

**Evaluation of the Formal
Technical Education Sub-Activity
of the Human Development
Project, El Salvador**

Design Report

May 14, 2014

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ACRONYMS

CCT	Conditional cash transfer
CIDE	Consortium for International Development in Education
DIGESTYC	Dirección General de Estadística y Censos, Ministerio de Economía, El Salvador
ERR	Economic rate of return
ESE	Encuesta de Seguimiento de Estudiantes
FEPADE	Fundación Empresarial para el Desarrollo Educativo
FOMILENIO	Millennium Challenge Fund of El Salvador
ITCHA	Instituto Tecnológico de Chalatenango
MCC	Millennium Challenge Corporation
M&E	Monitoring and evaluation
MEGATEC	Modulo Educativo Gradual de Aprendizaje Técnico y Tecnológico
MINED	Salvadoran Ministry of Education
PAES	Prueba de Aprendizaje y Aptitudes para Egresados de Educación Media
PILAS	Programa de Inserción Laboral Sostenible
WIRB	Western Institutional Review Board

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I. INTRODUCTION

In this report, we summarize our approach to evaluating three interventions under the Formal Technical Education Sub-Activity of the first MCC-El Salvador compact. These interventions are (1) a secondary school strengthening intervention; (2) a secondary school scholarship program; and (3) an intervention to strengthen a technical post-secondary school, the Chalatenango Technical Institute (known as ITCHA for its initials in Spanish).¹ This report has two main goals: First, to consolidate the designs for all evaluations that Mathematica is conducting for the Formal Technical Education Sub-Activity, which had been revised and approved by MCC in separate documents; second, to present new MCC-requested qualitative evaluation components for secondary and post-secondary education investments from the first compact.

In 2007, Mathematica staff began planning and implementing evaluations of Formal Technical Education Sub-Activity investments. These evaluations employ a quasi-experimental design to determine the impact of the secondary school strengthening program, an experimental design to estimate the impact of the secondary school scholarship program, and a mixed-methods approach to documenting and assessing the ITCHA intervention. As of late 2013, Mathematica staff had completed all baseline and interim data collection and analysis for the scholarship, secondary school strengthening, and ITCHA evaluations. In addition, data collectors completed final follow-up surveys for the scholarship and secondary school components in October 2013, and a follow-up survey of ITCHA students in November 2013. Table I.1 summarizes evaluation activities completed by December 2013 and those scheduled for 2014 and 2015 for each intervention.

In late 2014, Mathematica will complete the final analysis for the secondary school and scholarship impact evaluations (second and third rows in Table I.1). At MCC's request, we have added research questions that require qualitative data collection and analysis for the secondary school and scholarships evaluations. In late 2014 and early 2015, we plan to conduct interviews, focus groups, and stakeholder workshops to (1) document and analyze program implementation; (2) provide context for impact evaluation findings, and (3) assess the potential sustainability of secondary school improvements and scholarship programs in future years (Table I.1, row four). We anticipate submitting a final report for the secondary school and scholarship impact evaluations to MCC in early 2015.

Data collection and analysis for the ITCHA/MEGATEC performance evaluation (last row in Table I.1) is still pending. Following MCC's request to expand the evaluation to analyze outcomes of 2013 ITCHA graduates, we will supervise an additional follow-up survey in late 2014. We anticipate analyzing these data and submitting a final ITCHA report to MCC in mid 2015.

¹ The Technical Assistance Sub-Activity of the Formal Technical Education Sub-Activity was not evaluated, and hence is not covered in this document. In addition, Mathematica's evaluation design for the Non-Formal Skills Development Sub-Activity is discussed in a separate document. The Non-Formal Skills Development Sub-Activity served as a complementary investment to the Formal Technical Education Sub-Activity discussed in this design report.

Table I.1. Status of Evaluation Components

Evaluation Component	Completed (2007–2013)	Scheduled (2014–2015)
Evaluation of the Secondary Level Interventions (scholarships and secondary school strengthening)		
Impact evaluation: scholarships	Baseline and interim analysis; follow-up surveys	Final analysis in 2014
Impact evaluation: secondary school strengthening	Baseline and interim analysis; follow-up surveys	Final analysis in 2014
Qualitative component: scholarships and secondary school strengthening	Preliminary design discussed with MCC	Qualitative data collection and analysis in 2014 and 2015 (NEW)
Evaluation of the Post-secondary Level Intervention		
ITCHA/MEGATEC performance evaluation	Interim qualitative data collection and analysis	Qualitative data collection in 2014 and early 2015; analysis in 2014 and 2015 (MODIFIED)

We have organized the rest of this report into six additional chapters, as follows: In Chapter II, we provide an overview of the MCC-El Salvador compact and the Formal Technical Education Sub-Activity, including a discussion of the program logic and design, evidence base, and implementation of the sub-activity. In Chapter III, we present the overarching evaluation design for the secondary school and scholarship evaluations and the full set of research questions, including original impact-oriented questions and new questions regarding implementation, participants, and program sustainability. In this chapter, we also discuss the evaluation design for the newly added qualitative component on program implementation, participants, and sustainability. Chapters IV and V provide in-depth summaries of the impact evaluation designs for these two interventions. These two chapters are based on the original evaluation designs, but they have been updated to reflect recent modifications. In Chapter VI, we present the evaluation design for the ITCHA strengthening intervention. This chapter is based on the original evaluation design presented in 2011, but it has been modified to incorporate additional research questions requested by MCC. We conclude this report with a discussion of the additional administrative topics related to the evaluations (Chapter VII).

II. OVERVIEW OF THE FORMAL TECHNICAL EDUCATION SUB-ACTIVITY

Signed in late 2006, the MCC-El Salvador compact provided total funding of approximately \$461 million to implement three large-scale projects in El Salvador's Northern Zone (2007–2012): the Connectivity Project, the Human Development Project, and the Productive Development Project. With more than \$185 million in funding, the Connectivity Project financed the design and construction of the country's Northern Transnational Highway. The Productive Development Project provided \$78.5 million in funding for technical and material assistance to poor farmers and producer-owned enterprises, particularly in the horticulture, dairy, and handicraft sectors. With a total of \$103 million in funding, the Human Development Project was designed to increase Salvadorans' human capital through large-scale investments in formal education, as well as vocational technical training programs, through the Education and Training Activity. The project also featured other activities that provided substantial investments in water supply and sanitation facilities and services, universal coverage of on- and off-grid electricity, and community infrastructure to ensure local connectivity for poor communities in the Northern Zone. The overarching goal of all three projects was to reduce poverty, increase electricity coverage, and reduce travel time in the country's Northern Zone.²

1. Background on the Formal Technical Education Sub-Activity

With a budget of nearly \$20 million, the Formal Technical Education Sub-Activity comprised a substantial component of the Education and Training Activity of the Human Development Project. The goal of this sub-activity was to strengthen technical and vocational educational institutions in the Northern Zone “so that more youth can gain marketable skills and thereby increase their opportunities for employment and income generation.”³ According to the program design, strengthening efforts would take the form of large-scale infrastructure investments in classrooms, laboratories, and bathrooms, new technical degree and certificate program⁴ offerings, as well as teacher training in pedagogy, and student assessment. By improving schools-and offering scholarships, the sub-activity financed efforts to increase youths' access to high-quality technical education in the region, thus increasing their achievement levels, secondary (and post-secondary) school graduation rates, and prospects for gainful employment.⁵

By 2012, the Formal Technical Education Sub-Activity was scheduled to invest \$3.8 million in scholarships for students enrolled in secondary and post-secondary technical schools in the Northern Zone. According to preliminary budgets, the sub-activity would also provide \$9 million

²El Salvador Compact, Projected Long Term Results, <http://www.mcc.gov/pages/countries/evaluation/el-salvador-compact>.

³Schedule 1-3 to Annex I, Human Development Project, Compact between MCC and the Government of El Salvador.

⁴Certificate programs are short-term technical programs in agroforestry, milk production, solid and organic waste management, and other skills that would be introduced in provide students with training that could directly meet the labor demand in their region. These programs would complement students' standard general or technical degree curricula.

⁵Two other sub-activities are part of the Education and Training Activity, 1) the Non-Formal Skills Development intervention whose evaluation is not covered in this report, but has been discussed in a separate memo submitted to MCC in January of 2012, and 2) the Technical Assistance Sub-Activity that is not being evaluated.

to improve 20 technical secondary schools in the Northern Zone with infrastructure investments and additional teacher training programs. In addition, the sub-activity was scheduled to invest \$7 million to strengthen ITCHA, an existing post-secondary institute in the Northern Zone.

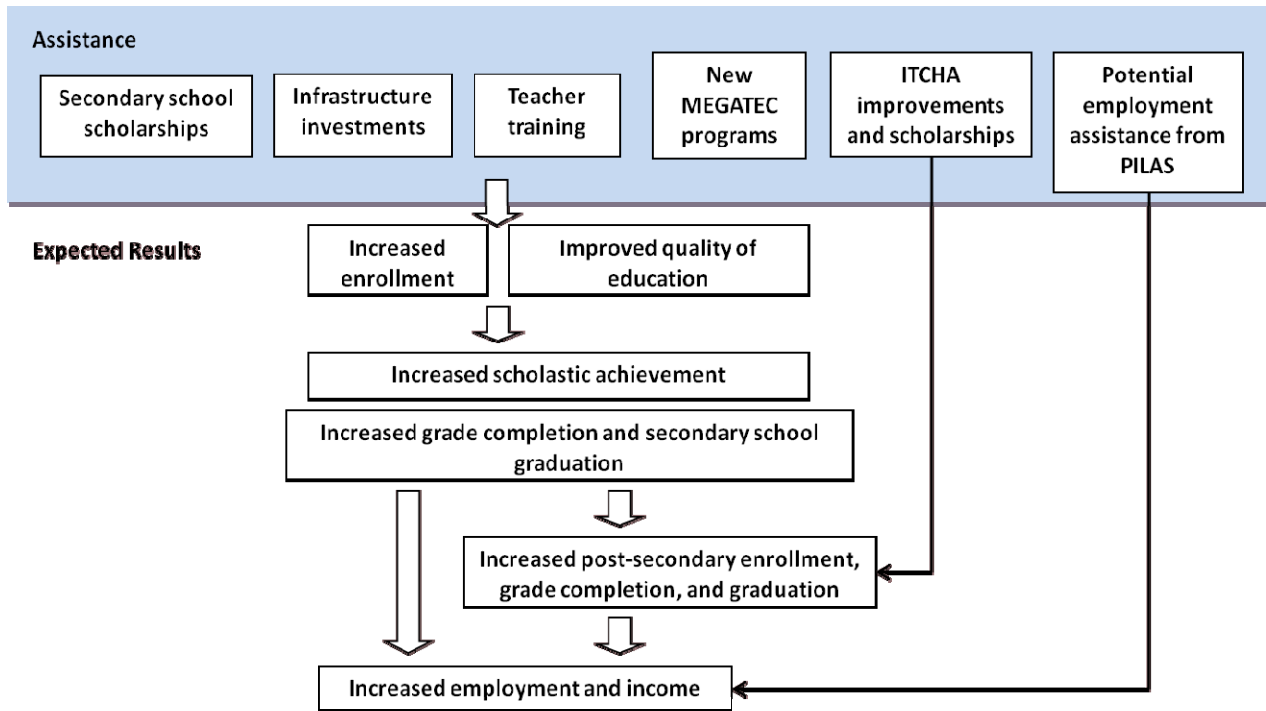
As part of the ITCHA intervention, MCC supported the Salvadoran Ministry of Education (MINED)'s development of two new technical degree programs and four feeder secondary schools under the Gradual Educational Model of Technical and Technological Learning⁶ (known as MEGATEC, for its initials in Spanish). The MEGATEC approach follows the principles of competency-based education, in which students learn the skills required of technical professions through firsthand experience. MEGATEC degree programs feature didactic modules—one module per competency—in which students learn relevant theory and get hands-on practice to build their understanding and key skill sets. Due to the importance of experiential learning in the MEGATEC model, all post-secondary MEGATEC students perform relevant internships in their field. Students who complete technical programs at feeder secondary schools are eligible to skip the first year of post-secondary study at ITCHA and receive a superior technical degree in one year (rather than the traditional two years). In addition, the Formal Technical Education Sub-Activity financed a labor insertion program known as PILAS (Programa de Inserción Laboral Sostenible) to help recent technical school graduates find salaried employment or start their own businesses.⁷

Program logic. Figure II.1 summarizes how the ITCHA sub-activity's range of investments—scholarships, school improvements, teacher training sessions, new technical programs, improvements at ITCHA, and PILAS—were intended to generate improved employment outcomes among secondary and post-secondary school students. Secondary school scholarships, infrastructure improvements, and new technical degrees were designed to motivate students to enroll in secondary, particular technical, school programs. In addition, teacher training sessions would improve the quality of technical and general education in secondary schools, as well as students' achievement levels. The program hypothesizes that increased enrollment and better instruction would generate a higher number of secondary school graduates, as well as increased employment and income among graduates. In addition, the post-secondary scholarships and ITCHA improvements would increase enrollment and completion of post-secondary technical education. Finally, potential employment assistance from PILAS would support recent secondary school and post-secondary school graduates in finding salaried employment or starting their own business.

⁶In Spanish, the full name of the MEGATEC program is Modulo Educativo Gradual de Aprendizaje Técnico y Tecnológico.

⁷PILAS assistance to beneficiaries with potential to establish their own business included help with business plans and technical training in business administration and accounting. In contrast, PILAS assistance to beneficiaries with potential for formal employment included job placement services, interview preparation assistance, and job fairs.

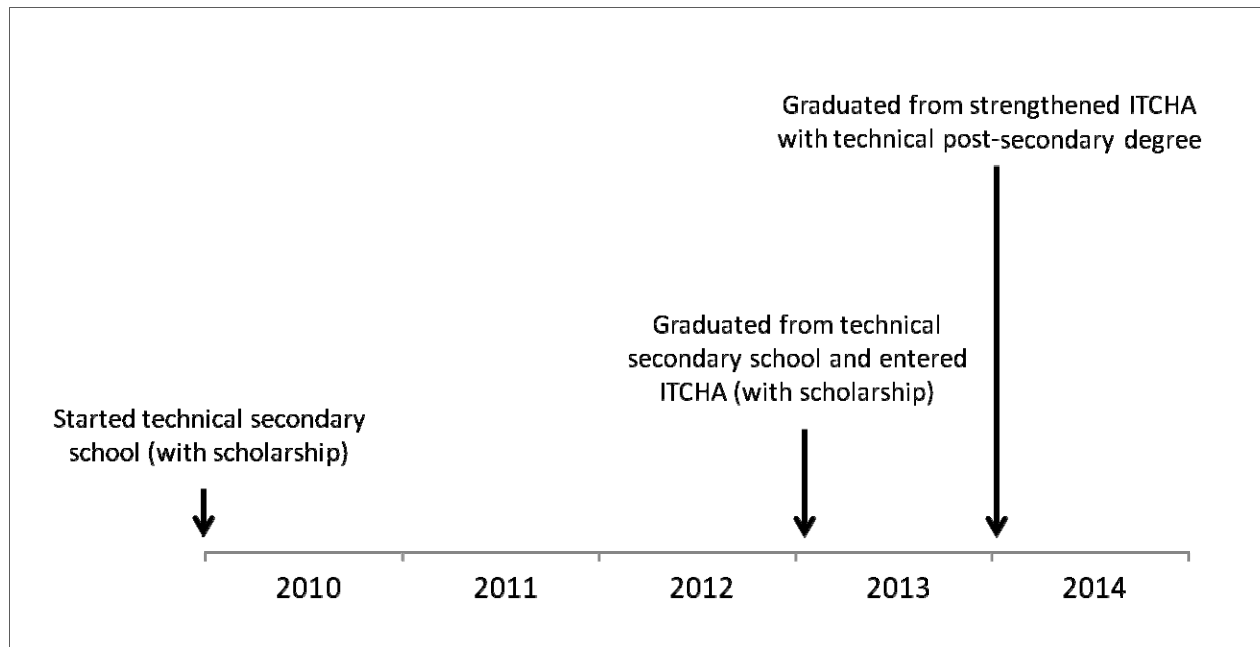
Figure II.1. Logic Model of Interventions Under the Formal Technical Education Sub-Activity



Source: CIDE and FOMILENIO operations manuals.

The sub-activity’s investments were strongly linked in their areas of influence, target populations, and objectives. In particular, the scholarship and secondary schools strengthening interventions had strong linkages, as scholarships would be offered only to students in the 20 secondary schools that were strengthened. For this reason, stakeholders considered the scholarship program to be one component of the secondary school strengthening activity. Strengthened secondary schools also served as a complement to the ITCHA intervention, as these improved schools would supply ITCHA (and other existing or new post-secondary schools in and near the Northern Zone) with students who were better prepared for post-secondary technical education.

The sub-activity’s secondary school improvements and scholarships began general implementation in 2010 and occurred concurrently with post-secondary investments at ITCHA. Based on this schedule, the first cohort of students who could benefit from the full set of sub-activity investments—including strengthened secondary schools and ITCHA facilities, new MEGATEC degree programs at the secondary and post-secondary level, and secondary and post-secondary scholarships—is the cohort who entered secondary school in early 2010 and completed a superior degree at ITCHA in late 2013, more than one year after the conclusion of the compact period in 2012 (see Figure II.2).

Figure II.2. Progression of First Cohort of Participants, Formal Technical Education Sub-Activity

Program Targets and Objectives. Table II.1 provides an overview of planned activities, implementation targets, and final objectives for the secondary school, scholarship, and ITCHA interventions. As illustrated, implementation targets focused on the number of scholarships administered, teachers trained, and students enrolled in post-secondary school. Notably, increased graduation rates, employment rates, and income levels were the primary objectives of the sub-activity's investments. The FOMILENIO monitoring and evaluation plan (2012) cited goals of a 71 percent secondary school graduation rate, a 66 percent employment rate among these graduates, and a 42 percent increase in these graduates' income as a result of secondary strengthening activities and scholarships (compared to the income of 9th grade graduates). Similarly, the compact articulated goals of a 70 percent employment rate of ITCHA graduates, as well as a 42 percent increase in ITCHA graduates' income (compared to incomes of secondary school graduates).

Program implementers. MINED was designated as the principal implementing entity for the Formal Technical Education Sub-Activity. In addition, the Millennium Challenge Fund of El Salvador (known as FOMILENIO in Spanish) was established as the entity responsible for the oversight and management of the sub-activity (as well as all other activities and sub-activities outlined in the compact). The Consortium for International Development in Education (known as CIDE for its initials in French) was the primary entity contracted to provide technical support for the sub-activity, including designing FOMILENIO's scholarship program, developing architectural plans for school improvements, designing new curricula for ITCHA and secondary school programs, and training all teachers at the ITCHA and the 20 secondary schools receiving assistance.

Table II.1. Planned Activities, Targets, and Objectives of the Formal Technical Education Sub-Activity

Component	Activities	Implementation Targets	Final Objectives
Scholarships and Middle School Strengthening	<ul style="list-style-type: none"> • New infrastructure—including classrooms, labs, and bathrooms • New technical degree and certification programs • Teacher training • Annual scholarships of \$400 for secondary education 	<ul style="list-style-type: none"> • 3,600 secondary and post-secondary scholarships administered (compact) • 500 teachers, staff, and parents trained (compact) • 9,000 students enrolled in secondary schools (compact) 	<ul style="list-style-type: none"> • 71 percent secondary school graduation rate • 66 percent employment rate among these graduates • 42 percent increase in these graduates' income
ITCHA	<ul style="list-style-type: none"> • Construction of a new post-secondary school, including classrooms, labs, cafeteria, and auditorium • New technical degree programs/materials • Annual scholarships of \$1,500 for ITCHA 	<ul style="list-style-type: none"> • 1,100 ITCHA students enrolled in 2012 (compact) • 540 ITCHA students enrolled in 2012 (M&E plan) 	<ul style="list-style-type: none"> • 70 percent employment among graduates • 42 percent increase in income

Economic rates of return. During the compact development phase, MCC and FOMILENIO staff verified that secondary school improvements, scholarships, and ITCHA improvements were strong investments, as defined by an economic rate of return (ERR) analysis. In this analysis, all these activities registered positive projected ERRs, meaning that the long-term benefits of secondary school improvements, scholarships, and ITCHA improvements outweighed their total costs.

FOMILENIO and MCC developed separate ERRs for secondary and post-secondary level interventions. For the secondary school and scholarship interventions, the primary benefits of investments were envisioned as additional secondary school enrollees and graduates, largely due to increased school capacity. These graduates would make higher wages during their professional careers as a result of completing secondary school (as compared to completing 9th grade), thus generating an ERR of 11.5 percent over a 40-year time horizon. This ERR was near MCC's minimal ERR threshold of 12 percent, which at the time of compact signing was used to determine whether investments had a sufficient level of cost-effectiveness to secure approval (currently MCC uses a minimum of 10 percent). Similarly, the ITCHA strengthening intervention's main benefits were the increased income that ITCHA graduates would generate

over the long term as a result of obtaining post-secondary technical degrees (as compared to secondary degrees).⁸

It should be noted that the ERRs for secondary and post-secondary school improvements and scholarships not explicitly account for benefits derived from a higher quality of education provided at the secondary and post-secondary school level—particularly among individuals who would have attended secondary and post-secondary school in the absence of the intervention. This diverged from the sub-activity’s original logic model, which envisioned an increased number of graduates, as well as an enhanced quality of technical education in the region as a result of the sub-activity. According to the original logic model, better technical secondary and post-secondary education programs, in combination with additional secondary and post-secondary school graduates, would combine to improve students’ education and labor market outcomes.

Evaluations of the Technical Education Sub-Activity. In 2007, MCC contracted Mathematica Policy Research to design and conduct the impact evaluation of the Formal Technical Education Sub-Activity, including the technical secondary school strengthening activity, the scholarship program, and the ITCHA strengthening activity. In part, these evaluations serve to determine whether key monitoring and evaluation (M&E) objectives were met, particularly goals regarding the ultimate impact of the sub-activity on participants’ household income. Beginning in 2007, Mathematica staff began coordinating with MCC, FOMILENIO, CIDE, and MINED representatives to design these evaluations. Mathematica staff initiated the secondary schools evaluation in 2008, the scholarship evaluation in 2009, and the ITCHA evaluation in 2011 (timelines are provided in following chapters). Beginning in 2013, in response to additional research questions requested by MCC, Mathematica designed qualitative evaluation components to document program implementation and explore associations between program implementation and estimated impacts. In 2014, Mathematica also finalized plans for an additional survey of ITCHA students, scheduled to occur in late 2014. This design report includes all plans to evaluation the sub-activity as of mid-2014.

2. Evidence Base for Sub-Activity Investments

The goal of the Formal Technical Education Sub-Activity was to increase income and employment of at-risk youth in El Salvador’s Northern Zone through the improvement of technical education services. The three main interventions implemented under this Sub-Activity were (1) scholarships for technical secondary and post-secondary education, (2) strengthening of 20 technical secondary schools through infrastructure improvements and teacher training, and (3) strengthening of a post-secondary technical institution. Here, we present a brief literature review on the evidence base for similar interventions focusing on research conducted in Latin America.

- **Scholarships.** Although some rigorous evaluations of scholarships have shown success in improving school enrollment (Duflo et al. 2013; Angrist et al. 2006),

⁸A more detailed discussion of ERRs for the Formal Technical Education Sub-Activity is found on MCC’s website at www.mcc.gov/documents/err/mcc-err-elsalvador-formalteched.xlsx.

rigorous research has not been conducted in countries with contexts similar to El Salvador. However, a growing body of research from Latin American countries shows that conditional cash transfer (CCT) programs are effective in improving school enrollment and attendance (Fiszbein and Schady 2009). CCT programs provide cash transfers to families who comply with a specific condition, such as attending appointments or enrolling in school. Therefore, many scholarship programs are a type of CCT program, because cash is given to the student on the condition of school enrollment, a minimum monthly attendance, or a minimum academic achievement. Increasing enrollment and attendance, however, have not translated to improved learning or achievement (Behrman et al 2005 and Fiszbein and Schady 2009), probably due to deficiencies within schools.

- **School infrastructure and teacher training.** A couple of studies have found that access to better school infrastructure is related to higher academic achievement (Duarte et al. 2011; Patrinos et al. 2005). However, the studies that have attempted to find causal relations between school improvements and educational outcomes have, in general, studied infrastructure improvements combined with other components (such as teacher training or free uniforms). For example, a study in Mexico found that infrastructure improvements, coupled with textbooks and teacher training, improved academic performance (Lopez-Acevedo 1999). In this study and others like it, it is not possible to determine the effect of each intervention component.

Although teacher training programs have been implemented all over the world as a way to improve educational achievement, few have been rigorously evaluated, and most evaluations have been conducted in rich countries (Bressoux 2006; Jacob et al. 2004; Angrist and Lavy 2001). Furthermore, the results are mixed, and the content and context of the training programs vary greatly. As such, it is not possible to make general conclusions regarding the effectiveness of teacher training programs.

- **Technical education.** Limited literature exists on the effectiveness of technical competency-based education similar to the MEGATEC competency-based model implemented in El Salvador. We found one relevant study of technical formal education at the upper secondary levels using a competency-based approach in Mexico (Lopez-Acevedo 2001). The study found that upper secondary technical education had a positive impact on income and employment in students' field of specialization, but no impact on the amount of time required to find employment. A subsequent design change to the technical education program that included a competency-based approach decreased the amount of time needed to find employment, on average. However, because other factors changed as a result of the design change, this study cannot isolate the effect of competency-based education on students' employment and income.

3. Sub-Activity Implementation

Strengthening technical secondary schools. In El Salvador, secondary schools offer general degrees that require two years of study (grades 10 and 11) and technical degrees that require three years of study (grades 10, 11, and 12). Some secondary schools offer either general

or technical degrees, and some offer both types of degrees. In this report, the term *technical secondary schools* refers to schools that offer at least one technical degree.⁹ When students enroll in secondary schools, they decide in which type of degree they want to enroll: either general or technical (but not both). The secondary school strengthening intervention was designed to benefit students enrolled in both the general and technical degrees offered by the secondary schools, but with an emphasis on investments in technical education. This reflected the primary objective of the sub-activity to strengthen technical education in the Northern Zone.

CIDE, as the technical support contractor, was responsible for the initial design of the secondary school strengthening intervention. MINED identified 75 secondary schools in the Northern Zone that were eligible to receive the intervention's investments in infrastructure and teacher training. CIDE developed criteria under which schools were selected to receive the intervention; some of the criteria were degree of need, potential for successful implementation, and the importance of geographic dispersion of schools across the Northern Zone. In 2008, the stakeholders selected the 20 secondary schools in the Northern Zone (most of them technical schools) that were to be strengthened by FOMILENIO (see, Appendix A, Table A.1 for a list of schools selected).

Based on a needs assessment, CIDE developed proposals for improving each school's infrastructure and educational programs, and the final improvements were finalized among MINED, CIDE, the school, and FOMILENIO. Although each school had specific improvements, the strengthening activities across all schools included (1) improving the array of technical training and skills courses, (2) supporting capital improvements (laboratories and workshops), (3) purchasing needed equipment, and (4) training teachers in the use of advanced instructional technologies.¹⁰

As a result of the strengthening intervention, these schools received 49 new classrooms (39 were additions and 10 replaced existing classrooms), 15 new laboratories, 8 new computer labs, and 124 new bathrooms (Table II.2). All infrastructure improvements were completed before the 2010 school year (February 2010) started. During the first semester of 2010 (February-June), FOMILENIO also provided computers, software licenses, and furniture for computer labs in the 20 secondary schools. Similar investments continued until mid-2012. By early 2012, payments to CIDE and subcontractors related to secondary school infrastructure and equipment improvements totaled approximately \$4 million.

As part of secondary school strengthening efforts, CIDE staff also administered training to 540 secondary school teachers, administrators, parents, MINED staff, and other stakeholders as of September 2011. These less intensive training sessions were designed to introduce stakeholders to competency-based educational approaches and help them develop lesson plans, educational charts, and assessment materials needed to teach courses.

⁹Throughout this document, when we use the term "secondary school," we refer to schools that teach grades 10, 11, and 12. In El Salvador, secondary schools are also known as middle schools; to avoid confusion with U.S. middle schools, which generally include grades 6 (or 7) through 8, we use the term secondary schools.

¹⁰The interim results report for the secondary schools evaluation (Campuzano et al. 2013a) provides a more detailed description of implementation.

Table II.2. Secondary School Improvement Outputs

Technical Secondary School Improvements		
	New Infrastructure	Improved Infrastructure
Classrooms	49 classrooms in 14 schools	18 classrooms in 2 schools
Laboratories	15 laboratories in 12 schools and 8 computer labs in 8 schools	1 laboratory in one school and 3 computer labs in 3 schools
Bathrooms	124 bathrooms in 19 schools	26 bathrooms in 2 schools
Teacher Training		
Number of stakeholders trained in additional secondary school workshops	540 teachers, administrators, parents, MINED staff, and other stakeholders as of September 2011	

Source: CIDE administrative data.

Scholarship program. FOMILENIO's scholarships were aimed at young people in El Salvador's Northern Zone who needed financial assistance to pursue their secondary and post-secondary education. The goal of the scholarship program was to increase enrollment, grade continuation, and completion of secondary and postsecondary education, and, ultimately, to improve labor market outcomes. While the program provided both secondary and post-secondary scholarships, in this section we focus on scholarships for secondary education. CIDE was responsible for the initial design of the scholarship program, including determining the appropriate scholarship amount and eligibility criteria.¹¹ After some deliberation, MINED and FOMILENIO approved a scholarship amount of \$400 per year per student enrolled in secondary school.¹² Because general secondary school programs are two years long (10th and 11th grade), and technical secondary school programs are three years long (10th through 12th grade), general secondary school students could renew their scholarships for the subsequent school year, and technical secondary school students could renew their scholarships for two subsequent school years.

According to original plans, scholarships were going to be offered to students at all 20 secondary schools to be strengthened under the sub-activity. FOMILENIO and MINED formed a scholarship committee to manage scholarship allocation across secondary schools. In deciding how these scholarships would be distributed, the committee first determined that scholarships would be offered to students in 17 of the 20 secondary schools strengthened by FOMILENIO. Within these schools, the committee also selected the educational programs in

¹¹The ultimate eligibility requirements for secondary school scholarships were the following: applicants must be a resident of the Northern Zone; be a Salvadoran citizen; have limited economic resources (a household income of less than three times the minimum wage of around \$6 a day); have completed a year of primary education in the previous three years; have passed ninth grade with a minimum of a 6 grade point average (out of 10 points); be interested in studying one of the educational programs selected to be included in the scholarship program; and meet the requirements set by the school in which they planned to enroll.

¹²To provide some context on the scholarship amount, we should note that the Encuesta de Hogares de Propósitos Múltiples (EHPM), conducted by DIGESTYC, reports that the monthly household income in the Northern Zone was almost \$400 in 2009.

which the scholarships would be offered and the number of scholarships to offer in each program.¹³

In 2009, FOMILENIO contracted the Fundación Empresarial para el Desarrollo Educativo (FEPADE) to conduct outreach to potential applicants, process applications, and administer the scholarship program. FEPADE staff monitored the payments and students' progress in school, and resolved any difficulties related to school or their scholarships. FOMILENIO scholarship recipients received annual benefits of \$400, regardless of their family income, cost of transportation, and distance from school. During the school year, students received \$30 monthly payments, as well as a larger initial payment and school supplies at the start of each school year.

As a counterpart contribution to the scholarship program, MINED agreed to finance and administer 50 percent of scholarships that would be renewed in 2011 for second-year secondary school students and, starting in 2012, 100 percent of the scholarships that would be renewed for third-year secondary school students. However, MINED payments were delayed in 2011 by at least six months due to bureaucratic complications. The first payment of FOMILENIO scholarships financed by MINED occurred in July 2011. The FOMILENIO scholarships administered by FEPADE were paid on schedule. For the 2012 school year, MINED experienced delays similar to those in 2011, and students had not received any scholarships payments by May 2012.

In 2011 and 2012, FOMILENIO granted two more rounds of scholarships for first-year secondary school students who had finished ninth grade. Table II.3 summarizes the number of scholarships that FOMILENIO granted to first-year secondary school students during the compact period. From 2009 to 2012, FOMILENIO awarded 3,409 secondary school scholarships.

Table II.3. Scholarships Granted by FOMILENIO to First-Year Secondary School Students

	2009	2010	2011	2012	Total
Number of scholarships	150	921	1,197	1,141	3,409
Number of schools	3	17	17	17	

Source: FOMILENIO administrative data for 2009–2012.

Strengthening ITCHA and introducing MEGATEC degrees. The ITCHA strengthening intervention centered on adapting ITCHA's curriculum to fit the MEGATEC educational model developed by the MINED. The MEGATEC model is based on the premise that technical education should be tailored to regional economies' labor market demands, and designed to build competencies required of professionals in each degree program's relevant fields. Using this premise, FOMILENIO contracted CIDE to analyze the labor market demands in the Northern Zone and develop new degree programs that responded directly to these demands. CIDE recommended and developed two MEGATEC degree programs—civil engineering and alternative tourism—to complement ITCHA's four existing technical programs. These two new

¹³The interim report for the secondary scholarships program offers a more detailed description of the implementation (Campuzano et al. 2013b).

programs, each two years long, were first made available to students during the 2010 school year.

In 2008, CIDE proposed several new MEGATEC degree programs based on labor market demands in the Northern Zone. After discussions among MINED, CIDE, and FOMILENIO, MINED representatives chose two new degrees—civil engineering and alternative tourism—to be developed as MEGATEC degree programs at ITCHA and its four linked secondary schools. CIDE, as the program’s primary technical support contractor, was charged with developing the curricula for these two new degree programs and training all newly hired ITCHA and secondary school teachers who would teach these programs. Throughout 2009, CIDE staff worked with stakeholders to develop and refine the programs’ core competencies and teaching modules. In December 2009, CIDE staff conducted the first of several training workshops for ITCHA and technical secondary school teachers.¹⁴ In January 2010, post-secondary civil engineering and alternative tourism programs began at ITCHA, and civil engineering and alternative tourism programs began at ITCHA’s four linked secondary schools. As planned, these 4 linked secondary schools were among the 20 secondary schools that participated in the secondary school strengthening intervention.

In addition, FOMILENIO offered \$1,500-a-year scholarships to ITCHA students. From 2009 to 2012, FOMILENIO awarded 586 first-year ITCHA scholarships.¹⁵ ITCHA scholarships were disbursed by the institute’s administrative staff.

Implementation of the ITCHA strengthening component generally followed the original design outlined in the compact, except that stakeholders opted to build a new facility instead of remodeling the existing ITCHA. After construction was complete in April 2011, ITCHA’s new facilities included 9 classrooms, 10 technical labs, 4 computer labs, an auditorium, and an outdoor cafeteria (Table II.4). Overall, ITCHA construction costs totaled around \$5 million, or \$3.4 million more than the \$1.6 million originally budgeted for renovations.

Closely related to ITCHA construction was the implementation of the newly developed MEGATEC civil engineering and alternative tourism programs at ITCHA and its four linked secondary schools. From November 2009 to August 2010, CIDE trained ITCHA staff, as well as teachers and principals at the four linked secondary schools, to implement the new MEGATEC curriculum. The two new MEGATEC programs were first implemented in 2010 by newly contracted and trained teachers at ITCHA and its four linked secondary schools.

¹⁴Teacher training would extend from December 2009 to August 2010. The training included seven workshops, totaling 136 hours of instruction, and nine months of follow-up and support.

¹⁵These figures reflect the number of scholarships awarded to first-year ITCHA. We should clarify that as part as the formal education sub-activity FOMILENIO offered scholarships both to secondary school students, which were discussed above, and also to post-secondary students, such as ITCHA students and students from other post-secondary institutions.

Table II.4. Primary ITCHA and MEGATEC Outputs

ITCHA Construction	
Infrastructure	9 classrooms, a multiple-use auditorium, and an outdoor cafeteria
Laboratories	4 computer labs and 10 technical labs
ITCHA Scholarships	
Scholarships	586 awarded (61 in 2009, 200 in 2010, and 325 in 2011)
MEGATEC Teacher Training	
Number of MEGATEC workshops conducted	7 workshops totaling 136 hours, and 9 months of follow-up training and support.
Number of teachers trained in MEGATEC workshops	11 teachers participated in nearly all workshops and sessions (4 ITCHA teachers and 7 secondary school teachers).

III. OVERVIEW OF SCHOLARSHIP AND SECONDARY SCHOOL EVALUATIONS

The secondary school scholarship program was designed to work in conjunction with secondary school strengthening investments in 20 pre-selected secondary schools (Chapter II). Due to the shared target population and objectives of these interventions, the evaluation of each intervention will address a common set of research questions. In this chapter, we outline the full set of research questions for the scholarship and secondary school strengthening programs. These questions focus on program design, implementation, sustainability, and impacts on participants' education and employment outcomes. We also present the newly-added study design to address both interventions' implementation and long-term sustainability. Chapters IV and V detail the impact evaluation designs for each of these two interventions.

1. Research Questions and Evaluation Designs

In conducting the scholarship and secondary school evaluations, we will address six research topics as follows:

1. **Program design/implementation.** How were the secondary school strengthening and scholarship programs designed and implemented? Did implementation meet original targets regarding number of scholarships, strengthened schools, trained teachers, and enrolled students? Did implementation meet stakeholder expectations regarding the quality of infrastructure improvements and teacher training sessions, or the adequacy of scholarships (in terms of annual amount)? Why or why not?
2. **Description of participants.** What are the characteristics (age, gender, initial household income, etc.) of scholarship recipients and secondary school students? What are students' professional aspirations and constraints to education and employment?
3. **Impact.** What is the impact of FOMILENIO's strengthening secondary school program on students' education and labor market outcomes, including secondary school enrollment, grade completion, graduation, additional education, employment, and income? What is the impact of the offer of scholarships in some programs within strengthened schools on student educational and labor outcomes?
4. **Impacts by key target subgroups.** Were impacts different for girls versus boys? Did some groups experience positive or negative outcomes relative to other groups?
5. **Explanation for impact findings.** What aspects of implementation can provide context for understanding impact findings? Can socioeconomic factors or elements of implementation help explain (potential) differences in impacts for girls versus boys? What was the ex-post statistical power, and can this provide context for the lack of impacts (in cases where no impacts are found)?
6. **Sustainability.** Are secondary school improvements and scholarships being maintained? Are they likely to be maintained in the medium- to long-term?

The research questions are highly relevant and of interest to El Salvador's Ministry of Education, which has committed funds to continue or maintain investments in secondary school

scholarships and infrastructure. The evaluations will provide the ministry with information regarding the impact of these investments on students' enrollment, graduation, employment, and income. These research questions are also highly relevant to MCC as it works with the government of El Salvador to finalize a second compact that features large investments in technical and vocational education. International donors are likely interested in the evaluation results as well, particularly the extent to which a need-based secondary school scholarship program can produce impacts in a Latin American context. Exploring impacts by gender (Topic 4) is also a priority for MCC, given its commitment to designing and measuring the effects of projects that promote gender equality in access to services and key outcomes of educational attainment and economic development.

Except for Topics 3 and 4, all the research questions above were introduced in late 2013 at the request of MCC, to complement existing impact evaluations of the scholarship and secondary school programs. In the rest of this chapter, we outline our mixed-methods approach to answering these new research questions.

Mixed-methods design. To answer all research questions regarding the design, implementation, and sustainability of the strengthening efforts and scholarships, we will use a mixed-methods evaluation design. This includes reviewing programmatic reports and collecting qualitative data to document all key investments and activities, analyze participants' perspectives on programmatic implementation and results, and contextualize programmatic impacts (or lack of impacts). In addition, we will use administrative data to summarize the intervention, describe its participants, and analyze the sustainability of its original investments. Using both qualitative and quantitative methods will allow us to address each research question with the most appropriate mix of data sources, and to triangulate qualitative and quantitative findings. (See Table III.1 for an illustration of the methods and data sources we will use to answer each research topic.)

Qualitative data collection and analysis. To learn about the design, implementation, and sustainability of the strengthening efforts and scholarships programs, we will conduct semi-structured, in-person interviews and focus groups with MINED, CIDE, MCC, former FOMILENIO representatives, secondary school principals and teachers, and current secondary school students. Most likely, we will conduct one-on-one (phone and in-person) interviews with school principals, MINED, CIDE, FOMILENIO, and MCC staff, and we will conduct focus groups with teachers and students. Focus groups with multiple teachers and students are preferable to multiple individual interviews due to their relative efficiency and low cost. The social nature of the focus groups setting may also encourage students and teachers to offer their perspectives and provide insight into statements made by other participants. During qualitative interviews and focus groups, we will ask stakeholders for their perspectives on the quality and completeness of implementation (Topic 1).¹⁶ Particularly important is documenting principals' and teachers' satisfaction with infrastructure improvements and teacher training, and students' experience with scholarships and newly introduced technical degree programs.

¹⁶Because Mathematica staff gathered a large amount of information on program implementation to inform interim impact analyses finished in 2012 and 2013, researchers will use interviews to verify and update their records regarding the number of scholarships, improvements, and training sessions that took place.

Table III.1. Data Sources for Non-Impact Secondary School and Scholarship Research Topics

Research Topics and Questions	Evaluation Design	Data Sources
1. Design/Implementation		
How were the secondary school strengthening and scholarship programs designed and implemented?	Mixed-methods	In-person interviews and focus groups with stakeholders, administrative records, and programmatic reports
Did implementation meet original targets and expectations, both in terms of quality and quantity? Why or why not?	Mixed-methods, with comparison of final outputs to M&E targets	
2. Description of Participants		
What are the characteristics (age, gender, initial household income, etc.) of scholarship recipients and secondary school students?	Mixed-methods	Application and survey data
What are students' professional aspirations and constraints to education and employment?		Focus groups with students
3. Impact		
What is the impact of FOMILENIO's strengthening secondary school program on students' education and labor market outcomes (including enrollment, grade progression, graduation, employment, and income)?	Quasi-experimental design for secondary schools; experimental design for scholarships	School census and student survey data
What is the impact of the offer of scholarships in some programs within strengthened schools on student educational and labor outcomes?		
4. Impacts for Key Target Subgroups		
Were impacts different for girls versus boys?	Quasi-experimental design for secondary schools; experimental design for scholarships	School census and student survey data
Did some groups experience positive or negative outcomes relative to other groups?		
5. Explanation for Impact Findings		
What aspects of implementation can provide context for understanding impact findings?	Mixed-methods	Stakeholder interviews and focus groups; programmatic reports
What socioeconomic or implementation factors may help explain variations in impacts by gender?		Synthesized implementation and impact findings
What was the ex-post statistical power, and can this provide context for the lack of impacts (in cases where no impacts are found)?		Updated power calculations

Table III.1 (cont'd)

6. Sustainability		
Are secondary school improvements being maintained (including the continued offer of scholarships)?	Mixed-methods	Stakeholder interviews and focus groups; administrative records
Are improvements likely to be maintained in the medium to long term? If so, what resources are available to maintain them?		

Note: Stakeholders include MINED, CIDE, former FOMILENIO representatives, MCC technical staff, and secondary school principals and teachers.

Questions will be tailored to each interviewee group's involvement in, and knowledge of, program design, implementation, and results. For example, we will ask students about their first-hand experience and satisfaction with school infrastructure, new degree programs and scholarships—including whether scholarships motivated them to continue studying. If teachers and principals have been active in secondary schools since at least 2010, we can inquire about their experience and satisfaction with school improvements new degree programs, and teacher training offered under the sub-activity. In addition, we will ask MINED, CIDE, and FOMILENIO representatives for their perspectives on whether the implementation team met (or did not meet) original output goals, as well as their perspectives on key barriers and facilitators that affected overall implementation. Also during focus groups, we will ask students to provide additional context on their socioeconomic backgrounds, the education challenges they face, and their long-term career goals (Topic 2).

Also during qualitative interviews, we will ask stakeholders a set of questions related to sustainability (Topic 6). Notably, we will ask school principals and MINED staff about the sustainability of funds for continued maintenance, teacher training, and scholarships. Also related to sustainability, we will ask students in interviews about the importance of scholarships in their decision to enroll in, and progress through, secondary school.

Near the end of stakeholder interviews with principals, FOMILENIO and MINED staff, we plan to share our intermediate impact findings and ask about their perceptions on why these impacts may (or may not) have occurred.¹⁷ In particular, during interviews with principals, we will reference each school's official enrollment and graduation numbers, and ask principals to help us interpret enrollment trends in their school. These conversations may help to identify contextual and implementation factors that may have influenced programmatic impacts (Topic 5). If possible, we will also ask stakeholders to help us interpret preliminary employment rates and income estimates from our analysis of student survey data (discussed in Chapters IV and V).¹⁸ Also important, we will ask stakeholders—particularly students—about potential constraints to graduation and employment, despite scholarships and school improvements. A

¹⁷We will structure interviews in such a way to reduce any potential biases that could result from sharing this information during the interviews and focus groups. Specifically, we will ask stakeholders about their perceptions on implementation and results prior to sharing our intermediate impact findings.

¹⁸ It is not yet clear whether employment and income estimates will be available and fully vetted at the time of data collection.

better understanding of these constraints can provide valuable context for impact findings, particularly if the analysis finds no positive impacts of the intervention on ultimate outcomes of employment and income.

Reviewing existing data sources. Administrative data and programmatic reports from MINED, CIDE, and FOMILENIO will also provide information on program implementation (Topic 1) on the type and number of infrastructure improvements, teacher training sessions, and scholarships distributed. In addition, school records and scholarship applications will provide information on program participants (Topic 2). Any administrative data on current or future MINED budgets related to scholarships or technical school maintenance will also provide insight into the sustainability of scholarship and improvements in future years (Topic 6).

Triangulation of data. To the extent possible, we will attempt to triangulate qualitative information provided by stakeholders during interviews with administrative data and programmatic reports on program implementation. For example, we will compare and contrast stakeholders' perceptions on the completeness of implementation with monitoring data on implementation outputs and targets. To the extent possible, we will attempt to triangulate stakeholders' perceptions on the quality of implementation—including the quality of training provided and infrastructure improvements—with programmatic reports. However, an initial scan of programmatic reports revealed an emphasis on reporting on quantitative outputs regarding training sessions and individuals trained, as opposed to qualitative information on the context and quality of training provided.

Exploring Perceptions on the Quality of Implementation, Instruction, and Academic Achievement

During qualitative data collection in 2014, Mathematica staff will ask stakeholders about their perceptions of the quality of implementation, including infrastructure improvements and teacher training sessions. Questions about the quality of infrastructure improvements will focus on whether new infrastructure is functional (or was functional at the conclusion of implementation). For example, we will inquire into the working order of computer and science labs, and whether classrooms are fully equipped. Research questions about the quality of teacher training sessions will focus on whether participating teachers believe the sessions prepared them to teach general and technical programs, and to incorporate competency-based methods into their day-to-day activities.

During interviews, Mathematica staff will also ask stakeholders—namely principals and teachers—about their perceptions on whether teacher training, new degree and certificate programs, and infrastructure improvements have led to tangible improvements in the quality of education in strengthened secondary schools. A review of programmatic documents revealed no pre-defined criteria to assess quality in the context of technical secondary schools in El Salvador. As such, we will request stakeholder input to define essential domains of education quality as they relate to the secondary school strengthening intervention. However, as an ex-ante framework for education quality, we define a high-quality secondary school education as one that includes all three of the components below (UNICEF 2000):

- Safe learning environment, complete with adequate resources and facilities
- Suitable curricula and materials for the acquisition of relevant skills
- Trained teachers who manage classrooms effectively and assess students regularly to facilitate learning

Similarly, we will ask stakeholders about their perceptions on whether the secondary school strengthening efforts—particularly new technical programs and teacher training efforts—had a potential effect on students' academic achievement. In particular, we will ask stakeholders to identify potential measures of academic achievement—including student grades—that could be used to assess any trends in student achievement from 2009 to 2014. Particularly important are measures outside of the Prueba de Aprendizaje y Aptitudes para Egresados de Educación Media (PAES) test, a national test given to all 11th graders in the country. (PAES scores are measured in the impact evaluation; see page 43). Of particular importance are metrics that capture potential gains in students' technical knowledge and skills as a result of the intervention's focus on strengthening technical degree offerings in the 20 selected schools.

Any findings regarding the quality of implementation, instruction, and academic achievement could provide valuable context for understanding impact evaluation findings. For example, if stakeholders report little improvement in the quality of technical education as a result of the sub-activity and we find no positive impacts of the sub-activity on employment or income, we can theorize that the sub-activity's failure to improve the quality of secondary education may be responsible, in part, for lack of impact on students' ultimate outcomes. However, any analysis regarding the exact cause(s) of (lack of) impacts would be inconclusive.

2. Data Collection and Interviewee Selection Plans

Mathematica staff will conduct qualitative data collection in 2014 related to the scholarship and secondary school strengthening programs. This data collection will consist of semi-structured telephone interviews with principals of the 20 secondary schools that received new infrastructure, curricula, and training as part of the secondary school strengthening intervention. The sample for the interviews consists of all 20 secondary school principals. Most of these principals will be interviewed by phone prior to in-person data collection. However, up to four principals will be interviewed in person.

In addition, Mathematica staff will conduct focus groups with at least 12 secondary school teachers and 24 secondary school students from the 20 schools that received assistance (Table III.2).¹⁹ These focus groups will take place at four secondary schools, with separate sessions for students and teachers (up to eight separate sessions in four schools). Two of these schools should be MEGATEC schools that feed into ITCHA, and two should be non-MEGATEC schools with general and technical degree programs. We will develop a convenience sample of teachers and students that will allow us to compare and contrast technical and general programs. This sample will include at least five teachers and ten students from general degree programs, and at least five teachers and ten students from technical degree programs. MINED staff will provide us with updated contact information for all 20 secondary school principals who will help us select teachers and students for interviews.²⁰

Table III.2. Sample Sizes for Interviews on Secondary School Strengthening and Scholarships, 2013

Evaluation Component	Respondent Type			FOMILENIO, MINED, CIDE and MCC
	Principals	Teachers	Students	
Additional qualitative component for scholarship and secondary school interventions	20 secondary school principals (by telephone and up to 4 in person)	Focus groups with at least 12 secondary school teachers (in 4 schools)	Focus groups with at least 24 students (in 4 schools)	Interviews with up to 6 representatives

In late 2013, Mathematica produced a semi-structured master protocol for interviews and focus groups with principals, teachers, students, and MINED and FOMILENIO representatives

¹⁹Sample sizes of 16 students and 8 teachers were selected based on the time available in the data collection trip, which is anticipated to be one full week for two researchers. Interviews with secondary school MEGATEC teachers (discussed below in the ITCHA section) may count toward these interviews with secondary school teachers, given the ability of these teachers to discuss the MEGATEC programs as well as the scholarship and strengthening programs.

²⁰We will coordinate with school principals to establish criteria for teacher and student selection. A primary selection criteria will be teacher and students' availability to participate. However, we will attempt to select a sample of teachers and students that represents some heterogeneity in terms of general and technical degree programs, the number of years taught (in the case of teachers), and overall performance (in the case of both students and teachers). Also, participating students should represent the range of secondary school grades offered at each school.

directly involved in—or affected by—scholarship and secondary school strengthening programs (See Appendix B for the full protocols, which include justifications for topic areas covered with each stakeholder type). The master protocol is structured around the evaluation’s six primary research questions; each primary question is accompanied by several sub-questions that explore central themes in each domain. After MCC approves the master protocols, Mathematica will tailor protocols to each respondent type (for example, MINED, principals, teachers, and students). In the second semester of 2014, Mathematica will conduct in-person interviews with MINED, CIDE, and former FOMILENIO representatives, secondary school teachers, and secondary school principals.²¹ Following these interviews, we will conduct telephone interviews with any of the four secondary school principals who did not complete in-person interviews.

The timing of this final round of interviews—tentatively scheduled for October 2014—strikes a balance between the two priorities of accurately documenting implementation and assessing medium- and long-term sustainability. In this period, teachers, principals, and MINED and FOMILENIO officials are likely to be able to recall salient aspects of the interventions, which were largely implemented from 2010 to 2012. In addition, sufficient time will have elapsed since the close of the compact in late 2012 to begin to assess the medium- and long-term sustainability of the sub-activity’s investments in formal technical education. Furthermore, conducting this final round of interviews in late 2014 will allow us to share findings for the interim report as well preliminary impact findings for the final report with stakeholders and ask about potential mechanisms through which impacts may have occurred (or failed to occur).

3. Data Analysis

Data analysis will focus on organizing and analyzing all qualitative interview data, obtaining all relevant administrative records that form part of the analysis, and begin reviewing all relevant data from scholarship applications. In this section, we provide more information on how we plan to structure our analyses of program design and implementation, participants, and program sustainability.

- **Analyzing program design** (Topic 1). To understand and characterize programmatic design, we will first group qualitative and administrative data into the following categories: (1) program objectives, activities and investments, (2) target population, (3) implementers and other actors, (4) funding and timeline, and (5) relationships between investments.²² Next, we will assess the coherence and completeness of information for each category, and compose summary paragraphs and tables of each conceptual category of program design.
- **Analyzing program implementation** (Topic 1). To characterize implementation, we will likely use a mix of qualitative interview data, administrative records, and programmatic reports to (1) identify natural demarcations between phases of

²¹Data collection will take 5 days: 2 days to interview principals, teachers, and students at ITCHA; 2 days interviewing principals and teachers at secondary schools; and 1 day of interviews with MINED, CIDE, and FOMILENIO representatives. Data collection is tentatively scheduled for October 2014.

²²For the most part, administrative data sources and programmatic reports will provide necessary information to document program design.

implementation, (2) summarize all relevant investments and activities in each phase, (3) document all actors involved, (4) compare any programmatic outputs to stated implementation goals, and (5) document stakeholders' explanations for why goals were or were not met. The MCC-El Salvador compact and FOMILENIO monitoring and evaluation (M&E) plan (updated September 2012) will serve as primary sources for implementation goals. For example, the M&E plan states that a total of 500 teachers, staff, and parents will be trained under the Formal Education Sub-Activity. We will compare the actual number of trained individuals reported in programmatic documents or administrative data to this goal, and synthesize stakeholders' explanations for why this goal was or was not met.

- **Characterizing participants** (Topic 2). For scholarship applicants and recipients, we will use scholarship applications to summarize the demographic and socioeconomic characteristics of applicants, as well as to compare and contrast applicants who accepted the scholarship versus those who did not. Representative baseline data are largely unavailable for the secondary schools evaluation. However, we can use administrative data to summarize the number and gender of students enrolled in each year of the intervention. We can also use student surveys to provide more detail on students' demographic characteristics, including their age at the time of enrollment, their academic program, and family income following graduation from secondary school. We will analyze and present these quantitative analyses in conjunction with qualitative narratives from individual students obtained during in-person focus groups.
- **Explaining impact findings** (Topic 5). We will use qualitative data from in-person interviews with principals, teachers, and MINED and FOMILENIO representatives to gather contextual information for impact findings. A main finding of the interim secondary school evaluation is that technical secondary school enrollment increased as a result of school improvements, but not by the expected margin (Campuzano et al. 2013a). During interviews, we will determine the extent to which stakeholders agree with this finding and document their rationales or evidence for these views. If multiple respondents share potential explanations for why larger improvements did not occur, we will group these explanations into broad categories. For example, some principals may claim that not enough new schoolrooms were constructed to boost enrollment in their school, and other principals may argue that improvements and modest scholarships were not sufficient to motivate large numbers of students to enroll. In our analysis, we will record the extent to which stakeholders agree on potential explanations. In addition, we will analyze these qualitative data in conjunction with updated power analyses for the scholarship and secondary school evaluations; these power analyses will provide appropriate context regarding the evaluation's ability to detect impacts that may have occurred.

Another key aspect of explaining impact findings is examining whether any variations in implementation are correlated with potential variations in impact. In this evaluation, of primary interest is assessing whether schools that experienced large infrastructure improvements, were more likely to experience substantial increases in enrolled students in subsequent years. Also of interest is assessing whether graduates of schools that implemented new degree programs and various certificate programs

were more likely to experience substantial increases in employment rates or average incomes following graduation (as compared to graduates of schools that did not change their academic offerings as a result of the intervention). We plan to complete these analyses by merging implementation data (on infrastructure improvements and new degree and certificate programs for each school) to the impact analysis database, and examining potential correlations between implementation factors (improvements and newly added academic programs) and student outcomes (enrollment, graduation, employment, and income).

- **Analyzing sustainability** (Topic 6). Based on our understanding of the interventions and previous education research, we will evaluate the sustainability of the school strengthening and scholarship interventions on the following criteria: (1) sufficient stakeholder political and budgetary support, (2) continued availability of human capital to educate students and administer scholarships, (3) sustained demand for secondary school programs and scholarships, and (4) sustained capital resources to maintain original infrastructure investments. To some extent, each of these criteria must be present to conclude that the scholarship and secondary school strengthening interventions—including their primary outputs and results—can be sustained in the future. For each criterion in the analysis, we will aggregate and triangulate relevant qualitative and quantitative information. For example, to assess whether there is sufficient capital resources to sustain original secondary school improvements, we will examine any available budget outlays for school maintenance, in conjunction with statements made by teachers, principals, and MINED representatives regarding funding for school maintenance in future years.

For all the analyses above, we will attempt to triangulate reports from MINED, CIDE, and FOMILENIO staff, as well as principals and teachers, taking into account that each set of stakeholders faces unique incentives that could affect their responses to interview questions. Agreement among interviewed stakeholders generally indicates that evidence is trustworthy, whereas disagreement among interviewed stakeholders necessitates some analysis into each stakeholder's motivations for highlighting particular points or presenting non-corroborated information.

4. Limitations

It is important to note that the qualitative methods detailed in this chapter have certain limitations. As with most qualitative research, stakeholder interviews and focus groups are illustrative and do not constitute a representative sample of all teachers and students affected by the sub-activity. The results of qualitative analysis for the secondary school strengthening and scholarship programs, therefore, may not generalize to all teachers and students that differ systematically from those in the sample.

IV. IMPACT EVALUATION DESIGN FOR THE SECONDARY SCHOOL STRENGTHENING INTERVENTION

In this chapter, we focus on the impact-oriented research questions from the full set of evaluation questions for the secondary school strengthening intervention presented in Chapter III. Mathematica staff began designing and implementing this impact evaluation of the secondary school strengthening intervention since 2007, and a report summarizing the interim findings was completed in May 2013. This chapter is based primarily on the design memorandum for the impact evaluation of the secondary school strengthening intervention (Campuzano et al. 2010a), and it also incorporates all the changes to the original design up to December 2013.

1. Primary Research Question and Basic Design

The objective of the secondary school strengthening impact evaluation is to assess whether the intervention improves educational and labor market outcomes for the students attending the 20 intervention schools. Specifically, the evaluation was originally designed to answer the impact-related questions for the secondary school activity:

- **Impact.** What is the impact of FOMILENIO's strengthening secondary school program on students' education and labor market outcomes, including secondary school enrollment, grade completion, graduation, and further education, employment, and income?
- **Impacts and outcomes for target subgroups.** Were impacts different for girls versus boys? Were there heterogeneous outcomes by key subgroups (for example, were technical degree students more likely to find employment than general degree students)?

To measure the impact on students who attended the 20 secondary schools selected for the intervention, we need to compare what happened to the students attending these 20 schools after the intervention was implemented with what would have happened to those students if these schools had not received the intervention. This last scenario, the counterfactual, cannot be observed. Therefore, our objective is to approximate it by finding a group of schools that were not selected for the intervention but were similar to the selected 20 secondary schools before the intervention. The experience of this comparison group will serve to approximate what would have happened to the group of schools that received the intervention.

We should also mention that our analysis compares students in schools where the strengthening program and the scholarships program were implemented by FOMILENIO versus students in schools without these two programs. For this reason, the impacts we will estimate cannot separate the effect of the strengthening program from the effect of scholarships program. As a result, this evaluation measures the combined effect of secondary school infrastructure improvements, teacher training sessions, new technical degree and certificate programs, and scholarships on students' educational and labor market outcomes. Another consideration is that this evaluation focuses on enrollment levels not enrollment rates. The main short term outcome of interest for MCC are enrollment levels since there is where MCC had projected a significant

change (1560 additional students) which was taken into account in the ERR model. In Section 6, we explain the relation between the impact results and ERR model in detail.

The selected evaluation design for the secondary school strengthening intervention is a matched comparison group approach using propensity score methods.²³ The difference in outcomes between what we observed in the intervention group and what we observed in the selected comparison group represents our impact estimator. We used propensity score matching to identify a comparison group with observable characteristics similar to those of the intervention group before the intervention. The limitation of this method, as with any quasi-experimental method, is that we cannot guarantee that the intervention and the comparison groups are similar on unobserved characteristics at baseline.

In the rest of this section, we first describe how the intervention group was selected by FOMILENIO. We then describe the selection of the comparison group using propensity score matching.

Selection of the intervention group. MINED identified 75 secondary schools in the Northern Zone that were eligible to receive the intervention. FOMILENIO contracted CIDE's services to develop the criteria on which 20 of the 75 technical secondary schools would be selected for the intervention. After FOMILENIO, MINED, and CIDE agreed on the final criteria, CIDE constructed a ranking score for each of the 75 eligible schools. A high score reflects that a school demonstrated a high level of need according to the selection criteria, and a low score reflects that a school demonstrated a low level of need.²⁴

An additional concern among stakeholders was to attain a wide geographic distribution of the intervention throughout the Northern Zone. Therefore, the procedure agreed upon by FOMILENIO, MINED, and CIDE was to select the two highest ranked schools in each of the 11 microregions of the Northern Zone. Through this procedure, wide geographic distribution was attained and preference was given to the schools that had scored highest on the selection criteria in each microregion. Given that this procedure would have selected 22 schools, two microregions had only one school selected for the intervention, and nine microregions had 2 schools selected for the intervention. Appendix A, Table A.1 lists the selected schools.

Selection of the comparison group. The 55 schools that were eligible for the intervention but were not selected to receive it were candidates for our comparison group; we refer to them as the potential comparison group. We compared the characteristics of the 20 schools in the intervention group and the 55 schools in the potential comparison group based on data from MINED's Censo Matricular 2006 and 2007. We found that the mean characteristics of the intervention group were significantly different from those of the potential comparison group. Therefore, our objective was to use a propensity score matching to identify a comparison group

²³Propensity score methods are discussed in Rosenbaum and Rubin (1983, 1985); Dehejia and Wahba (1999, 2002); and Smith and Todd (2005).

²⁴CIDE's deliverable, dated August 17, 2008, describes the selection criteria and the construction of the ranking score.

of 20 schools among these 55 schools that had school-level characteristics similar to those of the intervention group.

Propensity score matching uses a propensity score (that is, the estimated probability of selection in the intervention) to assess the similarity among schools. After the propensity score for each school has been estimated, several algorithms can be used to select the comparison group. Given that the number of potential comparison schools is small (55 schools), we used the nearest-neighbor algorithm (without replacement) to select the comparison schools. This algorithm assigns each intervention school to a comparison school whose propensity score is closest to the propensity score of the intervention school (that is, the school that produces the smallest arithmetic difference in scores), and has not been selected previously. After a comparison school is matched to an intervention school, it is taken out of the pool of potential comparison schools. Using this algorithm, we matched each intervention school to a unique comparison school, for a total of 40 schools (20 intervention schools and 20 comparison schools; see Appendix A, Table A.1 for a complete list of these 40 schools).

We estimated the propensity score with a probit model. The model's set of independent variables included variables that are correlated with the probability of selection into the intervention and, most important, variables that are most closely related to the outcomes we intend to measure (education and labor market outcomes). The variables come from the MINED's Censo Matricular 2006 and 2007, and from primary data collected by CIDE to select the intervention schools. We also considered forming the comparison group by other methods; for example, in each microregion, we could have selected the school(s) in CIDE's ranking right below the schools that were selected for the intervention group. However, this group was not balanced because the schools in that comparison group were considerably different from schools in the intervention group. Therefore, we discarded that option.

Similarity between the intervention group and the matched comparison group. Overall, the mean characteristics of the intervention group are similar to those of the comparison group. Differences between the intervention and comparison groups tend to be small and not statistically significant for most variables. However, we found three statistically significant differences. Specifically, the scores that measure external and internal management capacity of the intervention and comparison groups differ by a statistically significant margin (at the 5 percent level).²⁵ The ranking score calculated by CIDE also differs between the intervention and comparison groups by a statistically significant margin (at the 10 percent level), as well as the propensity score. As expected, the treatment group has a higher estimated probability of being selected than the comparison schools (also significant at the 5 percent level). The comparison schools were selected in 8 of the 11 microregions.²⁶ None of the potential comparison schools in the three regions without a comparison was similar to any of the intervention schools; therefore, they were not selected by the matching procedure.

²⁵The variables are: `subcriterio_capacidad_de_gestion` and `subcriterio_gestion_interna__600`, created by CIDE.

²⁶The three microregions that do not have comparison schools selected are La Palma-San Ignacio-Citalá; Metapán; and Manantiales Del Norte.

2. Data Sources and Outcome Indicators for the Secondary School Strengthening Intervention

The outcome indicators for the impact evaluation of the secondary school strengthening intervention are constructed from data from administrative databases and surveys collected for this study. Although the intervention was delivered at the school level, the goal of secondary school strengthening is to improve outcomes at the student level. Therefore, our original impact evaluation design intended to use both school-level data (from the Censo Matricular) and student-level data from administrative records to construct educational outcome measures such as enrollment, continuation, and progression in school. The original evaluation plan also included collecting student survey data to construct labor market outcomes such as employment, income, and continuation to post-secondary education. Next, we explain each data source and the outcome indicators constructed from it in more detail. Table IV.1 presents a summary of the outcomes and data sources.

School-level data from administrative records. MINED collects data on all the schools in El Salvador through the Censo Matricular. Data are collected at the beginning of each school year with the Censo de Matrícula Inicial and at the end of each school year with the Censo de Matrícula Final. The school-level outcomes constructed with these data are enrollment at the beginning of the school year, completion rates at the end of the school year, fail rates at the end of the school year, and dropout rates at the end of the school year. Table IV.1 describes the outcomes in detail. We used data from the 2006, 2007, 2008, and 2009 Censos as baseline data and data from the 2010 Censo as follow-up data for the first year of the intervention. Data from the Censo 2011 will be used as follow-up data for the second year of the intervention and Censo 2012 for the third intervention year. MINED will also provide school-level achievement on the Prueba de Aprendizaje y Aptitudes para Egresados de Educación Media (PAES) test, a national test given to all 11th graders in the country that tests language, mathematics, science, and social studies. The outcome indicator we will generate from this data source is school achievement (see Table IV.1).

Student-level data from school records. During the evaluation, the student-level administrative data we had intended to use were not available to us, so our main analysis had to rely on school-level data. To avoid relying exclusively on school-level data for the analysis, we contacted MINED's Accreditation Office to obtain the needed student-level data. The data from this office are provided by each school principal that is responsible for uploading basic information on each enrolled student to a centralized database. In addition, principals are responsible for updating the database when students' status changes (for example, when students transfer to another school or drop out). When we compared 2010 enrollment data from the Accreditation Office to the data provided by MINED, we found some inconsistencies.²⁷ To provide more reliable results, MCC contracted a data collector (the Dirección General de Estadística y Censos, DIGESTYC) to visit the schools in the study and collect school records for enrollment in 2010, 2011, and 2012. The main student-level outcomes we can construct from this data source are (1) enrollment in grades 10, 11, and 12 for each study year; (2) passed or failed; (3) enrolled in the next grade; and (4) dropout during the school year (see Table IV.1).

²⁷See interim results memo for details: ESVED2-31, Campuzano et al. 2013a.

Student-level survey data for post-secondary outcomes. Because administrative data collected by MINED do not include outcome indicators for post-secondary education and labor market outcomes, we collected these data through the Encuesta de Seguimiento de Estudiantes (ESE). The main outcome indicators that will be constructed with these data are secondary school graduation, employment, income, and post-secondary education. The baseline ESE was conducted in December 2009. CIDE collected baseline data from the cohort of students attending the last grade of secondary school in 2008 (that is, students in the 12th grade of a technical program and students in the 11th grade of a general program). These students were interviewed one year after they attended the last secondary school grade (October and November 2009). Post-intervention data were collected from the cohort of students attending their last year of secondary school in 2012. The students were interviewed almost one year after they should have finished the last year of technical secondary school (October 2013). Hence, follow-up data for labor market and post-secondary outcomes will come from the first cohort who completed the three years of technical secondary school under full implementation. The main outcome indicators we will obtain from this survey are high school graduation, employment, income and post-secondary education (see Table IV.1).

Table IV.1. Descriptions and Data Sources of Outcome Indicators: Secondary School Strengthening

Outcome Indicator	Description	Data Source
Enrollment	Number of students registered in grades 10, 11, or 12 in each school. School-level variable.	Censo Matricular Inicial
	A student-level binary variable of whether the student enrolled in each grade 10, 11, 12 each study year, 2010–2012.	School records
Passed grade	Percentage of students who passed grades 10, 11, or 12 in each study school. School-level variable.	Censo Matricular Final
	A student-level binary variable of whether the student passed the corresponding grade 10, 11, 12 each study year, 2010–2012.	School records
Re-enrollment on next grade	A student-level binary variable of whether the student enrolled in the next grade, grades 11, 12 for study years 2011 and 2012.	School records
Dropout within school year	Percentage of students who dropped out during the school year in grades 10, 11, or 12. School-level variable.	Censo Matricular Final
	A student-level binary variable of whether the student dropped out of school during each study year 2010–2012.	School records
Academic achievement	School average of students' PAES test scores in grade 11. School-level variable.	
Secondary school graduation	Student-level binary variable of whether the student graduated from secondary school in grade 11 or 12.	Student survey
Employment	Student-level variable of student employment status at the time of the survey, including part- and full-time employment	Student survey
Income	Student-level variable of student income in the 12 months preceding the survey. This includes formal and informal labor income, as well as remittances and other common sources of non-labor income.	Student survey
Post-secondary education	Student-level variable of student post-secondary education.	Student survey

3. Data Collection Time Frame for Post-Secondary Outcomes Survey

As explained above, data for educational outcomes during secondary education comes from MINED data and school records. However, post-secondary data is collected with a survey purposely prepared for this study. The baseline data for post-secondary outcomes was collected in 2009 by CIDE and we refer to it as baseline ESE. The sample frame for this data collection was composed by students who enrolled in their last grade of secondary school in 2008 regardless of whether they finished the school year or dropped out.²⁸ These students were interviewed in October and November 2009, which was almost one year after they should have finished the last year of their secondary education.²⁹ Similarly, the post-intervention data comes from what we refer to as follow-up ESE. The sample frame for this data collection is composed of students enrolled in their last year of secondary school in 2012 regardless of whether they successfully completed the school year or dropped out. These students were interviewed at the end of 2013, one year after they should have graduated from secondary school.³⁰ This group included students in the technical track registered in 12th grade in 2012, and students in the general track registered in 11th grade in 2012 (see Figure IV.1).

4. Impact Estimation for the Secondary School Strengthening Intervention

As explained earlier, the matching procedure allowed us to select a comparison group of schools with baseline characteristics that are somewhat similar to those of the intervention group. According to the school-level data from the Censos Matriculares, however, some characteristics are significantly different between the intervention and comparison groups. Therefore, we will use a regression framework, explained below, to control for any initial differences. An additional advantage of this framework is that the statistical precision of the impact estimates is improved by controlling for covariates such as students and school baseline characteristics in a regression model.

The impact analysis will rely on a regression specification that compares students in schools in the intervention group to students in schools in the comparison group, controlling for idiosyncratic differences in the two groups. The main analysis will estimate the model presented below separately for each secondary school grade (10, 11, and 12), and for each outcome indicator. The basic student-level model can be expressed as follows:

$$(1) \quad y_{is} = \alpha + \beta' \chi_{is} + \gamma z_s + \lambda T_s + \eta_s + \varepsilon_{is}$$

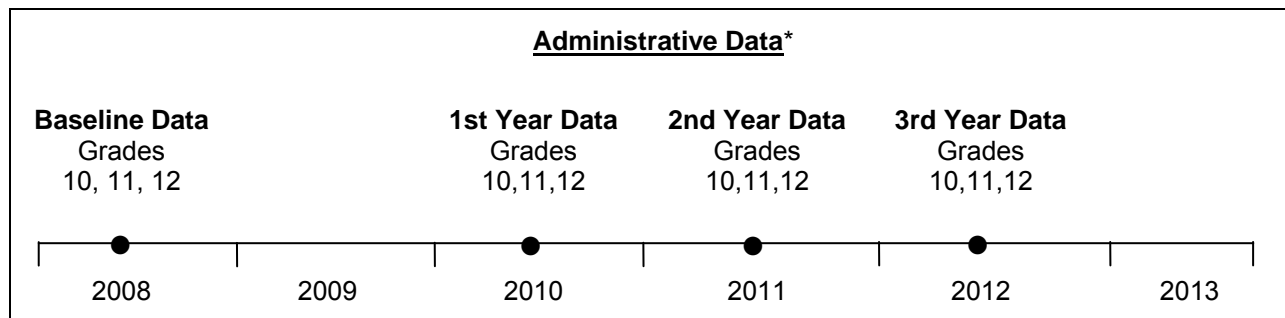
²⁸Two types of students are included in the survey: those who are in the general track in 11th grade in 2008, which is their last year of secondary school, and those who are in the technical track in 12th grade in 2008, which is their last year of secondary school.

²⁹Baseline administrative data from 2008 will be available for students taking the baseline ESE in 2009. These administrative data (such as test scores) will allow us to control for various student characteristics when estimating the impact of the intervention.

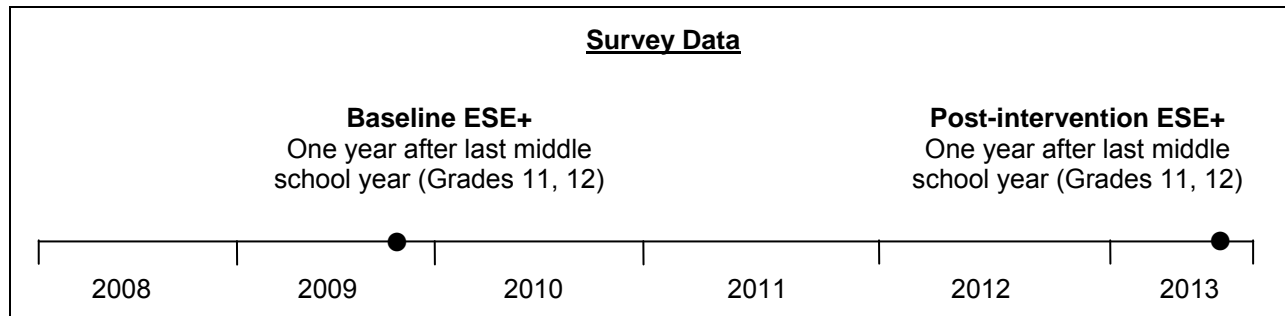
³⁰Administrative data from the third year of implementation (2012) will be available for students taking the post-intervention ESE in 2013. These administrative data (such as test scores) will allow us to control for various student characteristics when estimating the impact of the intervention.

where y_{is} is the outcome of interest for student i in school s ; X_{is} is a vector of baseline characteristics of student i in school s ; z_s is the vector of baseline characteristics in school s ; T_s is an indicator equal to one if school s is in the treatment group and zero if it is in the comparison group; η_s is a school-specific error term, a school effect; and ε_{is} is a random error term for student i in school s . The vector of student baseline characteristics x_{is} will include time-invariant characteristics such as age or gender, and time-variant characteristics such as academic achievement. The vector of school baseline characteristics z_s will include time-variant school characteristics such as number of students registered in the school in a certain year and number of teachers in a certain year.

Figure IV.1. Data Collection Timeline: Secondary School Strengthening



*All administrative data will be cross-sectional, student-level data.



+Students enrolled in general programs will be interviewed one year after grade 11, which is the last middle school year for general programs. Students enrolled in technical programs will be interviewed one year after grade 12, which is the last middle school year for technical programs.

The parameter estimate for λ is the estimated impact of the activity on the outcome of interest. The model presented in equation 1 takes into account the nested structure of the data; in this case, students are nested or clustered into schools. This type of model is referred to as a hierarchical linear model or mixed model and can be estimated with standard statistical packages.

An additional analysis of impacts by gender can be performed by adding an indicator variable for gender to the statistical model above. This will allow us to determine if impacts on graduation, enrollment, and income differ for males versus females. As an exploratory (and descriptive) analysis, we will also try to determine if any type of participants experienced positive or negative outcomes relative to other participant types. For example, we will likely compare and contrast technical degree students' employment rates and annual incomes with those of general degree students one year following their projection graduation date.

5. Statistical Power

An important consideration in any evaluation is to assess the size of the impact estimates that the evaluation will be likely to detect (statistical power). The sample size is critical in determining the size of the impact estimates that the evaluation will be likely to detect. Because this intervention was implemented at the school level, the number of schools participating in the study (20 treatment schools and 20 comparison schools) limits the size of the effect that the evaluation will be able to detect. We used student-level data to increase the statistical power of the evaluation. However, because the students are clustered within schools and are affected by the same school environment, the students cannot be considered statistically independent, and clustering at the school level needs to be accounted for. We discuss the statistical power for (1) analysis based on school-level data (such as that from MINED's Censos), and (2) analysis based on student-level data (such as that from school records or student surveys).

For outcome indicators constructed with school-level data, we have limited power because our analysis sample includes only 20 schools in the treatment group and 20 comparison schools. Other factors that affect the statistical power of the study are the response rate attained by follow-up data collection; the correlation between the outcome and other available school characteristics; and the variance of the outcome of interest. We assume a response rate of 80 percent and we estimated the other factors using 2010 data. We calculated that the smallest impact that the study is likely to detect for enrollment in grade 10 in technical programs is 40 students, which is similar to the enrollment estimation used by MCC in the economic rate of return calculated for this intervention.³¹

For outcome indicators constructed with student-level school records, we assumed that data on 30 students (per grade) in each of the 40 study schools would be available. In the student-level analysis, additional factors that affect the statistical power of the study are the portion of the total variation of the outcome indicator of interest that lies between schools (intra-cluster correlation, ICC), and the size of the correlation between baseline data and follow-up data both at the school and student levels. We made conservative assumptions on these factors and estimated that the smallest effect that the evaluation is likely to detect is a 13 percentage point difference in graduation rates between the intervention and comparison groups.³² For employment and income, we used data from the ESE baseline survey to estimate the factors mentioned above.³³ We calculated that the smallest effects that the study will be able to detect are 8 percentage points for employment and \$630 for annual income.

³¹We used an initial enrollment of 81, a standard deviation of 94, which are the data from the Censo Matricular 2010, and an R^2 of 0.75. Our initial regressions estimate a larger R^2 but we use this value to be conservative.

³²We used an initial graduation rate of 73 percent to calculate the mean and standard deviation of this outcome indicator. This rate is based on graduation rates for technical secondary school that appear in MCC's Monitoring and Evaluation plan at <http://www.mcc.gov/mcc/bm.doc/el-salvador---me-plan.pdf> We assume an intra-cluster correlation of 0.2, a student-level R^2 of 0.3, and a school-level R^2 of 0.5.

³³This assumes that for employment ICC is 0.02 with an initial mean of 0.35 and for annual income ICC is 0.10, initial mean \$1,874 and standard deviation \$2,678.

6. Relationship between the Impact Evaluation Results and the ERR

As explained above, the ERR calculations for the secondary school strengthening intervention assumed that all benefits would be derived from more students attending and graduating from secondary school (as opposed to completing 9th grade) as a result of the intervention. In other words, the logic behind the ERR benefits calculation is that schools would build new classrooms and increase their capacity for additional students. In addition, the sub-activity would finance scholarships for students in these schools. As a result of increased school capacity and the scholarship's financial incentives, more students would enroll in, and complete, secondary school. A key assumption of the ERR model is that these additional students would have not attended secondary school in the absence of the interventions.

In contrast, Mathematica's impact evaluation compares enrollment levels in the 20 strengthened schools with enrollment levels in the 20 comparison schools (after adjusting for any initial differences). Central to this impact evaluation is its use of a counterfactual—education and labor market outcomes in the 20 comparison schools—to estimate what would have happened in the 20 treatment schools in the absence of the intervention. If the evaluation detects an impact on enrollment, our interpretation would be that as a result of the intervention, treatment schools enrolled more students than the comparison schools (accounting for initial differences). However, we cannot determine whether those additional students would have not attended secondary school without the intervention. While it is possible that the additional students would not have attended any secondary school without the intervention, it is also possible that the additional students would have attended secondary schools outside the treatment group in the absence of the intervention. In other words, it's feasible that the intervention merely influenced students to attend one of the 20 strengthened schools as opposed to a non-strengthened school.

However, in El Salvador, access to secondary education is consistently low. According to one source, 39 percent of seventeen year olds do not attend school.³⁴ Furthermore, through conversations with staff from the Ministry of Education, we have learned that the primary constraint to higher secondary education rates is schools' physical capacity and human resources to serve additional students. Therefore, we can conjecture that in El Salvador's Northern Zone, there are less available slots than students who would like to attend secondary school. Given the capacity constraints at secondary schools and the fact that students can apply to any secondary school they chose—regardless of their current address at the time of application—it is likely that even if some students decided to attend intervention secondary schools (as opposed to non-intervention schools), the resulting vacancies in non-intervention schools would likely have been filled by students who otherwise would not have attended secondary school. In sum, although we do not have data to confirm this assumption, we believe it is reasonable to assume that measured positive impacts in enrollment in intervention schools—relative to comparison schools—do in fact represent a net increase in secondary school enrollment in the Northern Zone.

Regarding income, the ERR assumed a benefit stream of additional income related to students' completion of secondary school. The logic is that a student who would not have attended secondary school without the intervention would now attend and complete (with some

³⁴http://www.siteal.iipe-oei.org/sites/default/files/perfil_el_salvador_2013_06.pdf.

probability) secondary school. Therefore, his/her wages would be higher upon graduation due to additional years of school and a secondary degree. In contrast, the evaluation's impact estimate is calculated by comparing the average income of students enrolled in the last year of secondary school in the 20 intervention school versus the average income one year after students were enrolled in the last year of secondary school in the 20 comparison schools one year after all students should have completed secondary school. Therefore, the evaluation assumes that two factors could feasibly generate positive impacts on income: 1) higher graduation rates in intervention schools (versus comparison schools), and 2) higher quality of education in intervention schools (versus comparison schools).

Regarding the impact evaluation, if students from the 20 strengthened schools graduate from secondary school with better skills (as was the goal of introducing new technical options and certification programs), these better skills could feasibly generate increased employment and income. However, the impact evaluation compares intervention and comparison school students who are already enrolled in their last year of secondary school. As such, our impact estimates will not capture income gains of having completed secondary school versus only primary school, as the ERR assumes. However, these impact estimates could feasibly capture income gains linked to the improved quality of education provided by strengthened intervention schools, in addition to any economic benefits of a potentially higher graduation rate in intervention schools among those students enrolled in the last year of secondary school.

V. IMPACT EVALUATION DESIGN FOR THE SCHOLARSHIP INTERVENTION

In this chapter, we focus on the impact-oriented research questions from the full set of evaluation questions for the scholarship intervention presented in Chapter III. Mathematica staff began designing and implementing this impact evaluation of the scholarship intervention since 2007, and an interim report has already been completed (Campuzano et al. 2013b). This chapter is based primarily on the design memorandum completed in 2010 (Campuzano and Blair 2010), and it also incorporates all the changes to the original design up to December 2013.

1. Research Questions and Basic Design

The purpose of the impact evaluation of the scholarship sub-activity is to determine whether FOMILENIO's scholarship recipients are better off than they would have been without the scholarship. Specifically, the study was designed to answer the impact-related questions for the secondary school activity:

- **Impact.** What is the impact of the offer of scholarships in some programs within strengthened schools on student educational and labor outcomes?
- **Impact for key target subgroups.** Were impacts different for girls versus boys? What types of participants experienced positive outcomes relative to other participants?

The most rigorous impact evaluation design available for determining the effectiveness of the scholarship activity is random assignment among the pool of applicants who have met the program selection criteria (that is, *eligible* applicants). Random assignment is logistically feasible and ethical in cases of *oversubscription*—that is, when the number of eligible applicants exceeds the number of scholarships available. As we learned in December 2009, there were more applicants to the scholarship activity than scholarships available for some schools and educational programs. This oversubscription of scholarships allowed us to proceed with random assignment of scholarships among eligible applicants within each school and educational program oversubscribed. In 2010, there was oversubscription in 15 educational programs in 12 of the 17 schools selected for the scholarships. As a result, randomization of scholarships was possible for these 15 educational programs.

An important limitation is that the scholarship program was implemented in tandem with FOMILENIO financed activities for strengthening the secondary schools where the programs were offered. Under this strengthening program, all 17 schools participating in the scholarship program received infrastructure improvements and most middle school teachers and administrators at these schools received teacher training. Most likely, these improvements would affect students' educational outcomes independently of the effect of the scholarship program. However, this evaluation cannot separate the effects of the monetary scholarship from the effects of other secondary school improvements. The impacts estimated should be interpreted as the effect of the offer of a scholarship to study in certain programs of the secondary schools strengthened by FOMILENIO. Therefore, the impacts reflect both the effect of the scholarship and of the improved schools.

Student assignment process. To promote scholarships for the 2010 academic school year, FEPADE staff visited all 162 primary schools that feed into the selected 17 secondary schools at the end of 2009. FEPADE received 1,841 scholarship applications, which they reviewed to assess eligibility. According to FEPADE's review, 1,524 applications were deemed eligible to receive a scholarship. As agreed with the stakeholders, random assignment was to be done only in schools and programs that were oversubscribed. A total of 15 schools and programs were oversubscribed, with a total number of 1,160 eligible applicants. In December 2009, FEPADE sent Mathematica a list of eligible applicants in each school and educational program that had more eligible applicants than available scholarships. Mathematica used this list to develop a computer program that randomized eligible applicants into three groups: (1) the intervention group (scholarships), (2) the control group (no scholarships), and (3) the nonresearch group (students on a waiting list who could replace students in the intervention group if they drop out in the first few weeks of the school year).³⁵

On December 11, 2009, scholarships were randomly assigned to applicants in a public event sponsored by FOMILENIO and MCC. Of 1,160 eligible applicants, 636 scholarships were randomly awarded, 449 students were randomly assigned not to receive scholarships (control group), and 75 students were placed on a waiting list for scholarships (nonresearch group). In late January 2010, Mathematica learned that scholarships were awarded to at least 36 students in the control group in one school, Dr. Francisco Martínez Suárez. To avoid biased estimates due to contamination of the control group, all intervention and control students from this school were excluded from the evaluation. All intervention and control students were also excluded from another school, Carolina, due to the large imbalance of intervention students (43) compared to control students (2) at the school. Another concern at this time was the relatively low acceptance rate (70 percent) among students in the intervention group.³⁶ As a result, FEPADE had a substantial number of unclaimed scholarships for the 2010 school year, but a lack of viable scholarship recipients outside of the control group. To raise the number of claimed scholarships, Mathematica designated 100 students from the control group as eligible to receive scholarships for the 2010 school year. To respect the randomness of the process, these students were selected according to their random number from the original selection process.³⁷ This transfer of students

³⁵Random assignment was done by school and educational program. Within each school and educational program, the computer program assigned a random number to each student. The students with the highest numbers were assigned to the intervention group up to the point where scholarships were no longer available; the next five highest numbers were placed on the waiting list; the rest of the students (those with the lower random numbers) were placed in the control group.

³⁶FEPADE informed Mathematica and MCC that there were several reasons for the low acceptance rate. In some cases, eligible applicants did not follow through with their intent of enrolling in 10th grade on time. By the time they tried to enroll, schools no longer had place for them. Others decided to enroll in schools that were not selected for scholarships. We have requested that FEPADE documents applicants' reasons for refusing the scholarship.

³⁷The original assignment process placed the students with the highest random numbers in the intervention group, the next five random numbers in the waiting list (nonresearch) group, and the rest of the students (those with the lowest random numbers) in the control group. The intervention group and the waiting list groups were not affected by the changes in January 2010. However, in some schools or programs, the original control group changed. Among the original controls, those students with the highest random numbers were placed in a nonresearch group that was offered a scholarship at that time, and students with the lowest random numbers were kept in the control

from the control group reduced the size of the study sample, which reduced the study's statistical power.³⁸ However, it met the more pressing need to award the majority of available scholarships for the academic year.

As a result of these changes, the evaluation is now being conducted in 13 educational programs of 10 schools with 751 students, 515 of whom were randomly assigned to receive scholarships and 236 of whom remained in the control group (see Appendix A, Table A.2). The 100 students from the original control group who were designated as eligible for scholarships were excluded from the evaluation (nonresearch group) in a manner similar to the 75 students originally placed on the waiting list.

2. Data Sources and Outcome Indicators: Scholarship Program

Unlike the secondary school strengthening intervention, which is implemented at the school level, the scholarship intervention is implemented at the student level; therefore, the outcome indicators for the scholarships evaluation need to be obtained at the student level. Two types of outcome indicators are of interest to the stakeholders: (1) educational outcomes such as enrollment, grade completion, continuation in school, and academic achievement (which had originally been planned to be collected from student-level administrative records); and (2) labor market outcomes such as employment, income, and continuation in post-secondary education (which had originally been planned to be collected through a student survey). However, as in the secondary school strengthening evaluation, student-level administrative records were not available. Therefore, MCC hired DIGESTYC to conduct three student surveys that serve as the data sources for this evaluation. Table V.1 provides descriptions and data sources of the outcome indicators discussed above.

(continued)

group and were not offered a scholarship. This decreased the sample size of the study, but respected the randomness of the process.

³⁸The reduction in statistical power due to these changes was the following: the minimum detectable difference went from 0.16 under the original sample size to 0.19 under the revised sample size. The section on statistical power provides more detail.

Table V.1. Descriptions and Data Sources of Outcome Indicators: Scholarships

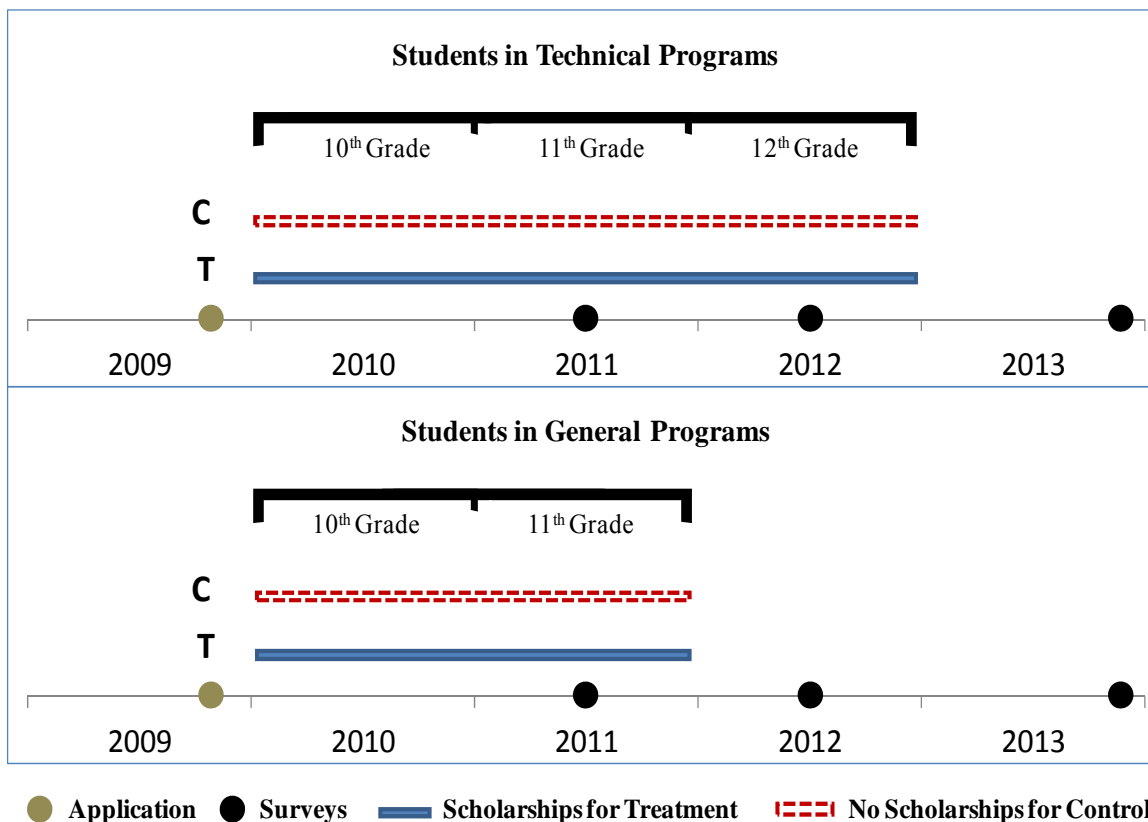
Outcome Indicator	Description	Data Source
Enrollment	Student-level binary variable of whether the student was enrolled in grade 10 in 2010, in grade 11 in 2011, and in grade 12 in 2012.	Student Survey
Pass Grade	Student-level binary variable of whether the student passed (or not) grade 10 in 2010, grade 11 in 2011, and grade 12 in 2012.	Student Survey
Progressed to the Next Grade	Student-level binary variable of whether the student advanced to the next grade in 2011 and 2012.	Student Survey
Academic achievement	Student-level variable of the scores the student reported obtaining in the PAES (grade 11).	Student Survey
Secondary school graduation	Student-level binary variable of whether the student graduated from secondary school either with a general degree (obtained in 11th grade) or a technical degree (obtained in 12th grade).	Student Survey
Employment	Student-level variable of student employment status at the time of the survey, including part- and full-time employment	Student Survey
Income	Student-level variable of student income in the 12 months preceding the survey. This includes formal and informal labor income, as well as remittances and other common sources of non-labor income.	Student Survey
Post-secondary education	Student-level variable of student post-secondary studies.	Student Survey

3. Time Frame of the Intervention and Data Collection

The first round of data collection was conducted in July and August 2011 (Figure V.1). The purpose was to obtain information on the main educational outcomes during 2010 and the first semester of 2011, as well as any labor market outcomes related to this period. The second round of data collection was conducted in July and August 2012. The purpose was to obtain information on educational outcomes during 2011 and the first semester of 2012, as well labor market outcomes for this period. The third round of data collection was conducted in October 2013. The main purpose of the third survey round was to collect labor market outcomes of the students one year after they should have finished technical secondary education. For students who registered for a general secondary education in 2010, we will have data on student employment almost two years after they finished general secondary school, because the data will be collected at the end of 2013 and they should have finished in 2011. For students who registered for a technical secondary education in 2010, however, we will have data on student employment one year after they finished technical secondary school in 2012, because the data were collected in 2013.

This time frame will allow us to obtain educational outcomes for the three years of technical secondary education and to obtain labor market outcomes approximately one year after the students should have finished technical secondary school.

Figure V.1. Scholarship and Data Collection Timeline, 2009–2013



4. Estimating Scholarship Impacts

The impact analysis relies on a regression specification that compares outcomes of students who were offered a scholarship (treatment group) with outcomes of students who were not offered a scholarship (control group), controlling for idiosyncratic differences between the two groups. The basic model can be expressed as follows:

$$(2) \quad Y_{it} = \alpha + \beta X_{is} + \lambda T_{is} + \eta_s + \varepsilon_{is}$$

where Y_{is} is the outcome of interest for student i in educational program or school s ; X_{is} is a vector of baseline characteristics of student i in educational program or school s (baseline data comes from application forms and includes variables such as household income, household size, grades, urban, age, and gender); T_{is} is an indicator equal to one if student i in program or school s was assigned to the treatment group and zero if he or she was assigned to the control group; η_s is a program-school-specific indicator variable to account for the fact that randomization was done within programs and schools (this fixed effect also allow us to control for differences across school or programs); and ε_{is} is a random error term for student i in school s . The parameter estimate for λ is the estimated impact of the scholarships on the outcome of interest.

In addition, all the impact estimates are weighted to account for differential assignment probability within strata and for nonresponse.

The estimate is based on an intent-to-treat analysis, so the estimates described above will be based on the sample that was randomized by the study. Students who drop out of school or of the scholarship program will still be treated as intervention or control, based on their randomization outcome. Students on the waiting list are not part of the research study, and thus are referred to as the nonresearch group.

An additional analysis of impacts by gender can be performed by adding an indicator variable for gender to the statistical model above. This will allow us to determine if impacts on graduation, enrollment, and income differ for males versus females. As an exploratory (and descriptive) analysis, we will also try to determine if any type of participants experienced positive or negative outcomes relative to other participant types. For example, we could compare and contrast the employment rates and annual incomes of students with relatively high initial achievement versus students with relatively low initial achievement (according to application data).

5. Statistical Power

In 2009, we conducted a statistical power analysis to determine minimum detectable impacts (MDIs) for each relevant outcome. An MDI is the smallest program impact that a research design can measure with confidence. Our ability to detect statistically significant impacts will be influenced by factors such as the total number of eligible students participating in the study; the rates of assignment to the intervention and control groups; the response rate attained by follow-up data collection (assumed at 80 percent); the correlation between the outcome and other available student and school characteristics (assumed at 0.40); and the variance of the outcome of interest. An equivalent measure is the minimum detectable effect size (MDE), which is the MDI measured in standard deviations of the outcome. The advantage of using MDE is that we have a common comparison for different outcomes.

Our power calculations indicate that the study is powered to detect effect sizes of around 0.20 standard deviations of the outcome, which are within the typical range of effect sizes encountered in educational studies. We assumed a sample size of 751 students, with 70 percent of them randomly assigned to the intervention group and 30 percent to the control group. The smallest effect on graduation of secondary school that the study is likely to detect is 0.19 standard deviations, which is equivalent to an increase of 8.4 percentage points in graduation rate, assuming that the initial graduation rate is 75 percent.³⁹ Our experience in other educational interventions is that effect sizes near 0.20 standard deviations are common. We therefore believe that the scholarship evaluation is well powered to detect policy-relevant effects.⁴⁰

³⁹MCC's Monitoring and Evaluation Plan for El Salvador assumes graduation rates of 72 and 78 percent.

⁴⁰The calculations were done to estimate an intent-to-treat impact. However, the statistical power of any treatment-on-the-treated analysis was lower as a result of the low scholarship acceptance rate. For example, for an

6. Relationship between the Impact Evaluation Results and the ERR

In the previous chapter, we discussed how the impact evaluation results of the school strengthening intervention relate to the ERR model. Here we will discuss how the results of the scholarship impact evaluation relate to the ERR model. An important difference between the impact evaluation of scholarships and the impact evaluation of strengthened schools is the study sample. The scholarship evaluation compares outcomes of students who were enrolled in 9th grade and were offered a scholarship to continue their secondary studies (treatment group) versus students who were enrolled in 9th grade and were not offered the scholarship (control group). In contrast, the school strengthening evaluation compares students in the 20 strengthened schools to students in the 20 comparison schools. An impact of the scholarship offer on enrollment in 10th grade of 8 percentage points means that 8 percent of the treatment group enrolled in secondary school due to the scholarship offer, and these students would have not enrolled in secondary school without the scholarship. These impact estimates from the scholarship evaluation are conceptually in line with the ERR model, which assumes that non-recipients will not progress in school. However, we cannot use this estimate to calculate how many students attending strengthened schools would not have attended without the strengthening or scholarship programs (which is what the ERR needs as input).

Regarding the evaluation's analysis of income, the impact of the scholarship offer is calculated by comparing average income of the treatment group—four years after the scholarship for secondary school was offered—to the average income of the control group (who was not offered the scholarship). The impact on income will reflect several ways in which the offer of the scholarship could have affected income: 1) treatment and control groups enrolled in secondary schools at different rates, 2) treatment and control groups attended different schools (a larger proportion of the treatment group attended strengthened schools), and 3) dropout and graduation rates differ across treatment and control groups. In contrast, the ERR for strengthening schools assumes that the income gains come from attending and likely completing secondary school versus not attending secondary school. As with the case of the secondary school strengthening evaluation, the income estimate derived from the scholarships evaluation cannot be used to as an input on the ERR model because it does not estimate income gains from completing secondary school (versus not completing secondary school).

(continued)

acceptance rate of 70 percent then the effect sizes the evaluation would be able to detect are of 0.30 standard deviations, which translate into an effect of 12 percentage points.

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VI. EVALUATION DESIGN FOR THE ITCHA/MEGATEC INTERVENTION

In this chapter, we present all the research questions related to the ITCHA/MEGATEC intervention and discuss the quantitative and qualitative evaluation methods we will use to address them. As discussed, the ITCHA intervention has linkages to the secondary school and scholarship interventions that Mathematica is evaluating using a mixed methods research design. However, the ITCHA evaluation targets post-secondary education in contrast to the other two interventions (discussed in Chapters III to V), which target the secondary school level. Since 2007, Mathematica has been implementing an impact evaluation of the ITCHA/MEGATEC intervention and produced an interim evaluation report in 2013. This chapter is based primarily on the original design, summarized in Blair et al. (2013), but has been modified to include additional research questions requested by MCC in late 2013. To highlight our proposed approach to meeting MCC's additional requests, we use text boxes throughout the chapter.

1. Research Questions and Basic Design

For the ITCHA evaluation, we will address the following six research topics:

1. **Design/implementation.** How were ITCHA strengthening efforts designed and implemented (including construction, teacher training, new MEGATEC degree programs, and scholarships)? Did implementation meet original targets and expectations, both in terms of quantity and quality? How were MEGATEC degree programs implemented at ITCHA and its linked secondary schools (including teacher training and curriculum), and how were students graded on competencies?
2. **Description of participants.** What are the characteristics (age, gender, income, etc.) of ITCHA students? What are students' professional aspirations and constraints to education and employment?
3. **Results.** Did enrollment, instruction, achievement, and graduation meet stakeholders' expectations? Why or why not? How did enrollment and graduation change from 2010 to 2014? Did MEGATEC degree programs prepare students for employment and university-level studies? Did ITCHA graduates obtain jobs and experience increased income following graduation?
4. **Results for key subgroups.** Who likely benefited most from the ITCHA/MEGATEC investments? Did ITCHA students who graduated from secondary school MEGATEC programs have better academic and labor market outcomes than students who did not attend secondary school MEGATEC programs? Were results different for girls versus boys?
5. **Explanation for results.** What are potential reasons that results (enrollment, achievement, graduation, employment, and income) did or did not meet expectations? If results were different for girls versus boys, why?
6. **Sustainability.** Are ITCHA and MEGATEC improvements being maintained in the short-term (including the continued offer of scholarships)? Are they likely to be maintained in the medium to long term?

These questions are particularly relevant and of interest to El Salvador's Ministry of Education to sustain the MCC-initiated programs, including funds to maintain ITCHA's facilities, train ITCHA teachers, and continue post-secondary MEGATEC scholarships in several MEGATECs throughout the country. The evaluations will provide the Ministry with information regarding the potential effect of these investments on students' enrollment and graduation rates as well as employment and income outcomes.

Mixed-methods design. To answer these research questions, we are using a mixed-methods performance evaluation design.⁴¹ This design uses a mix of qualitative information gleaned from stakeholder interviews and focus groups, as well as quantitative information gleaned from administrative records and student follow-up surveys. Mathematica researchers will collect qualitative data from semi-structured, in-person interviews with ITCHA administrators, MINED, CIDE, former FOMILENIO representatives, and principals from linked secondary schools. In addition, we will conduct semi-structured focus groups with linked secondary school and ITCHA students and teachers.⁴² These qualitative data will be supplemented by quantitative data gleaned from follow-up surveys with two cohorts of ITCHA students. (See Table VI.1 for an indication of which methods and data sources will be used to answer each research topic.) Below, we provide more detail on qualitative and quantitative data collection and analysis.

Qualitative data collection. In total, Mathematica staff will conduct two rounds of interviews and focus groups to ask stakeholders about their perceptions of program implementation. The first round of qualitative data collection occurred in 2011, and the second round is scheduled for late 2014. This second round will include interviews and focus groups with ITCHA staff about their experiences with school improvements, training, new degree programs, and scholarships; their views on the overall quality of program implementation; the approach to structuring MEGATEC modules and assess student achievement; and their perceptions on students' education and labor market outcomes (Topic 1 and 3). Also during qualitative data collection, Mathematica staff will hold focus groups with current ITCHA students to learn more about their socioeconomic backgrounds, academic achievement, and career goals (Topic 2), as well as their experience at ITCHA and linked secondary schools (Topic 1).

Questions about results (Topics 3, 4, and 5) will delve into stakeholders' perceptions on the main factors driving key enrollment and graduation trends, and the primary reasons some groups may have fared better than others in terms of achievement, graduation, and employment. For example, interviews with ITCHA teachers will explore whether students who completed

⁴¹We could not conduct an impact evaluation of the ITCHA component, as this would require information on an alternate institution to which ITCHA could be compared—for example, a similar technological center that will not be transformed into a MEGATEC. However, finding suitable comparison schools was likely to be very difficult, because technical institutes in El Salvador offer a different mix of technical degrees and serve different student populations across the country (not only in the Northern Zone). Furthermore, an important technical limitation is that comparing only two institutions would not allow us to isolate the effect of the intervention from all other factors particular to those two institutions that could also influence the outcomes of interest.

⁴²ITCHA administrators and teachers are employees of AGAPE, a non-profit religious organization that administers ITCHA's degree programs.

secondary school MEGATEC degrees are better prepared for post-secondary education than students who did not complete them. If possible, Mathematica staff will share preliminary quantitative findings on student employment and income with stakeholders (discussed below) during interviews and focus groups, as these findings could facilitate a discussion of factors driving results.⁴³

During focus groups, we will also explore sustainability issues (Topic 6), specifically the current state of ITCHA infrastructure investments, MEGATEC teacher training services, ITCHA scholarships, and any other key factors necessary to sustain current MEGATEC degree programs or create additional technical programs in the future.

Quantitative data collection and review. We will use existing administrative data to summarize program implementation (Topic 1); describe program participants (Topic 2); assess the evolution of enrollment and graduation rates between 2010 and 2014 (Topic 3); and examine the gender balance of ITCHA students and graduates (Topic 4). In addition, Mathematica staff will attempt to survey all students who enrolled in the first year of ITCHA in early 2011 and 2012 (discussed in depth below). These ITCHA student surveys will provide detailed information on the sex, age, and demographic characteristics of ITCHA students, as well as their employment and income outcomes following post-secondary school (Topics 3 and 4).

Although qualitative interviews with stakeholders will provide most of the information on sustainability (Topic 6), administrative information on current and future budget allocations for ITCHA will also provide insight into the sustainability of MCC-funded infrastructure improvements and investments in teacher training. For example, strong MINED budget outlays for ITCHA maintenance, teacher training, and scholarships would suggest strong potential for sustained ITCHA enrollment and operations, whereas weak outlays for these costs may suggest that decreased investments in ITCHA following the FOMILENIO intervention could result in decreased enrollment or a reduction in the quality of the school's infrastructure or academic programs.

Triangulation of data. To the extent possible, we will attempt to triangulate qualitative information provided by stakeholders during interviews with survey data, administrative data and programmatic reports on program implementation.⁴⁴ For example, we will compare and contrast stakeholders' perceptions on the completeness of implementation with monitoring data on implementation outputs and targets. We will also attempt to triangulate stakeholders' perceptions on the quality of implementation—including the quality of training provided and infrastructure improvements—with programmatic reports.

⁴³ It is not yet clear whether we will have verified preliminary findings from our analysis of survey data by the time of qualitative data collection. We will update MCC on this issue prior to data collection.

⁴⁴ Programmatic reports contain both qualitative and quantitative information. Using a tagging or coding system, we will examine the extent to which implementation themes commonly cited in interviews are present in programmatic reports. We will also triangulate administrative data and quantitative findings in programmatic reports with stakeholder perceptions, particularly regarding the quality of implementation. If programmatic reports show that all implementation targets were met (in terms of number of trained teachers or constructed labs), but interviewed stakeholders report that training was not adequate or labs are not functioning, we should highlight this discrepancy in our results.

Table VI.1. Data Sources and Evaluation Designs for ITCHA Research Questions

Research Topics and Questions	Evaluation Design	Data Sources
1. Design/Implementation		
How were ITCHA strengthening efforts designed and implemented (including construction, teacher training, new MEGATEC degree programs, and ITCHA scholarships)?	Mixed-methods	Interviews and focus groups with stakeholders, administrative records, and programmatic reports
Did implementation—including infrastructure improvements, new degree programs, and teacher training—meet original targets and expectations, both in terms of quality and quantity?	Mixed-methods, with comparison of final outputs to M&E targets	
How were MEGATEC degree programs implemented at ITCHA and its feeder secondary schools, and how were students graded on competencies?	Mixed-methods	
2. Description of Participants		
What are the characteristics (age, gender, income, etc.) of ITCHA students? What are students' professional aspirations and constraints to education/employment?	Mixed-methods	School records, survey data, and focus groups with students
3. Results		
Did enrollment, instruction, achievement, and graduation meet stakeholder expectations? Why or why not?	Mixed-methods, with comparison of final results to M&E targets	ITCHA administrative data, interviews, and focus groups
How did enrollment and graduation change from 2010 to 2014?	Descriptive analysis	ITCHA administrative data
Did MEGATEC degree programs prepare students for employment and university-level studies?	Mixed-methods	Interviews, focus groups, workshops, administrative records, and reports
Did ITCHA graduates obtain jobs and experience increased income following graduation?	Quantitative analysis with the comparison group of ITCHA students who did not graduate	Student survey data
4. Results for Key Subgroups		
Did some groups experience positive or negative outcomes relative to other groups?	Quantitative analysis of primary outcomes by degree program, scholarship award, etc.	Student survey data and ITCHA records
Did ITCHA students who graduated from secondary school MEGATEC programs have better academic and labor market outcomes than students who did not attend secondary school MEGATEC programs?	Quantitative analysis comparing outcomes of ITCHA students from linked secondary schools to ITCHA students who did not attend schools	

Table VI.1 (cont'd)

Research Topics and Questions	Evaluation Design	Data Sources
Were results different for girls versus boys?	Quantitative analysis of primary outcomes by gender	
5. Explanation for Results		
What are potential reasons that results (enrollment, achievement, graduation, employment, and income) did or did not meet expectations?	Mixed-methods	Interviews and focus groups with stakeholders; synthesized findings on implementation and results
What socioeconomic or implementation factors may help explain variations in results by gender?		
6. Sustainability		
Are ITCHA and MEGATEC improvements being maintained in the short term (including scholarships)?	Mixed-methods	Interviews and focus groups with stakeholders; administrative records
Are they likely to be maintained in the medium to long term?		

Additional Analysis on Students Who Attended Strengthened Secondary Schools And ITCHA

In 2013, MCC representatives expressed interest in studying the combined effect of improved secondary schools and ITCHA improvements on student outcomes. In response, Mathematica is analyzing how well ITCHA students who graduated from MEGATEC secondary school programs fared compared to students who entered ITCHA MEGATEC programs without a MEGATEC secondary school degree.¹ Using student survey data and administrative data, we will determine whether ITCHA students who completed secondary school MEGATEC degrees were more likely to excel in school, graduate, and find employment than ITCHA students who did not. Measured differences between these groups may provide some insight into the possible effect of completing four years of MEGATEC education versus completing only two years of MEGATEC education.

2. Data Collection and Interviewee Selection Plans

Qualitative data collection and interviewee selection. Qualitative data collection for the ITCHA evaluation consists of semi-structured, in-person interviews and focus groups with the following stakeholders: (1) ITCHA administrators; (2) MINED, CIDE, MCC, and former FOMILENIO representatives directly involved in program design and implementation; (3) ITCHA and linked secondary school teachers; (4) ITCHA and linked secondary school students; and (5) principals of secondary schools with linkages to ITCHA. Mathematica staff interviewed these stakeholders during in 2011 and will interview all groups again in 2014.⁴⁵

⁴⁵Because the final evaluation focuses on ITCHA students and graduates, we will not interview these groups again.

With the help of ITCHA staff, we will conduct focus groups with a convenience sample of students and teachers from the full population of active ITCHA students and teachers (see Table VI.2 for projected sample sizes). One focus group of MEGATEC students will include at least four students from each of the two new MEGATEC degree programs—with at least two students in each program who also completed MEGATEC secondary degree programs.⁴⁶ This will allow us to hear perspectives on both the civil engineering and alternative tourism MEGATEC programs, and interviewing at least two students who also completed MEGATEC secondary degree programs could provide insight into the experience of students who skipped the first year of ITCHA studies due to their completion of a secondary MEGATEC degree. To compare and contrast the experiences of MEGATEC versus non-MEGATEC students, we also hope to conduct a focus group with at least six ITCHA students who are not enrolled in MEGATEC degree programs.

Similarly, the sample of ITCHA teachers invited to focus groups will include at least two teachers from each of the two MEGATEC programs, and at least two teachers not associated with the MEGATEC programs. These criteria will allow us to compare and contrast the experiences of ITCHA students and teachers according to their involvement in MEGATEC programs.

Table VI.2. Sample Sizes for ITCHA Qualitative and Quantitative Data Collection, 2014

Data Source				
Principals	Teachers	Former Students	Current Students	FOMILENIO, MINED, MCC, and CIDE Representatives
1 ITCHA principal and up to 2 secondary school principals (in-person)	Focus groups with at least 6 ITCHA teachers and 4 secondary school teachers	Follow-up surveys with up to 400 former ITCHA students in 2013 and up to 400 former ITCHA students in 2014 (total of 800)	2 focus groups with at least 14 ITCHA students	Interviews with up to 5 representatives

In addition, we will interview two principals of the linked secondary schools with MEGATEC programs, as well as at least four teachers who teach the civil engineering and alternative tourism MEGATEC programs at these secondary schools. If possible, at least two sampled teachers will teach the alternative tourism MEGATEC program, and at least two sampled teachers will teach the civil engineering MEGATEC program.⁴⁷ This will allow researchers to ask questions about potential linkages between secondary and post-secondary MEGATEC programs, as well as to compare the lesson plans and assessment methodologies of these two MEGATEC programs.

⁴⁶An optimal arrangement would be at least one student from each of ITCHA's four non-MEGATEC degree programs. This would facilitate some comparison of experiences between MEGATEC and non-MEGATEC students.

⁴⁷This requirement necessitates field visits to either Aguilares or Benjamin Estrada Valiente (to discuss the civil engineering program) and either San Ignacio or La Palma (to discuss the alternative tourism program).

Exploring MEGATEC Curriculum and Student Assessment

In 2013, MCC expressed interest in assessing how well the competency-based MEGATEC approach is being implemented at ITCHA and its linked secondary schools. To explore this, Mathematica is devoting a portion of teacher interviews to discussing how MEGATEC modules are structured and how students are assessed. Before interviews, we will request that ITCHA and secondary school MEGATEC teachers bring a copy of their annual curricula, at least one example of exemplary student work, and at least one example of student work that does not meet basic module requirements. During the interviews, we will ask teachers to present these lesson plans and examples of student work, and describe their methodology for assessing this work. After these interviews, we will document similarities and differences between curricula and student assessment methodologies among ITCHA MEGATEC programs, among secondary school MEGATEC programs, and between ITCHA and secondary school MEGATEC programs.

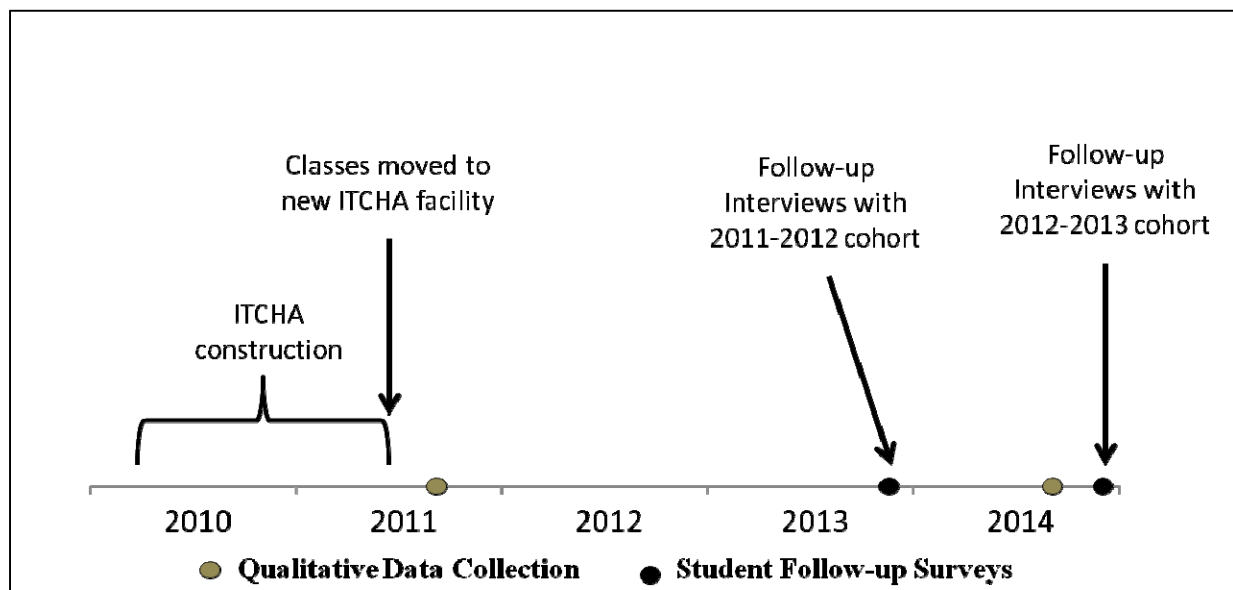
In addition, we will request that Agape staff provide us with any information on ITCHA students' achievement levels over time—including grade point averages or other assessment metrics. If possible, we will obtain this information by degree program, and disaggregated by gender. An analysis of achievement levels will provide insight into how student achievement—or at least the primary measures of student achievement—have evolved since the ITCHA intervention's investments in new degree programs and teacher training were introduced.

In September 2013, Mathematica developed a master interview protocol for beneficiaries and key staff related to the ITCHA and MEGATEC interventions (See Appendix B for the draft master protocol, which delineates which questions will be asked of each stakeholder type and provides justifications for topics asked of each type). The master protocol is structured around the study's six primary research topics; each topic contains several specific sub-questions that explore different aspects of the broader topic. In mid 2014, we hope to obtain MCC's approval for these proposed designs and protocols and to conduct the qualitative interviews listed in Table VI.2 in late 2014.

Quantitative data collection and interviewee selection. To complement qualitative interview data, Mathematica staff will analyze ITCHA administrative records and present general trends regarding enrollment, grade continuation, and graduation. If possible, we will also obtain and analyze administrative data on student achievement, particularly regarding MEGATEC competencies.

In addition, Mathematica is implementing a follow-up survey that will be administered to two cohorts of ITCHA students approximately one year after their graduation. This survey was administered in late 2013 to the full cohort of ITCHA students who enrolled in their first year of studies in 2011. In late 2014, a similar follow-up survey will be administered to the full cohort of ITCHA students who enrolled in their first year of studies in 2012 (see Figure VI.1).

Figure VI.1. ITCHA Data Collection Timeline



Both 2013 and 2014 student surveys will be used (1) to assess whether former ITCHA students (including both graduates and non-graduates) have found employment approximately one year after their projected graduation date, and (2) to quantify their average employment income. The 2014 follow-up survey is unique because it will include the first cohort of students who progressed through both secondary and post-secondary MEGATEC programs established under the sub-activity. As such, the results from the 2014 survey will allow us to compare educational and labor market outcomes of students who completed secondary MEGATEC programs before enrolling in ITCHA versus students who were first introduced to MEGATEC programs at ITCHA.⁴⁸

Each of the 2013 and 2014 survey cohorts contains approximately 400 students (see Table VI.2).⁴⁹ We expect these cohorts to be relatively balanced by gender, and the age range of sampled students is expected to be between 19 and 22 years old at the time of the survey. We will coordinate with ITCHA administrative staff to obtain updated contact information for all students in the survey sample.

⁴⁸This is an interesting comparison because secondary school MEGATEC graduates will have three years of secondary school study and one year of post-secondary school study in their field, whereas students who did not complete MEGATEC secondary school programs will have only two years of post-secondary study in their field.

⁴⁹The full cohort of students enrolled in their second year of studies may be lower than the pre-identified sample size of 400 students. To complete the 400 surveys, data collectors may attempt to locate students who enrolled in the first year of ITCHA, but dropped out during the first school year. Depending on the number of dropouts that are located and surveyed, it may be possible to compare their employment and income with those of ITCHA graduates.

Additional Details on the 2014 ITCHA Follow-up Survey

In 2013, MCC proposed adding an additional ITCHA student follow-up survey to data collection for the ITCHA/MEGATEC performance evaluation. This survey would supplement the 2013 ITCHA student follow-up survey, which was completed by DIGESTYC in December 2013. Below we provide summary information on the proposed additional follow-up survey.

Name: 2014 ITCHA Student Follow-up Survey

Rationale: The 2014 follow-up survey will obtain education and labor market data for the first cohort of students who progressed through both secondary and post-secondary MEGATEC programs established under the sub-activity. An analysis of these data will help MCC better understand the outcomes of students who participated in the full array of services financed under the Formal Technical Education Sub-Activity, including infrastructure improvements, teacher training, scholarships, and new MEGATEC degree programs at the secondary and post-secondary level.

Content of Survey Instrument: Modules on education outcomes (continuation, graduation), labor market outcomes (employment and labor income), non-labor income, demographic characteristics, and scholarships. Students are also asked about their satisfaction with ITCHA facilities and academic programs.

Field dates: November and December, 2014

Sample size: Up to 400 students who enrolled in the first year of ITCHA in early 2012.

Data collectors: DIGESTYC (tentative)

Estimated cost: \$20,000 (based on cost of 2013 ITCHA follow-up survey)

3. Data Analysis

In 2014, Mathematica will analyze qualitative and quantitative data sources separately and relationally. We will organize and synthesize findings according to our evaluation framework. In particular, we will triangulate reports from MINED, CIDE, and FOMILENIO staff, as well as principals, teachers and students, taking into account that each set of stakeholders faces unique incentives that could affect their responses to interview questions. These data will be analyzed and presented separately for MEGATEC and non-MEGATEC programs, and for male and female students, when relevant. The analysis components include:

- **Program design** (Topic 1). To begin analyzing the program design and implementation, we will sort data from qualitative interviews and administrative records into conceptual categories. To understand and characterize the design of the ITCHA intervention—including the linked MEGATEC component—we will group data into the following categories: (1) objectives, activities, and investments; (2) target population; (3) implementers and other actors; (4) funding and timeline; and (5) relationships between investments. Next, we will assess the coherence and completeness of information for each category, and compose summary paragraphs and tables of each conceptual category of program design.
- **Program implementation** (Topic 1). To characterize implementation, we will likely (1) identify natural demarcations between phases of implementation, (2) summarize

all relevant investments and activities in each phase, (3) document all actors involved, (4) compare any programmatic outputs to pre-defined goals, and (5) document stakeholders' explanations for why goals were or were not met. The MCC-El Salvador compact and the FOMILENIO M&E plan (updated September 2012) will serve as the primary source for ITCHA implementation goals. For example, the M&E plan identifies an enrollment goal of 540 ITCHA students in 2012. We will compare the actual number of trained individuals reported in programmatic documents or administrative data to these goals, and present stakeholders' perceptions of why these goals were or were not met.

Also related to program implementation (Topic 1), we must analyze interview data and school curricula to determine how student competencies were assessed at ITCHA and at the linked secondary schools. To do this, we must assess the extent to which established grading criteria were employed in assessing at least three students. As part of our analysis, we will document the extent to which grading criteria were applied uniformly or non-uniformly among students in MEGATEC programs at ITCHA (for example, between an ITCHA civil engineering student and an ITCHA alternative tourism student), and among secondary and post-secondary MEGATEC programs (for example, between a secondary school civil engineering student and an ITCHA civil engineering student). This analysis will not assess the quality of the MEGATEC grading scheme per se, but rather the extent to which the established grading scheme has been implemented at ITCHA and its linked secondary schools.

- **Characterizing participants** (Topic 2). We will use follow-up ITCHA student surveys to summarize the demographic and socioeconomic characteristics of ITCHA students, as well as compare and contrast the demographic characteristics of students who graduated from ITCHA versus those who did not. We will analyze and present these quantitative analyses in conjunction with qualitative narratives provided by students during focus groups.
- **Analyzing outcome data** (Topic 3). Data collectors will provide Mathematica with ITCHA student survey data in early 2014 and early 2015. Mathematica will conduct a quantitative analysis of these data in early 2014 and early 2015, respectively. As part of the quantitative analysis, we will calculate and present the outcomes in Table VI.3 for all ITCHA students who were surveyed in 2013 and 2014. Of particular importance is calculating the employment rate and income of ITCHA graduates, given that the MCC-El Salvador compact and M&E plans cite key goals of 70 percent employment among ITCHA graduates.⁵⁰ ITCHA student surveys have been designed to closely align with secondary school and scholarships surveys, so that employment rates and annual income are calculated at secondary and post-secondary levels using the same methodology.

To the extent possible, our analysis will also explore assumptions underlying the MCC-El Salvador compact's goals of a 42 percent increase in incomes of MEGATEC

⁵⁰Annex III-2 of the Millennium Challenge Compact Between the U.S. and El Salvador and FOMILENIO Monitoring and Evaluation Plan, September 2012.

graduates versus non-MEGATEC graduates.⁵¹ Although there is no suitable comparison group of nongraduates to which we can compare ITCHA graduates regarding income one year after attending ITCHA, our survey of all ITCHA enrollees will permit us to calculate and compare the incomes of ITCHA graduates one year after graduation to the incomes of ITCHA enrollees who did not graduate within the expected time frame. Due to potential selection bias, the difference in average income between the two groups should not be interpreted as the impact of ITCHA's potentially superior technical degree programs' on student income.

- **Analyzing outcomes by subgroups** (Topic 4). In this analysis, we will also compare and contrast males' and females' graduation rates, employment rates, and income, as well as compare and contrast the outcomes of MEGATEC students versus non-MEGATEC students and scholarship recipients versus non-recipients. As described above, we will also compare and contrast the academic and labor market outcomes ITCHA MEGATEC students who received MEGATEC secondary school degrees with ITCHA MEGATEC students who did not.⁵² (See Table VI.4 for a list of all key subgroup comparisons in the ITCHA results analysis and a rationale for these comparisons.) Note that most of these comparisons are subject to selection bias because the type of student who decides to select into each condition may be different from the type of student who decides to select into the other condition. For example, students enrolling in the alternative tourism MEGATEC degree program may be systematically different from students enrolling in the computer technician (non-MEGATEC) program in terms of their motivation, skill set, and career goals. As such, any differences in outcomes between students in one program versus another should not be interpreted as the differential effect of ITCHA improvements on these groups.

⁵¹Annex III-2 of the Millennium Challenge Compact Between the U.S. and El Salvador and FOMILENIO Monitoring and Evaluation Plan, September 2012.

⁵²This is only possible with the cohort of ITCHA students who will graduate at the end of 2013 and be interviewed in late 2014, provided that the first cohort of secondary school MEGATEC students will graduate from ITCHA in 2013.

Table VI.3. Student Outcome Indicators for ITCHA Follow-Up Analysis

Indicator	Description	Data Source
Academic achievement	Final grade point average (or equivalent grading metric) at ITCHA	Administrative Records
Passed 2nd year at ITCHA	Binary measure of whether the student passed the second year of study, according to the student	Administrative Records
Graduated from ITCHA	Binary measure of whether the student received a superior technical degree from ITCHA	Administrative Records
Employed one year after planned graduation	Binary measure in which a student is considered employed if he or she reported being employed either part- or full-time	Follow-Up Survey
Employed full-time one year after planned graduation	Binary measure in which a student is considered to have full-time employment if he or she reported working at least a minimum threshold of 40 hours per week	Follow-Up Survey
Hours worked weekly	Number of hours the student reported working on a weekly basis	Follow-Up Survey
Student total annual income during year following planned graduation	The sum of student-reported annual income from his or her main job, secondary activities such as a second job, and scholarships, remittances, and transfers from parents	Follow-Up Survey
University enrollment	University-level education one year after students were scheduled to graduate from post-secondary technical school	Follow-Up Survey

Note: To the extent possible outcomes of employment and income for the ITCHA analysis will be calculated with the same methodology used to calculate these outcomes for the secondary school and scholarship analyses.

Table VI.4. Key Comparisons of ITCHA Results

Comparison	Rationale for Comparison
Compare employment and income of ITCHA graduates versus nongraduating ITCHA enrollees	Explore the extent to which ITCHA graduation is associated with positive labor market outcomes
Compare graduation, employment, and income of female and male enrollees	Explore differential outcomes according to gender, in accordance with MCC's objective of disaggregating key outcomes by gender
Compare employment, and income of MEGATEC ITCHA graduates versus non-MEGATEC ITCHA graduates	Explore the extent to which MEGATEC civil engineering and alternative tourism programs are associated with better or worse labor market outcomes relative to non-MEGATEC programs in computer technologies and marketing
Compare graduation, employment, and income of ITCHA students who came from linked MEGATEC programs versus ITCHA students who did not (only possible with 2014 survey data)	Explore the extent to which four years of MEGATEC training (at both secondary and post-secondary levels) is associated with better education and labor market outcomes than two years of MEGATEC training (at post-secondary level only)

- **Explanation of results** (Topic 5). We will use qualitative data from in-person interviews with principals, teachers, and MINED and FOMILENIO representatives to gather contextual information on results. A main finding of the interim ITCHA evaluation is that enrollment increased by large margins in 2010 and 2011 (Blair et al. 2013). With information from stakeholders on why enrollment increased during the evaluation period, we will group these explanations into broad categories. For example, some stakeholders may claim that the new facility boosted enrollment, and other stakeholders may argue that new scholarships had a large role in motivating students to enroll. By grouping these explanations and assessing the frequency with which they are mentioned, we can fully document potential explanations for enrollment, graduation, and labor market results. In addition, if our analysis yields differential results in graduation or employment rates for girls versus boys, we will present a similar analysis of stakeholders' explanations for these results.
- **Analyzing sustainability** (Topic 6). Using information from qualitative interviews, we will further refine our analytic framework for analyzing the sustainability of the ITCHA improvements. In our interim evaluation report, we assessed ITCHA's medium- to long-term sustainability on the following criteria: (1) stakeholder political and financial support, (2) availability of human capital, (3) sustained demand for secondary schools and scholarships, and (4) sustained capital resources to maintain original infrastructure investments. During the analysis phase, we will aggregate and assess the most updated qualitative information and quantitative information on each criterion, and prepare the criterion-specific results and overall sustainability assessment.

4. Limitations

It is important to note that the qualitative methods detailed in this chapter have certain limitations. As with most qualitative research, stakeholder interviews and focus groups are illustrative and do not constitute a representative sample of all teachers and students affected by the sub-activity. The results of qualitative analysis for the ITCHA evaluation, therefore, may not generalize to all teachers and students that differ systematically from those in the sample.

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VII. ADMINISTRATIVE ASPECTS

In this chapter, we provide additional information on important administrative aspects of all evaluations for the Formal Technical Education Sub-Activity. These include institutional review board requirements and clearances, data access and privacy, schedule for reports and dissemination of results, and staffing for the evaluations.

1. Summary of Institutional Review Board Requirements and Clearances

In late 2013, Mathematica staff solicited approval from the Western Institutional Review Board (WIRB) for all remaining in-person surveys and focus groups related to the scholarship, secondary school, and ITCHA evaluations. WIRB granted approval, with the provision that *parental consent be obtained for all study participants under 18 years of age*. In addition, WIRB required that additional language be added to oral introductions to in-person interviews, in which data collectors explain that participants face no direct benefits or risk as a result of the research, and explicitly ask for consent to continue with the interview. Starting with data collection in October 2013, Mathematica and its data collection partner, DIGESTYC, followed this protocol. The important aspects of the protocol are provided here:

All the information we obtain will remain strictly confidential and this information will not be released in any way that would allow identification of yourself or your answers. The information you provide may be seen by Millennium Challenge Corporation (MCC), Salvadoran Ministry of Education (MINED) and the Office of Statistics and Census of the Ministry of Economy (DIGESTYC). This information will be used for evaluation purposes only, and all identifiable information such as names or contact information will be removed. Once the study is completed data from the study that does not identify you personally will be made publicly available to enable additional analyses.

Your participation is voluntary and you may choose not to answer any or all questions for any reason. *In other words, you have the alternative to not participate*. There is no penalty or change in your educational or occupational status if you do not participate in this study. There are no risks and no direct benefits to you for participating in this study.

You may contact Alejandro Sosa, the director of this survey, at 2590-2146 if you have questions, concerns, input, or complaints about the study or your rights as a participant. If you have questions about your rights as a research subject or if you have questions, concerns or complaints about the research, you may contact: Western Institutional Review Board[®] (WIRB[®]), Telephone: 1-800-562-4789, E-mail: Help@wirb.com, WIRB is a group of people who perform independent review of research.

- Do you agree to be in this research?
- Do you have any questions before we begin?

2. Data Access, Privacy, and Documentation Plan

One stipulation of WIRB approval of the research protocol is that Mathematica does not share any information that could identify study participants. To protect participants' confidentiality, Mathematica staff stores all data on a secure server. Only individuals with proper permissions can access data on this server.

Under its current contract, Mathematica staff will produce public use data sets for the secondary school strengthening, scholarship, and ITCHA evaluation components. All public data sets related to the Formal Technical Education Sub-Activity will follow the latest MCC anonymization guidelines, including the deletion of all names and personal identification numbers and aggregating or recoding data to preclude the identification of individuals or groups. All public data sets will be submitted to MCC with proper documentation, including a data dictionary, all statistical programs, and a full explanation of all transformations and imputations.

3. Project Timeline and Deliverables

In May 2013, we finalized a memorandum to MCC summarizing the interim findings of the strengthening secondary schools evaluation (Campuzano et al. 2013a). This document used MINED data from 2010. The main focus of this document was to estimate the impact of one year of the intervention on students' enrollment in 10th grade and 10th grade completion. In May 2013, we finalized a memorandum to MCC summarizing the interim findings of the scholarships evaluation (Campuzano et al. 2013b). The main focus of this report was the impact of one year of scholarship offer on students' enrollment in 10th grade, completion of 10th grade, and continuation to 11th grade. In October 2013, we finalized the interim ITCHA implementation report (Blair et al. 2013).

Table VII.1 shows key dates for all upcoming activities and deliverables related to the secondary school strengthening, scholarships, and ITCHA evaluations. In early 2015, we will submit a final report summarizing the impact findings from the scholarship and secondary school strengthening interventions. These impact findings will be complemented with qualitative findings regarding program implementation and results. In mid-2015, we will submit a final ITCHA evaluation report, which will include findings from the 2013 and 2014 ITCHA student surveys.

Following submission of the draft scholarship, secondary school, and ITCHA reports, we recommend a presentation of final education impact and performance findings in mid-2015. This presentation will function to communicate our primary results, as well as to get stakeholders' input on preliminary impact findings—largely findings on students' labor market outcomes one year after their projected graduation date. The best forum for this final round of feedback would be an evaluation workshop, in which we share our preliminary findings and solicit stakeholder feedback to help us interpret the findings. We see this as a good solution because it will place all key stakeholders in one place, at the moment that preliminary final results are available. This is more cost-effective than another round of data collection focused almost solely on outcomes.

Table VII.1. Proposed Timeline for Education Evaluation Activities: 2013–2015

Activity or Deliverable	Date
Analysis for scholarships and secondary school strengthening final data and ITCHA survey round 1	Mid to late 2014
Qualitative data collection for ITCHA, scholarships, and secondary school strengthening	Late 2014
Qualitative analysis (all components)	Late 2014
ITCHA student survey round 2	November 2014
Analysis of ITCHA survey round 2	Early 2015
Draft scholarship and secondary school final report, including implementation and impact findings	Early 2015
Draft ITCHA final report	Mid-2015
Education workshop with stakeholders	Mid-2015

4. Evaluation Team

Dr. Larissa Campuzano, a senior researcher at Mathematica, is the senior analyst for evaluations of the Formal Technical Education Sub-Activity. Mr. Randall Blair, a researcher at Mathematica, leads evaluation activities related to qualitative methods. Both researchers have served in this role for several years; Dr. Campuzano has led all education evaluations under the current contract since 2007, and Mr. Blair has led all qualitative education work since 2011. In addition, Dr. Lorenzo Moreno is senior technical adviser for this contract. His responsibility is to provide quality assurance for our deliverables. Ms. Raquel af Ursin supports data collection in El Salvador and is responsible for all document translations. Mr. Seth Morgan is lead programmer for all evaluations under this contract. He will organize data sets, prepare programming files, and produce all statistical output for quantitative analyses. Ms. Anne Bloomenthal will provide quality assurance for all public use files related to the sub-activity.

In addition, DIGESTYC will conduct all in-country quantitative data collection, with technical support from Mathematica. Throughout the evaluations, MCC M&E staff will supervise DIGESTYC's data collection contract, as well as Mathematica's evaluation work. Mr. Alejandro Sosa is Mathematica's primary contact at DIGESTYC, and Ms. Rebecca Goldsmith is Mathematica's primary contact at MCC.

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APPENDIX A

TREATMENT AND CONTROL/COMPARISON GROUPS FOR EVALUATIONS

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Table A.1. Treatment and Comparison Schools in the Secondary School Strengthening Evaluation

Code	School	Treatment	Comparison
1	10806	Instituto Nacional "Doctor Francisco Martínez Suárez"	X
2	13624	Instituto Nacional De Osicala	X
3	10311	Instituto Nacional "Benjamín Estrada Valiente"	X
4	13255	Instituto Nacional "14 De Julio De 1875"	X
5	11307	Instituto Nacional "De Aguilares"	X
6	10864	Instituto Nacional "De La Palma"	X
7	10900	Instituto Nacional "De Nueva Concepción"	X
8	10883	Instituto Nacional De La Reina	X
9	14833	Instituto Nacional "De Chapeltique"	X
10	14786	Instituto Nacional "Anamorós"	X
11	13111	Instituto Nacional "De Sesorí"	X
12	10819	Instituto Nacional "General Juan Orlando Zepeda"	X
13	10948	Instituto Nacional "De San Ignacio"	X
14	13391	Instituto Nacional "De El Sauce "	X
15	13202	Complejo Educativo "General Manuel José Arce"	X
16	12780	Instituto Nacional "De Carolina"	X
17	11377	Complejo Educativo Cantón El Tule	X
18	12266	Complejo Educativo "Sotero Laínez"	X
19	10116	Instituto Nacional De Jutiapa	X
20	10513	Complejo Educativo "Santiago De La Frontera"	X
21	12217	Instituto Nacional "De Sensuntepeque"	X
22	13550	Instituto Nacional "Profesor Francisco Ventura Zelaya"	X
23	12143	Instituto Nacional "De Ilobasco"	X
24	14774	Instituto Nacional De Nueva Esparta	X
25	13229	Instituto Nacional "Segundo Montes"	X
26	10990	Instituto Nacional "República De Italia"	X
27	14794	Instituto Nacional "De Potonico"	X
28	14874	Instituto Nacional "De San Antonio Los Ranchos"	X
29	14797	Instituto Nacional De Perquín	X
30	14795	Instituto Nacional "De La Laguna"	X
31	10833	Instituto Nacional De Dulce Nombre De María	X
32	13205	Complejo Educativo "Florinda De Juárez Alemán"	X
33	10103	Instituto Nacional De Yamabal	X
34	12282	Instituto Nacional De Victoria	X
35	13283	Instituto Nacional "De San Simón"	X
36	10849	Instituto Nacional "De El Paraíso"	X
37	13144	Complejo Educativo "Naciones Unidas"	X
38	88150	Instituto Católico "San Pablo Apóstol"	X
39	14757	Instituto Nacional "De Nombre De Jesús"	X
40	72067	Complejo Educativo Caserío Las Américas Cantón La Bermuda	X

Table A.2. Treatment and Control Assignments for the Scholarship Evaluation

No.	School Name	Gen.	Tech.	Technical Programs	Diplomas	Scholarships Offered	Randomization of Scholarships	MEGATEC	Scholarships Available	Treatment	Control
1	INSTITUTO NACIONAL DE JUTIAPA	No	Yes	Comercial Contaduria	Contabilidad Financiera	Yes	Yes		40	40	28
2	INSTITUTO NACIONAL BENJAMIN ESTRADA VALIENTE	Yes	Yes	Comercial Contaduria		No	No		0	0	
				Comercial Asistencia Admin		No	No		0	0	
				Comercial Asistencia Contable		No	No		0	0	
				Mecánica General		Yes	No		28	0	
				Electrotecnia		Yes	No		27	0	
				Ingeniería Civil		Yes	Yes		50	50	12
				General		No	No	Yes	0	0	
3	COMPLEJO EDUCATIVO SANTIAGO DE LA FRONTERA	Yes	No	NA		No	No		0	0	
4	INSTITUTO NACIONAL DOCTOR FRANCISCO MARTINEZ SUAREZ	Yes	Yes	Comercial Asistencia Admin		Yes	No		39	0	
				Comercial Asistencia Contable		Yes	No		39	0	
				Agrícola		Yes	No		9	0	
				General		No	No		0	0	
5	INSTITUTO NACIONAL GENERAL JUAN ORLANDO ZEPEDA	Yes	Yes	Comercial Contaduria	Promotor Comunitario	No	No		0	0	
				Salud		Yes	No		50	0	
				General		No	No		0	0	
6	INSTITUTO NACIONAL DE LA PALMA	Yes	Yes	Comercial Contaduria		No	No		0	0	
				Gestion de Turismo Alternativo		Yes	Yes		45	45	18
				General	Cocina	Yes	No	Yes	17	0	
7	INSTITUTO NACIONAL DE LA REINA	Yes	Yes	Comercial Secretariado	Transformación de Leche	No	No		0	0	
				Comercial Contaduria		No	No		0	0	
				General		Yes	No		22	0	
8	INSTITUTO NACIONAL DE NUEVA CONCEPCION	Yes	Yes	Comercial Secretariado	Cultivos Orgánicos e Hidropónicos	No	No		0	0	
				Comercial Contaduria		No	No		0	0	
				General		Yes	No		52	0	
9	INSTITUTO NACIONAL DE SAN IGNACIO	Yes	Yes	Comercial Contaduria		No	No		0	0	
				Gestion de Turismo Alternativo		Yes	Yes		45	45	20
				General		No	No	Yes			

Table A-2 (cont'd)

No.	School Name	Gen.	Tech.	Technical Programs	Diplomas	Scholarships Offered	Randomization of Scholarships	MEGATEC	Scholarships Available	Treatment	Control
10	INSTITUTO NACIONAL DE AGUILARES	Yes	Yes	Comercial Secretariado		No	No		0	0	
				Comercial Contaduría		No	No		0	0	
				Ingeniería Civil		Yes	Yes		45	45	30
				General		No	No	Yes	0	0	
11	COMPLEJO EDUCATIVO CANTON EL TULE	Yes	No	NA		No	No		0	0	
12	COMPLEJO EDUCATIVO SOTERO LAINEZ	Yes	No	NA		No	No		0	0	
13	INSTITUTO NACIONAL DE CAROLINA	Yes	No	NA	Cultivos Orgánicos e Hidropónicos	Yes	No		43	0	
14	INSTITUTO NACIONAL DE SESORI	Yes	Yes	Comercial Secretariado	Asesoría de Comercio Justo	No	No		0	0	
				Comercial Contaduría		Yes	Yes		60	60	21
				General		No	No		0	0	
15	COMPLEJO EDUCATIVO GENERAL MANUEL JOSE ARCE	Yes	Yes	Comercial Secretariado		Yes	No		28	0	
				Comercial Contaduría		No	No		0	0	
				General		No	No		0	0	
16	INSTITUTO NACIONAL 14 DE JULIO DE 1875	Yes	Yes	Comercial Asistencia Admin		Yes	Yes		20	20	8
				Comercial Asistencia Contable		Yes	Yes		20	20	26
				Mecánica Automotriz		Yes	No		76	0	
				Agrícola		No	No		0	0	
				Logística de Aduanas		Yes	Yes		45	45	6
				General		No	No		0	0	
17	INSTITUTO NACIONAL DE EL SAUCE	Yes	Yes	Comercial Secretariado	Manejo de Desechos Orgánicos y Sólidos	No	No		0	0	
				Comercial Contaduría		Yes	No		55	0	
				General		Yes	No				
18	INSTITUTO NACIONAL DE OSICALA	Yes	Yes	Comercial Secretariado	Promotor Comunitario	Yes	Yes		60	60	33
				Comercial Contaduría		Yes	Yes				
				General		No	No		0	0	
19	INSTITUTO NACIONAL ANAMOROS	Yes	Yes	Comercial Secretariado	Transformación de Leche	No	No		0	0	
				Comercial Contaduría		No	No		0	0	
				General		Yes	Yes		45	45	10
20	INSTITUTO NACIONAL DE CHAPELTIQUE	Yes	Yes	Comercial Secretariado	Agroforestería	No	No		0	0	
				Comercial Contaduría		No	No		0	0	
				General		Yes	Yes		40	40	24
TOTAL									1,000	515	236

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APPENDIX B

**QUALITATIVE PROTOCOLS FOR SCHOLARSHIP, SCHOOL STRENGTHENING,
AND ITCHA EVALUATIONS**

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QUALITATIVE PROTOCOL FOR SCHOLARSHIP DATA COLLECTION, 2014

To be administered to each of the stakeholders below, with \checkmark s indicating whether each battery of questions is asked:

Research Topics	MINED, CIDE, and FOMILENIO Representatives	Secondary School Principals	Secondary School Teachers	Secondary School Students
1 Design/Implementation	\checkmark	\checkmark	\checkmark	\checkmark
2 Description of Participants		\checkmark	\checkmark	\checkmark
(No qualitative questions for Topics 3 and 4, which deal with measuring program impact)				
5 Explanation for Impact Findings	\checkmark	\checkmark	\checkmark	\checkmark
6 Sustainability	\checkmark	\checkmark	\checkmark	\checkmark

Justification: Due to their multiyear involvement in the sub-activity design and implementation, MINED, CIDE, and FOMILENIO representatives have a strong understanding of nearly every aspect of the interventions, including their implementation and potential sustainability. In particular, MINED representatives can speak to future budget outlays for secondary school scholarships. However, because MINED, CIDE, and FOMILENIO representatives do not have firsthand interactions with students, we will not ask them to elaborate on students' backgrounds, motivations, and career aspirations. Regarding the other stakeholders, principals and teachers are in an ideal position to speak to all research topics above, given their direct knowledge of academic programs, school improvements, and student outcomes of graduation and employment.

1. Design/Implementation

Were original scholarship targets and commitments met? [exclude students]

How many secondary school scholarships did FOMILENIO and MINED plan to administer in the Northern Zone from 2007 to 2012? Did the organizations meet these targets? What were MINED's secondary school scholarship commitments for 2013? Were these commitments fulfilled?

How have scholarships to secondary students changed since mid-2011? [exclude students] How does MINED compare to FOMILENIO in terms of the number and amount of scholarships granted? Is the profile of scholarship recipients for current scholarships different from the profile targeted by FOMILENIO? How does the application process work, in general, and how are scholarships disbursed?

Is the scholarship amount adequate? How easy is it to access the scholarship funds? Are transfers completed in a timely manner? [students only]

Have institutional roles changed since mid-2011? [exclude students] What role does MINED play in scholarships? Are any intermediary organizations or secondary schools involved in the process?

2. *Participants*

What are your education and career goals? What are the biggest obstacles to meeting those goals [students only]

In general, what differentiates students who accepted scholarships from students who did not accept them? Are they enrolled in different types of programs, or does one group tend to perform better than the other?

In general, what differentiates students with scholarships from students who do not have them? Are they enrolled in different types of programs, or does one group tend to perform better than the other?

5. *Explanation for Impact Findings*

Are scholarship recipients completing grades, continuing to subsequent years, and graduating? Do scholarship recipients appear more likely to keep studying and graduate than non-scholarship recipients? Why or why not?

- Probe for additional factors besides scholarships that could affect students' decision to continue studying.

Are scholarship recipients any more likely than nonrecipients to find employment or enroll in post-secondary school or a university program?

In our interim impact evaluation of the scholarship program, we found that the positive impact of the scholarship offer was much larger for males than females for key educational outcomes. **Can you help us interpret this finding?**

6. *Sustainability*

Will secondary school scholarships continue into the future? [exclude students] If so, what organizations will play a role, and do they have any major human resource constraints?

Does there appear to be enough political will and support from MINED to continue investing in technical secondary school education in the region? [exclude students]

QUALITATIVE PROTOCOL FOR SECONDARY SCHOOL DATA COLLECTION, 2014

To be administered to each of the stakeholders below, with √s indicating whether each battery of questions is asked:

Research Topics	MINED, CIDE, MCC and FOMILENIO Representatives	Secondary School Principals	Secondary School Teachers	Secondary School Students
1 Design/Implementation	√	√	√	√
2 Description of Participants		√	√	√
(No qualitative questions for Topics 3 and 4, which deal with measuring program impact)				
5 Explanation for Impact Findings	√	√	√	√
6 Sustainability	√	√	√	√

Justification: Due to their multiyear involvement in the sub-activity design and implementation, MINED, CIDE, FOMILENIO, and MCC representatives have a strong understanding of nearly every aspect of the interventions, including their implementation and potential sustainability. In particular, MINED representatives can speak to future budget outlays for secondary school maintenance and teacher training. However, because MINED, CIDE, and FOMILENIO representatives do not have firsthand interactions with students, we will not ask them to elaborate on students' backgrounds, motivations, and career aspirations. Regarding the other stakeholders, principals and teachers are in an ideal position to speak to most research topics above, given their direct knowledge of academic programs, school improvements, and student outcomes of graduation and employment. Students can speak to all research topics above, but they cannot offer multi-year perspectives on changes in training, curriculum, and infrastructure that teachers and principals can offer.

1. Design/Implementation

Were original output targets and commitments met by the end of the compact period? What were FOMILENIO's output targets and planned commitments for secondary school strengthening—including construction and training? Were these targets met and commitments fulfilled—both in terms of quality and quantity?

Are new classrooms, computer labs, and bathrooms still functional? Has any other infrastructure worsened since secondary school improvements were made a few years ago?

Please describe any teacher training that has happened in the past two years? What were the planned and actual results of teacher training in terms of the number of teachers trained/certified and the skills and knowledge learned by teachers? **How did training go—was it well delivered? Was it useful?**

Have teachers applied what they learned in training? Did teachers use the skills and techniques they learned in training? How would you rate the quality of instruction, and how it has changed in the past few years?

Could you describe any teacher turnover that has occurred since 2011?

Have the new degree programs evolved since 2011? Have the programs changed in terms of subjects covered or teaching materials used?

2. *Participants*

What are your education and career goals? What are the biggest obstacles to meeting those goals [students only]

Could you describe, in general terms, a typical student enrolled in a general program versus a technical program? Any differences in background, demographics, or job goals?

What about students enrolled in MEGATEC programs versus non-MEGATEC programs? Are there any notable differences in background, demographics, or job goals?

5. *Explanation for Impact Findings*

Has student achievement in the past two years met expectations? What were stakeholders' goals and expectations for students' achievement in MEGATEC and non-MEGATEC programs? Were these goals and expectations met? How do you know—what are relevant assessment protocols and measures? How has achievement changed since the end of FOMILENIO assistance, and why?

Has student enrollment in the past two years met expectations? What were stakeholders' goals and expectations for students' enrollment in MEGATEC and non-MEGATEC programs? Were these goals and expectations met? How has enrollment changed since the end of FOMILENIO assistance, and why? Are there sufficient resources to accommodate current enrollment numbers?

Has graduation in the past two years met expectations? How many students graduated in 2011 and 2012? What were the academic profiles of students who enrolled versus graduated? Did enrollment and graduation numbers meet or exceed pre-planned targets? Why?

- Probe for key factors that could affect graduation rates, including grades, financial constraints, loss of motivation, and immigration.

Do general and technical degree programs prepare students for employment and/or post-secondary education? What were stakeholders' goals and expectations for employment, post-secondary education and university education following students' completion of the technical degree? Were these goals and expectations met? Did the PILAS program ever play a role in helping students find employment?

- Probe for key factors that could affect employment, including job readiness, access to information, transportation, and structural market demand.

In our interim impact evaluation of the secondary school strengthening program, we found statistically significant positive effects of the intervention on 10th grade enrollment in technical programs in 2010, but no other significant positive effects of the program. **Can you help us interpret this finding?**

In our interim impact evaluation, we also found lower enrollment in 10th grade general programs in 2009 at treatment schools versus comparison schools. **Can you help us interpret this finding?**

6. *Sustainability*

How is the new infrastructure holding up, including the lab equipment, computers, new classrooms, and sanitation services? Are the facilities and equipment being properly maintained? If so, what is the funding source? Is funding secured for regular maintenance in upcoming years?

Has there been any teacher turnover at improved secondary schools? If so, are new teachers being adequately trained? Are secondary schools adequately staffed to serve all students who enroll?

Does there appear to be enough support from MINED to continue investing in secondary schools in the region? Are there any plans for future investments in these schools?

QUALITATIVE PROTOCOL FOR ITCHA/MEGATEC DATA COLLECTION, 2014

To be administered to each of the stakeholders below, with \checkmark s indicating whether each battery of questions is asked:

Research Topics	MINED, CIDE, MCC, and FOMILENIO Representatives	ITCHA Administrators and Secondary School Principals	ITCHA and Secondary School Teachers	ITCHA Students
1. Design/Implementation	\checkmark	\checkmark	\checkmark	
2. Description of Participants		\checkmark	\checkmark	\checkmark
3. Results	\checkmark	\checkmark	\checkmark	\checkmark
4. Results by Subgroups	\checkmark	\checkmark	\checkmark	
5. Explanation of Results	\checkmark	\checkmark	\checkmark	\checkmark
6. Sustainability	\checkmark	\checkmark	\checkmark	\checkmark

Justification: Due to their multiyear involvement in the sub-activity design and implementation, MINED, CIDE, and FOMILENIO representatives have a strong understanding of nearly every aspect of the interventions, including their results and potential sustainability. In particular, MINED representatives can speak to future budget outlays for MEGATEC education programs and post-secondary scholarships. However, because MINED, MCC, CIDE, and FOMILENIO representatives do not have firsthand interactions with students, we will not ask them to elaborate on students' backgrounds, motivations, and career aspirations. Regarding the other stakeholders, administrators and teachers are in an ideal position to speak to all research topics above, given their direct knowledge of academic programs, school improvements, and student outcomes of graduation and employment. In contrast, students probably cannot speak to medium-term results of trends in enrollment and graduation among multiple cohorts. However, they can provide some contextual information on results, particularly their perspectives on their career aspirations, job and college readiness, and prospects for finding future employment.

Before interviews with teachers and principals: Request that interviewees bring a copy of their official annual curriculum and any materials on student assessment.

1. Design/Implementation

Please describe the current state of ITCHA facilities. Are new classrooms, computer labs, and bathrooms still functional? Has any other infrastructure worsened since the ITCHA was built a few years ago?

How has the MEGATEC program at ITCHA and its linked secondary schools changed since mid-2011? Has staffing changed? Has funding changed? Have degree programs changed? Have the number and size of scholarships to ITCHA students changed?

Have institutional roles changed since mid-2011? What role does MINED continue to play? What role does AGAPE (the nonprofit organization that manages

ITCHA) play? What role do the linked secondary schools play? How is communication between ITCHA staff and staff from linked secondary schools?

Please describe any teacher training related to MEGATEC that has happened in the past two years (skip for students). How were training units designed and who designed them? What were stakeholders' goals and expectations for the teacher training sessions included in the intervention? Were these goals and expectations met? What were the planned and actual results of teacher training in terms of the number of teachers trained/certified and the skills and knowledge learned by teachers?

Are teachers applying what they learned in training? Have teachers used the skills and techniques they learned in training? [Ask about any student assessment or evaluation skills]

Are teachers fully capable of teaching the classes/modules? In which subjects/areas do teachers excel? In which subjects/areas could they improve? How would you rate the quality of instruction in the MEGATEC and non-MEGATEC programs?

Could you describe any teacher turnover that has occurred since 2011?

Have the new degree programs evolved since 2011? Have the programs changed in terms of subjects covered or teaching materials used?

Does ITCHA continually reassess whether degree programs are meeting employer demand? If so, does ITCHA staff interact with potential employers in this process

Have the scholarships evolved since 2011 in terms of number and amount?

Could you talk about linkages between secondary schools and ITCHA, and between ITCHA and universities? How does the link between feeder schools and the ITCHA currently work? Can secondary school graduates transfer to the second year of ITCHA—for example, a student finishing a degree in civil engineering in 2013? Can ITCHA graduates transfer their degrees or credits to university programs—for example a student finishing a superior degree in civil engineering in 2013?

Discussion of Curriculum, Student Assessment, and Achievement (primarily for MEGATEC teachers)

How is the MEGATEC annual curriculum structured? When are modules implemented and at what point are students tested?

How is student achievement assessed in the MEGATEC program? Are students learning and applying the core competencies defined in the program curricula? What were barriers to, and facilitators of student achievement?

[Requested of teachers prior to the interview] Could you provide a good example of exemplary student work? Of unacceptable student work? What are

the criteria and scoring used to determine the quality of this work? Are these criteria uniform across MEGATEC programs?

2. *Description of Participants*

What are ITCHA students' education and career goals? What are the biggest obstacles to meeting those goals?

In general, where are ITCHA students from? Where do they generally live while studying at ITCHA?

How do MEGATEC students differ from non-MEGATEC students?

How do students who drop out differ from those who eventually graduate? Do they tend to have different characteristics or socioeconomic backgrounds?

3. *Results*

Has student enrollment in the past two years met expectations (skip for students)? What were stakeholders' goals and expectations for students' enrollment? Were these goals and expectations met? How has enrollment changed since the end of FOMILENIO assistance, and why?

Has graduation in the past two years met expectations (skip for students)? Did enrollment and graduation numbers meet or exceed pre-planned targets? How has graduation changed since the end of FOMILENIO assistance, and why?

Please compare and contrast student achievement in MEGATEC programs versus non-MEGATEC programs (skip for students)? Any notable deficiencies or subjects/aspects that students are learning well?

Are MEGATEC and non-MEGATEC degree programs preparing students for employment? What were stakeholders' goals and expectations for employment and university education following students' completion of the technical degree? Were these goals and expectations met? How many students found related employment within a year of graduating from ITCHA? Were there any additional factors that affected students' employment?

Are MEGATEC and non-MEGATEC degree programs preparing students for university studies? How many students enrolled in a university the following academic year? What are the current barriers to, and facilitators of, student graduation? Were there any additional factors that affected university enrollment?

Are ITCHA graduates finding relevant jobs and making a good income? From what you've seen in recent years, are ITCHA graduates finding jobs in fields related to their degree programs? In particular, how are MEGATEC graduates faring? Do graduates from any program or programs appear to make more money, on average, than other ITCHA graduates? Did the PILAS program play a role?

4. *Results by Subgroups*

Do boys and girls have similar enrollment rates? Graduation rates? Performance in school? Why or why not?

In the tourism and civil engineering programs, do you notice differences in performance between students who completed secondary school MEGATEC degrees and students who did not? Why or why not?

In general, do students who got technical secondary school degrees outperform students who got general secondary school degrees? Why or why not?

5. *Explanation for Results*

What major factors help to explain general trends in enrollment, grade continuation, achievement and graduation?

- Probe for financial and transportation constraints, immigration trends

What major factors help to explain general trends in graduates' ability to find jobs in their field?

- Probe for transportation or information constraints, job readiness constraints, and structural labor demand constraints.

What major factors help to explain any gender disparities in academic outcomes at ITCHA?

6. *Sustainability*

How is the new ITCHA operating, including the lab equipment and computers? Are the facilities and equipment being properly maintained? If so, what is the funding source? Is funding secured for regular maintenance in upcoming years?

Has there been any teacher turnover at ITCHA and at linked secondary schools? If so, are new teachers being adequately trained? Are ITCHA and the linked secondary schools adequately staffed to serve all students who enroll?

Will ITCHA scholarships continue into the future?

Does there appear to be enough political will and support from MINED to continue investing in ITCHA and technical education in the region?

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