	-0.03
ICTOT_02						1.00	0.01	0.02	.07 **	.10 **	0.04	0.04
TS01_05							1.00	.82 **	.13 **	.08 **	.48 **	.41 **
TS01_02								1.00	0.01	.11 **	.41 **	.50 **
EMTOT_05									1.00	.78 **	.23 **	.10 **
EMTOT_02										1.00	.14 **	.17 **
SC01_05											1.00	.80 **
SC01_02												1.00

Note: See Table E1 for variable labels.
*Significant at the 0.05 level.
**Significant at the 0.01 level

Table F3

Correlations among Measures of Social Capital Change (Pearson R)

	D_EM	D_CAC_01	D_CAC_02	D_CAC_03	D_IC_03	D_IC_04	D_IC_05	D_IC_06	D_IC_07	D_TS_01	D_TS_02	D_TS_03	D_TS_04	D_TS_05	D_TS_06	D_SC_01	D_SC_02
D_EM	1.00	.08 **	.09 **	.08 **	.08 **	.13 **	0.05	.08 **	0.06	0.06	0.05	.11 **	.11 **	.12 **	.07**	0.04	.36 **
D_CAC_01		1.00	.22 **	0.07	0.02	0.06	0.04	0.00	0.00	0.05	-0.01	.09 **	0.04	.11 **	0.02	-0.01	.18 **
D_CAC_02			1.00	0.01	.09 **	.08 **	.12 **	-0.01	0.05	0.03	0.03	0.06	0.04	.11 **	0.02	0.02	.10 **
D_CAC_03				1.00	0.04	0.02	0.05	0.06	0.05	0.06	0.00	.07 **	0.01	.10 **	.10 **	.08 **	.15 **
D_IC_03					1.00	.68 **	.63 **	.07 **	.07 **	0.03	0.01	-0.01	-0.02	.10 **	0.01	.07 **	.08 **
D_IC_04						1.00	.73 **	.07 **	.09 **	0.04	-0.01	.08 **	0.04	.08 **	0.03	.08 **	0.06
D_IC_05							1.00	0.05	.08 **	0.05	-0.01	0.05	0.03	.07 **	0.05	0.06	0.03
D_IC_06								1.00	.23 **	0.04	0.01	.07 **	0.04	0.02	0.04	.07 **	.08 **
D_IC_07									1.00	0.01	0.00	0.00	0.01	.075 **	.096 **	.074 **	.081 **
D_TS_01										1.00	.50 **	.27 **	.27 **	.23 **	.15 **	.07 **	0.03
D_TS_02											1.00	.32 **	.30 **	.12 **	.16 **	0.05	0.04
D_TS_03												1.00	.45 **	.09 **	.12 **	.07 **	.09 **
D_TS_04													1.00	.08 **	0.06	0.06	.09 **
D_TS_05														1.00	.42 **	.14 **	.08 **
D_TS_06															1.00	.12 **	0.03
D_SC_01																1.00	0.07
D_SC_02																	1.00

Note: See Table E1 for variable labels.
*Significant at the 0.05 level. **Significant at the 0.01 level.

Appendix G

Mplus Input for Data Analyses

Mplus Input Research Question 1.

Mplus instructions for SC configural testing group 0 (control).

```
TITLE:  CFA Configural Testing Group 0 4-22-10

DATA:
        FILE IS "E:\CONFIG_ALL_4-22-10.dat";
        FORMAT IS 31F8.0;

VARIABLE:
        NAMES = STATE COMM_CT HH_ED_05 HH_ED_02 HH_SC_05 HH_SC_02
        SP_ED_05 SP_ED_02 SP_SC_05 SP_SC_02 CH_SC_05 CH_SC_02 D_CH_SC
        D_HH_ED D_HH_SC D_SP_ED D_SP_SC GN01_05 GN01_02 GNTOT_05
        GNTOT_02 CAC01_05 CAC01_02 ICTOT_05 ICTOT_02 TS01_05 TS01_02
        EMTOT_05 EMTOT_02 SC01_05 SC01_02;

USEVARIABLES =  GN01_02 EMTOT_02 SC01_02 TS01_02;
MISSING IS .;

USEOBS ARE (COMM_CT == 0);

ANALYSIS:
        TYPE IS GENERAL;
        ESTIMATOR IS ML;
        ITERATIONS = 1000;
        CONVERGENCE = 0.00005;

OUTPUT:   SAMPSTAT STANDARDIZED;

MODEL:    SSC BY SC01_02 TS01_02 GN01_02 EMTOT_02;
```

Mplus instructions for SC configural testing group 1 (treatment).

```
USEOBS ARE (COMM_CT == 1);

MODEL: SSC BY SC01_02 TS01_02 GN01_02 EMTOT_02;
```

Mplus instructions for SC configural testing all.

```
MODEL:    SCAP02 BY SC01_02 TS01_02 GN01_02 EMTOT_02;
```

Mplus instructions for configural testing SC change group 0 (control).

```
TITLE:  CHANGE TESTING GROUP 0 4-23-10

DATA:
        FILE IS "E:\CHANGE_ALL_4-23-10.dat";
        FORMAT IS 38F8.0;

VARIABLE:
        NAMES = STATE COMM_CT HH_ED_05 HH_ED_02 HH_SC_05 HH_SC_02
        SP_ED_05 SP_ED_02 SP_SC_05 SP_SC_02 CH_SC_05 CH_SC_02 D_CH_SC
        D_HH_ED D_HH_SC D_SP_ED D_SP_SC D_CAC_01 D_CAC_02 D_CAC_03
        D_IC_03 D_IC_04 D_IC_05 D_IC_06 D_IC_07 D_TS_01 D_TS_02 D_TS_03
        D_TS_04 D_TS_05 D_TS_06 D_SC_01 D_SC_02 TDCAC TDIC TDTS TDSC
        D_EM;

USEVARIABLES =
        D_CAC_01 D_CAC_02 D_CAC_03 D_IC_03 D_IC_04 D_IC_05 D_IC_06
        D_IC_07 D_TS_01 D_TS_02 D_TS_03 D_TS_04 D_TS_05 D_TS_06 D_SC_01
        D_SC_02;
MISSING IS .;

USEOBS ARE (COMM_CT == 0);

ANALYSIS:
        TYPE IS GENERAL;
        ESTIMATOR IS ML;
        ITERATIONS = 1000;
        CONVERGENCE = 0.00005;

OUTPUT:   SAMPSTAT STANDARDIZED;

MODEL:      DCAC BY D_CAC_01 D_CAC_02 D_CAC_03;
            DIC BY D_IC_03 D_IC_04 D_IC_05 D_IC_06 D_IC_07;
            DTS BY D_TS_01 D_TS_02 D_TS_03 D_TS_04 D_TS_05 D_TS_06;
            DSC BY D_SC_01 D_SC_02;
```

Mplus instructions for configural testing SC change group 1 (treatment).

```
USEOBS ARE (COMM_CT == 1);

MODEL:    DCAC BY D_CAC_01 D_CAC_02 D_CAC_03;
          DIC BY D_IC_03 D_IC_04 D_IC_05 D_IC_06 D_IC_07;
          DTS BY D_TS_01 D_TS_02 D_TS_03 D_TS_04 D_TS_05 D_TS_06;
          DSC BY D_SC_01 D_SC_02;
```

Mplus instructions for configural testing SC change all.

```
MODEL:    DCAC BY D_CAC_01 D_CAC_02 D_CAC_03;
          DIC BY D_IC_03 D_IC_04 D_IC_05 D_IC_06 D_IC_07;
          DTS BY D_TS_01 D_TS_02 D_TS_03 D_TS_04 D_TS_05 D_TS_06;
          DSC BY D_SC_01 D_SC_02;
```

Mplus Input Research Question 2.

Mplus instructions for SC group-code model.

```
TITLE:  PRE POST Group-Code MODEL Testing 4-25-10

DATA:
FILE IS "E:\CONFIG_ALL_4-22-10.dat";
FORMAT IS 31F8.0;

VARIABLE:
        NAMES = STATE COMM_CT HH_ED_05 HH_ED_02 HH_SC_05 HH_SC_02
        SP_ED_05 SP_ED_02 SP_SC_05 SP_SC_02 CH_SC_05 CH_SC_02 D_CH_SC
        D_HH_ED D_HH_SC D_SP_ED D_SP_SC GN01_05 GN01_02 GNTOT_05
        GNTOT_02 CAC01_05 CAC01_02 ICTOT_05 ICTOT_02 TS01_05 TS01_02
        EMTOT_05 EMTOT_02 SC01_05 SC01_02;

USEVARIABLES =
        COMM_CT GN01_02 EMTOT_02 SC01_02 TS01_02 GN01_05 EMTOT_05
        SC01_05 TS01_05;
MISSING IS .;

ANALYSIS:
        TYPE IS GENERAL;
        ESTIMATOR IS ML;
        ITERATIONS = 1000;
        CONVERGENCE = 0.00005;

OUTPUT:   SAMPSTAT STANDARDIZED;

MODEL:      SCAP02 BY SC01_02 TS01_02 GN01_02 EMTOT_02;
            SCAP05 BY SC01_05 TS01_05 GN01_05 EMTOT_05;
            SCAP05 ON SCAP02;
            GN01_02 PWITH GN01_05;
            EMTOT_02 PWITH EMTOT_05;
            SC01_02 PWITH SC01_05;
            TS01_02 PWITH TS01_05;
            SCAP02 WITH COMM_CT;
            SCAP05 ON COMM_CT;
```

Mplus instructions for SC change group-code model.

```
TITLE:  CHANGE TESTING Group-Code 4-23-10

DATA:
        FILE IS "E:\CHANGE_ALL_4-23-10.dat";
        FORMAT IS 38F8.0;

VARIABLE:
        NAMES = STATE COMM_CT HH_ED_05 HH_ED_02 HH_SC_05 HH_SC_02
        SP_ED_05 SP_ED_02 SP_SC_05 SP_SC_02 CH_SC_05 CH_SC_02 D_CH_SC
        D_HH_ED D_HH_SC D_SP_ED D_SP_SC D_CAC_01 D_CAC_02 D_CAC_03
        D_IC_03 D_IC_04 D_IC_05 D_IC_06 D_IC_07 D_TS_01 D_TS_02 D_TS_03
        D_TS_04 D_TS_05 D_TS_06 D_SC_01 D_SC_02 TDCAC TDIC TDTS TDSC
        D_EM;

USEVARIABLES =
        COMM_CT D_CAC_01 D_CAC_02 D_CAC_03 D_IC_03 D_IC_04 D_IC_05
        D_IC_06 D_IC_07 D_TS_01 D_TS_02 D_TS_03 D_TS_04 D_TS_05 D_TS_06
        D_SC_01 D_SC_02 D_EM;
MISSING IS .;

ANALYSIS:
        TYPE IS GENERAL;
        ESTIMATOR IS ML;
        ITERATIONS = 1000;
        CONVERGENCE = 0.00005;

OUTPUT:   SAMPSTAT STANDARDIZED;

MODEL:      DCAC BY D_CAC_01 D_CAC_02 D_CAC_03;
            DIC BY D_IC_03 D_IC_04 D_IC_05 D_IC_06 D_IC_07;
            DTS BY D_TS_01 D_TS_02 D_TS_03 D_TS_04 D_TS_05 D_TS_06;
            DSC BY D_SC_01 D_SC_02;
            DCAC ON COMM_CT;
            DIC ON COMM_CT;
            DTS ON COMM_CT;
            DSC ON COMM_CT;
            D_EM ON COMM_CT;
```

Mplus Input Research Question 3.

Mplus instructions for full education model.

```
TITLE:  EDUCATION MODEL Testing ALL 4-25-10

DATA:
FILE IS "E:\EDUC_4-23-10.dat";
FORMAT IS 38F8.0;

VARIABLE:
        NAMES = STATE COMM_CT HH_ED_05 HH_ED_02 HH_SC_05 HH_SC_02
        SP_ED_05 SP_ED_02 SP_SC_05 SP_SC_02 CH_SC_05 CH_SC_02 D_CH_SC
        D_HH_ED D_HH_SC D_SP_ED D_SP_SC GN01_05 GN01_02 GNTOT_05
        GNTOT_02 CAC01_05 CAC01_02 ICTOT_05 ICTOT_02 TS01_05 TS01_02
        EMTOT_05 EMTOT_02 SC01_05 SC01_02 TDCAC TDIC TDTS TDSC D_EM
        PARED_05 PARED_02;

USEVARIABLES =
        COMM_CT CH_SC_05 CH_SC_02 GN01_02 EMTOT_02 C01_02 TS01_02
        GN01_05 EMTOT_05 SC01_05 TS01_05 PARED_05 PARED_02;
MISSING IS .;

ANALYSIS:
        TYPE IS GENERAL;
        ESTIMATOR IS ML;
        ITERATIONS = 1000;
        CONVERGENCE = 0.00005;

OUTPUT:     SAMPSTAT STANDARDIZED;

MODEL:      SCAP02 BY SC01_02 TS01_02 GN01_02 EMTOT_02;
            SCAP05 BY SC01_05 TS01_05 GN01_05 EMTOT_05;
            SCAP05 ON SCAP02;
            GN01_02 PWITH GN01_05;
            EMTOT_02 PWITH EMTOT_05;
            SC01_02 PWITH SC01_05;
            TS01_02 PWITH TS01_05;
            SCAP02 WITH COMM_CT;
            SCAP05 ON COMM_CT;
            SCAP02 ON PARED_02;
            SCAP05 ON PARED_05;
            CH_SC_02 ON PARED_02;
            CH_SC_02 ON SCAP02;
```

```
        CH_SC_05 ON PARED_05;
        CH_SC_05 ON SCAP05;
        CH_SC_05 ON CH_SC_02;
        COMM_CT WITH PARED_02;
        PARED_05 ON COMM_CT;
        PARED_05 ON PARED_02;
```

Mplus instructions for education SC change group-code model.

```
TITLE:  EDUCATION 2005 SC CHANGE Group-Code 4-25-10

DATA:
        FILE IS "E:\EDUC_CHANGE_4-25-10.dat";
        FORMAT IS 54F8.0;

VARIABLE:
        NAMES = STATE COMM_CT HH_ED_05 HH_ED_02 HH_SC_05 HH_SC_02
        SP_ED_05 SP_ED_02 SP_SC_05 SP_SC_02 CH_SC_05 CH_SC_02 D_CH_SC
        D_HH_ED D_HH_SC D_SP_ED D_SP_SC GN01_05 GN01_02 GNTOT_05
        GNTOT_02 CAC01_05 CAC01_02 ICTOT_05 ICTOT_02 TS01_05 TS01_02
        EMTOT_05 EMTOT_02 SC01_05 SC01_02 TDCAC TDIC TDTS TDSC D_EM
        PARED_05 PARED_02 D_CAC_01 D_CAC_02 D_CAC_03 D_IC_03 D_IC_04
        D_IC_05 D_IC_06 D_IC_07 D_TS_01 D_TS_02 D_TS_03 D_TS_04 D_TS_05
        D_TS_06 D_SC_01 D_SC_02;

USEVARIABLES =
        COMM_CT D_CAC_01 D_CAC_02 D_CAC_03 D_IC_03 D_IC_04 D_IC_05
        D_IC_06 D_IC_07 D_TS_01 D_TS_02 D_TS_03 D_TS_04 D_TS_05 D_TS_06
        D_SC_01 D_SC_02 D_EM PARED_02 PARED_05;
MISSING IS .;

ANALYSIS:
        TYPE IS GENERAL;
        ESTIMATOR IS ML;
        ITERATIONS = 1000;
        CONVERGENCE = 0.00005;

OUTPUT:   SAMPSTAT STANDARDIZED;

MODEL:      DCAC BY D_CAC_01 D_CAC_02 D_CAC_03;
            DIC BY D_IC_03 D_IC_04 D_IC_05 D_IC_06 D_IC_07;
            DTS BY D_TS_01 D_TS_02 D_TS_03 D_TS_04 D_TS_05 D_TS_06;
            DSC BY D_SC_01 D_SC_02;
```

DIC ON COMM_CT;
DTS ON COMM_CT;
DSC ON COMM_CT;
D_EM ON COMM_CT;
DCAC ON PARED_05;
DIC ON PARED_05;
DTS ON PARED_05;
DSC ON PARED_05;
D_EM ON PARED_05;
PARED_05 ON PARED_02;
COMM_CT WITH PARED_02;
PARED_05 ON COMM_CT;

Appendix H

Results of MPlus Data Analyses

Results Research Question 1.

Table H1

Testing for Configural Invariance General SC 2002

	Group 0	Group 1	All
	Estimates (S.E.)	Estimates (S.E.)	Estimates (S.E.)
SCAP02 BY			
SC01_02	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
TS01_02	0.83* (0.17)	0.57* (0.12)	0.71* (0.10)
GN01_02	0.51* (0.15)	0.37* (0.09)	0.48* (0.08)
EMTOT_02	0.71* (0.16)	0.20* (0.08)	0.37* (0.08)
Variances			
SCAP02	0.11* (0.02)	0.23* (0.05)	0.170* (0.03)
Residual Variances			
SC01_02	0.11* (0.02)	0.01 (0.04)	0.07* (0.02)
TS01_02	0.16* (0.02)	0.14* (0.01)	0.15* (0.014)
GN01_02	0.53* (0.04)	0.41* (0.3)	0.47* (0.02)
EMTOT_02	0.51* (0.03)	0.47* (0.03)	0.51* (0.03)

	Group 0	Group 1	All
	Estimates (S.E.)	Estimates (S.E.)	Estimates (S.E.)
Chi-Square	χ^2 (2) = 0.57	χ^2 (2) = 4.85	χ^2 (2) = 1.67
CFI	1.00	0.99	1.00
TLI	1.04	0.96	1.00
RMSEA	0.00	0.06	0.00
90% CI	[0.00, 0.07]	[0.000, 0.13]	[0.00, 0.06]
P(RMSEA) <= .05	0.90	0.33	0.87
SRMR	0.01	0.03	0.01

Note: Group 0 = control; Group 1 = treatment
*statistically significant, $p < .05$

Table H2

Testing for Configural Invariance General SC 2005

	Group 0	Group 1	All
	Estimates (S.E.)	Estimates (S.E.)	Estimates (S.E.)
SCAP05 BY			
SC01_05	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
TS01_05	0.58* (0.12)	0.26* (0.09)	0.58* (0.10)
GN01_05	0.27* (0.10)	0.26* (0.0)	0.28* (0.07)
EMTOT_05	0.79* (0.18)	0.50* (0.13)	0.47* (0.09)
Variances			
SCAP05	0.17* (0.04)	0.24* (0.07)	0.19* (0.03)
Residual Variances			
SC01_05	0.09* (0.03)	-0.00 (0.06)	0.06 (0.03)
TS01_05	0.17* (0.01)	0.13* (0.01)	0.15* (0.01)
GN01_05	0.40* (0.02)	0.40* (0.02)	0.40* (0.02)
EMTOT_05	0.55* (0.04)	0.53* (0.04)	0.56* (0.02)
Chi-Square	χ^2 (2) = 1.45	χ^2 (2) = 0.73	χ^2 (2) = 0.30
CFI	1.00	1.00	1.00
TLI	1.01	1.02	1.02
RMSEA	0.00	0.00	0.00

	Group 0	Group 1	All
	Estimates (S.E.)	Estimates (S.E.)	Estimates (S.E.)
90% CI	[0.00, 0.09]	[0.00, 0.07]	[0.00, 0.03]
P(RMSEA) <= .05	0.76	0.88	0.98
SRMR	0.02	0.01	0.01

Note: Group 0 = control; Group 1 = treatment
*statistically significant, $p < .05$

Table H3

Testing for Configural Invariance SC Change

	Group 0	Group 1	All
	Estimates (S.E.)	Estimates (S.E.)	Estimates (S.E.)
DCAC BY			
D_CAC_01	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
D_CAC_02	0.71* (0.28)	1.01* (0.32)	0.95* (0.24)
D_CAC_03	0.19 (0.13)	0.38* (0.17)	0.31* (0.12)
DIC BY			
D_IC_03	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
D_IC_04	1.25* (0.08)	1.22* (0.06)	1.23* (0.05)
D_IC_05	1.13* (0.08)	1.16* (0.06)	1.14* (0.05)
D_IC_06	0.27* (0.13)	0.21 (0.13)	0.23* (0.09)
D_IC_07	0.14 (0.15)	0.50* (0.14)	0.31* (0.10)

	Group 0	Group 1	All
	Estimates (S.E.)	Estimates (S.E.)	Estimates (S.E.)
DTS BY			
D_TS_01	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
D_TS_02	0.96* (0.12)	0.99* (0.11)	0.96* (0.08)
D_TS_03	1.42* (0.19)	0.95* (0.11)	1.12* (0.10)
D_TS_04	1.24* (0.16)	0.79* (0.11)	0.95* (0.09)
D_TS_05	0.79* (0.14)	0.30* (0.09)	0.52* (0.08)
D_TS_06	0.66* (0.13)	0.19* (0.08)	0.41* (0.07)
DSC BY			
D_SC_01	1.00 (0.00)	1.000 (0.000)	1.000 (0.000)
D_SC_02	0.47* (0.16)	1.39 (1.02)	0.72* (0.21)
DIC WITH			
DCAC	0.01 (0.01)	0.02* (0.01)	0.02* (0.01)
DTS WITH			
DCAC	0.03* (0.01)	0.00 (0.00)	0.017* (0.00)
DIC	0.01 (0.01)	0.00 (0.01)	0.01 (0.01)
DSC WITH			
DCAC	0.04* (0.02)	0.01 (0.01)	0.03* (0.01)
DIC	0.03* (0.01)	0.01 (0.01)	0.01* (0.00)
DTS	0.03* (0.01)	0.01 (0.01)	0.02* (0.00)

	Group 0	Group 1	All
	Estimates (S.E.)	Estimates (S.E.)	Estimates (S.E.)
Variances			
DCAC	0.11* (0.05)	0.09* (0.03)	0.09* (0.02)
DIC	0.14* (0.01)	0.12* (0.01)	0.13* (0.01)
DTS	0.07* (0.01)	0.10* (0.02)	0.09* (0.01)
DSC	0.04 (0.02)	0.00 (0.00)	0.02 (0.01)
Residual Variances			
D_CAC_01	0.27* (0.05)	0.23* (0.03)	0.26* (0.03)
D_CAC_02	0.36* (0.03)	0.38* (0.04)	0.37* (0.02)
D_CAC_03	0.26* (0.02)	0.39* (0.02)	0.33* (0.01)
D_IC_03	0.13* (0.01)	0.07* (0.00)	0.10* (0.00)
D_IC_04	0.07* (0.01)	0.03* (0.00)	0.06* (0.00)
D_IC_05	0.11* (0.01)	0.05* (0.00)	0.08* (0.00)
D_IC_06	0.83* (0.06)	0.85* (0.05)	0.84* (0.04)
D_IC_07	1.17* (0.08)	0.95* (0.07)	1.06* (0.05)
D_TS_01	0.16* (0.01)	0.12* (0.01)	0.14* (0.01)
D_TS_02	0.14* (0.01)	0.11* (0.01)	0.13* (0.009)
D_TS_03	0.32* (0.02)	0.25* (0.02)	0.29* (0.02)
D_TS_04	0.24* (0.02)	0.23* (0.01)	0.24* (0.01)
D_TS_05	0.31* (0.02)	0.27* (0.02)	0.29* (0.02)

	Group 0	Group 1	All
	Estimates (S.E.)	Estimates (S.E.)	Estimates (S.E.)
D_TS_06	0.25* (0.01)	0.22* (0.02)	0.23* (0.01)
D_SC_01	0.38* (0.03)	0.37* (0.02)	0.38* (0.02)
D_SC_02	0.10* (0.00)	0.07* (0.01)	0.08* (0.00)
Chi-Square	χ^2 (98) = 228.81*	χ^2 (98) = 329.058*	χ^2 (98) = 425.500*
CFI	0.86	0.82	0.85
TLI	0.83	0.79	0.81
RMSEA	0.05	0.07	0.06
90% CI	[0.04, 0.07]	[0.07, 0.08]	[0.05, 0.06]
P(RMSEA) <= .05	0.15	0.00	0.00
SRMR	0.06	0.07	0.05

Note: Group 0 = control; Group 1 = treatment
*statistically significant, $p < .05$

Results Research Question 2.

Table H4

MPlus Results General SC Group-Code Model

	Estimates (S.E.)
SCAP02 BY	
SC01_02	1.00 (0.00)
TS01_02	0.85* (0.07)
GN01_02	0.45* (0.07)
EMTOT_02	0.80* (0.07)
SCAP05 BY	
SC01_05	1.00 (0.00)
TS01_05	0.77* (0.07)
GN01_05	0.28* (0.06)
EMTOT_05	0.82* (0.08)
SCAP05 ON	
SCAP02	0.82* (0.04)
SCAP05 ON	
COMM_CT	-0.01 (0.02)
SCAP02 WITH	
COMM_CT	0.03* (0.00)
GN01_02 WITH	

	Estimates (S.E.)
GN01_05	0.33* (0.02)
EMTOT_02 WITH	
EMTOT_05	0.43* (0.03)
SC01_02 WITH	
SC01_05	0.08* (0.01)
TS01_02 WITH	
TS01_05	0.11* (0.01)
Variances	
COMM_CT	0.25* (0.01)
SCAP02	0.13* (0.02)
Residual Variances	
GN01_02	0.48* (0.02)
EMTOT_02	0.50* (0.02)
SC01_02	0.11* (0.01)
TS01_02	0.13* (0.01)
GN01_05	0.41* (0.02)
EMTOT_05	0.55* (0.03)
SC01_05	0.10* (0.01)
TS01_05	0.05* (0.00)
Chi-Square	χ^2 (21) = 152.87; p = .00

	Estimates (S.E.)
CFI	0.96
TLI	0.94
RMSEA	0.09
90% CI	[0.07, 0.09]
P(RMSEA) <= .05	0.00
SRMR	0.07

*statistically significant, p < .05

Table H5

MPlus Results for SC Change Group-Code Model

	Estimates (S.E.)
DCAC BY	
D_CAC_01	1.00 (0.00)
D_CAC_02	0.94* (0.22)
D_CAC_03	0.33* (0.11)
DIC BY	
D_IC_03	1.00 (0.00)
D_IC_04	1.23* (0.05)
D_IC_05	1.15* (0.05)
D_IC_06	0.22* (0.09)

	Estimates (S.E.)
D_IC_07	0.30* (0.10)
DTS BY	
D_TS_01	1.00 (0.00)
D_TS_02	0.96* (0.08)
D_TS_03	1.13* (0.10)
D_TS_04	0.96* (0.09)
D_TS_05	0.52* (0.08)
D_TS_06	0.41* (0.07)
DSC BY	
D_SC_01	1.00 (0.00)
D_SC_02	2.41* (1.02)
DCAC ON	
COMM_CT	-0.00 (0.03)
DTS ON	
COMM_CT	0.01 (0.03)
DIC ON	
COMM_CT	0.07* (0.02)
DSC ON	
COMM_CT	-0.01 (0.01)
D_EM ON	

	Estimates (S.E.)
COMM_CT	-0.07 (0.03)
DIC WITH	
DCAC	0.02* (0.01)
DTS WITH	
DCAC	0.02* (0.00)
DIC	0.01 (0.01)
DSC WITH	
DCAC	0.01* (0.01)
DIC	0.00 (0.00)
DTS	0.01 (0.00)
D_EM WITH	
DCAC	0.03* (0.01)
DIC	0.02* (0.01)
DTS	0.02* (0.00)
DSC	0.02* (0.01)
Residual Variances	
D_CAC_01	0.26* (0.03)
D_CAC_02	0.37* (0.03)
D_CAC_03	0.32* (0.01)
D_IC_03	0.10* (0.00)

	Estimates (S.E.)
D_IC_04	0.06* (0.00)
D_IC_05	0.08* (0.00)
D_IC_06	0.84* (0.04)
D_IC_07	1.06* (0.05)
D_TS_01	0.14* (0.01)
D_TS_02	0.13* (0.01)
D_TS_03	0.292 (0.02)
D_TS_04	0.25* (0.01)
D_TS_05	0.29* (0.02)
D_TS_06	0.23* (0.01)
D_SC_01	0.39* (0.02)
D_SC_02	0.07* (0.01)
D_EM	0.25* (0.01)
DCAC	0.09* (0.03)
DIC	0.13* (0.01)
DTS	0.09* (0.01)
DSC	0.01* (0.00)
Chi-Square	χ^2 (122) = 473.52; p = .00
CFI	0.85
TLI	0.81

	Estimates (S.E.)
RMSEA	0.05
90% CI	[0.05, 0.06]
P(RMSEA) <= .05	0.01
SRMR	0.05

*statistically significant, $p < .05$

Results Research Question 3.

Table H6

MPlus Results General SC Education and Group-Code Model

	Estimates (S.E.)
SCAP02 BY	
SC01_02	1.00 (0.00)
TS01_02	0.86* (0.07)
GN01_02	0.46* (0.07)
EMTOT_02	0.83* (0.07)
SCAP05 BY	
SC01_05	1.00 (0.00)
TS01_05	0.78* (0.07)
GN01_05	0.29* (0.06)
EMTOT_05	0.85* (0.08)

	Estimates (S.E.)
SCAP05 ON	
SCAP02	0.81* (0.04)
SCAP05 ON	
COMM_CT	-0.02* (0.02)
PARED_05	0.01* (0.00)
SCAP02 ON	
PARED_02	0.03* (0.00)
CH_SC_02 ON	
SCAP02	0.14 (0.14)
CH_SC_05 ON	
SCAP05	0.07 (0.08)
CH_SC_02 ON	
PARED_02	0.00 (0.02)
CH_SC_05 ON	
PARED_05	0.01 (0.01)
CH_SC_02	0.77* (0.02)
PARED_05 ON	
COMM_CT	-0.02 (0.02)
PARED_02	1.00* (0.01)
SCAP02 WITH	

	Estimates (S.E.)
COMM_CT	0.03* (0.01)
COMM_CT WITH	
PARED_02	0.10* (0.03)
GN01_02 WITH	
GN01_05	0.32* (0.02)
EMTOT_02 WITH	
EMTOT_05	0.43* (0.03)
SC01_02 WITH	
SC01_05	0.09* (0.01)
TS01_02 WITH	
TS01_05	0.11* (0.01)
Variances	
COMM_CT	0.25* (0.01)
PARED_02	3.32* (0.16)
Residual Variances	
CH_SC_05	0.52* (0.03)
CH_SC_02	1.42* (0.07)
GN01_02	0.47* (0.02)
EMTOT_02	0.49* (0.02)
SC01_02	0.12* (0.01)

	Estimates (S.E.)
TS01_02	0.13* (0.01)
GN01_05	0.41* (0.02)
EMTOT_05	0.55* (0.03)
SC01_05	0.12* (0.01)
TS01_05	0.13* (0.01)
PARED_05	0.14* (0.01)
SCAP02	0.12* (0.01)
SCAP05	0.04* (0.01)
Chi-Square	χ^2 (53) = 212. 49; p = .00
CFI	0.98
TLI	0.97
RMSEA	0.06
90% CI	[0.05, 0.06]
P(RMSEA) <= .05	0.03
SRMR	0.06

*statistically significant, p < .05

Table H7

MPlus Results SC Change Education and Group-Code Model

	Estimates (S.E.)
DCAC BY	
D_CAC_01	1.00 (0.00)
D_CAC_02	0.97* (0.23)
D_CAC_03	0.32* (0.11)
DIC BY	
D_IC_03	1.00 (0.00)
D_IC_04	1.23* (0.05)
D_IC_05	1.14* (0.05)
D_IC_06	0.23* (0.09)
D_IC_07	0.31* (0.10)
DTS BY	
D_TS_01	1.00 (0.00)
D_TS_02	0.95* (0.08)
D_TS_03	1.12* (0.10)
D_TS_04	0.96* (0.09)
D_TS_05	0.52* (0.08)
D_TS_06	0.41* (0.07)
DSC BY	

	Estimates (S.E.)
D_SC_01	1.00 (0.00)
D_SC_02	2.37* (0.10)
DCAC ON	
COMM_CT	-0.00 (0.03)
PARED_05	0.02 (0.01)
DTS ON	
COMM_CT	0.01 (0.03)
PARED_05	-0.02* (0.01)
DIC ON	
COMM_CT	0.07* (0.02)
PARED_05	0.01 (0.01)
DSC ON	
COMM_CT	-0.01 (0.01)
PARED_05	0.00 (0.00)
D_EM ON	
COMM_CT	-0.08* (0.03)
PARED_05	0.02* (0.01)
PARED_05 ON	
PARED_02	1.00* (0.01)
COMM_CT	-0.02 (0.02)

	Estimates (S.E.)
COMM_CT WITH	
PARED_02	0.10* (0.03)
DIC WITH	
DCAC	0.01* (0.01)
DTS WITH	
DCAC	0.01* (0.00)
DIC	0.01 (0.01)
DSC WITH	
DCAC	0.01* (0.01)
DIC	0.00 (0.00)
DTS	0.00 (0.00)
D_EM WITH	
DCAC	0.03* (0.01)
DIC	0.02* (0.01)
DTS	0.02* (0.00)
DSC	0.02* (0.01)
Residual Variances	
D_CAC_01	0.26* (0.03)
D_CAC_02	0.36* (0.03)
D_CAC_03	0.33* (0.01)

	Estimates (S.E.)
D_IC_03	0.10* (0.00)
D_IC_04	0.06* (0.00)
D_IC_05	0.08* (0.00)
D_IC_06	0.84* (0.04)
D_IC_07	1.06* (0.05)
D_TS_01	0.14* (0.01)
D_TS_02	0.13* (0.01)
D_TS_03	0.29* (0.02)
D_TS_04	0.24* (0.01)
D_TS_05	0.29* (0.02)
D_TS_06	0.23* (0.01)
D_SC_01	0.39* (0.02)
D_SC_02	0.06* (0.01)
D_EM	0.24* (0.01)
PARED_05	0.14* (0.01)
DCAC	0.08* (0.02)
DIC	0.13* (0.01)
DTS	0.09* (0.01)
DSC	0.01 (0.00)

	Estimates (S.E.)
Chi-Square	χ^2 (152) = 515.77; p = .00
CFI	0.93
TLI	0.91
RMSEA	0.05
90% CI	[0.04, 0.05]
P(RMSEA) <= .05	0.18
SRMR	0.05

*statistically significant, p < .05

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Curriculum Vitae

Jill D. Lammert has a M.A. in Education and Human Development and a B.A. in Psychology from The George Washington University. As a Ph.D. student at George Mason University, Ms. Lammert majored in educational research methods. She has knowledge of advanced qualitative and quantitative research methods, mixed-method research design, program evaluation, and structural equation modeling.

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