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REPORT

FINAL REPORT

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

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ACRONYMS

CCT	Conditional Cash Transfer
CIDE	Consortium for International Development in Education
DIGESTYC	Dirección General de Estadística y Censos
ESE	Encuesta de Seguimiento de Estudiantes
EHPM	Encuesta de Hogares y Propósitos Múltiples
ERR	Economic Rate of Return
FEPADE	Fundación Empresarial para el Desarrollo Educativo
FOMILENIO	Millennium Challenge Fund of El Salvador
ITCHA	Chalatenango Technical Institute
ITTs	Indicator Tracking Tables
ITT	Intention-to-Treat
MCC	Millennium Challenge Corporation
MINED	Salvadoran Ministry of Education
MEGATEC	Gradual Educational Model of Technical and Technological Learning
M&E	Monitoring and evaluation
PAES	Prueba de Aprendizaje y Aptitudes para Egresados de Educación Media
PILAS	Programa de Inserción Laboral Sostenible
TOT	Treatment-on-the-Treated

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EXECUTIVE SUMMARY

A. Introduction

In this report, we present the final results of the evaluations of three interventions funded under the Formal Technical Education Sub-Activity of the first Millennium Challenge Corporation (MCC)-El Salvador compact. These interventions were: (1) an intervention to strengthen secondary schools[1], (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). The impact evaluation of the secondary school strengthening program employed a quasi-experimental design; the evaluation of the secondary school scholarship program employed an experimental design; and the evaluation of the ITCHA intervention employed a mixed-methods performance evaluation design.

The MCC compact with the government of El Salvador was a $461 million (U.S. dollars) initiative in effect from 2007 to 2012. The compact was designed to fuel economic growth and reduce poverty in El Salvador's Northern Zone by improving human and physical capital, increasing production and employment, and reducing travel cost and time within the country. The compact had three main projects: (1) the Human Development Project, (2) the Productive Development Project, and (3) the Connectivity Project. The Human Development Project, which involved a total investment of $84 million, encompassed the following two activities: (a) the Education and Training Activity, which invested nearly $28 million to increase the quality of and access to professional and technical education and training; and (b) the Community Development Activity, which was designed to expand access to sanitation facilities, electricity, potable water services, and community infrastructure in El Salvador's Northern Zone. The compact established a counterpart entity under the government of El Salvador, el Fondo del Milenio (FOMILENIO), which was charged with administering the compact's three projects.

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 could "gain marketable skills and thereby increase their opportunities for employment and income generation."[2] 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. The sub-activity would also provide $9 million to improve 20 technical secondary schools in the Northern Zone with large-scale infrastructure investments in classrooms, laboratories, and

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

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

sanitation services; new technical degree and certificate program[3] offerings; teacher training in pedagogy; and student assessment.

In addition, the sub-activity would invest $7 million to strengthen ITCHA. This included large-scale infrastructure investments, teacher training in pedagogy, and student assessment. As part of the ITCHA intervention, FOMILENIO also supported the Salvadoran Ministry of Education's (MINED's) development of two new technical degree programs to be introduced at ITCHA and four feeder secondary schools under the Gradual Educational Model of Technical and Technological Learning[4] (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 in which students learn relevant theory and engage in hands-on practice to enhance their understanding and build key skill sets. Students who complete technical programs at "linked" 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.[5]

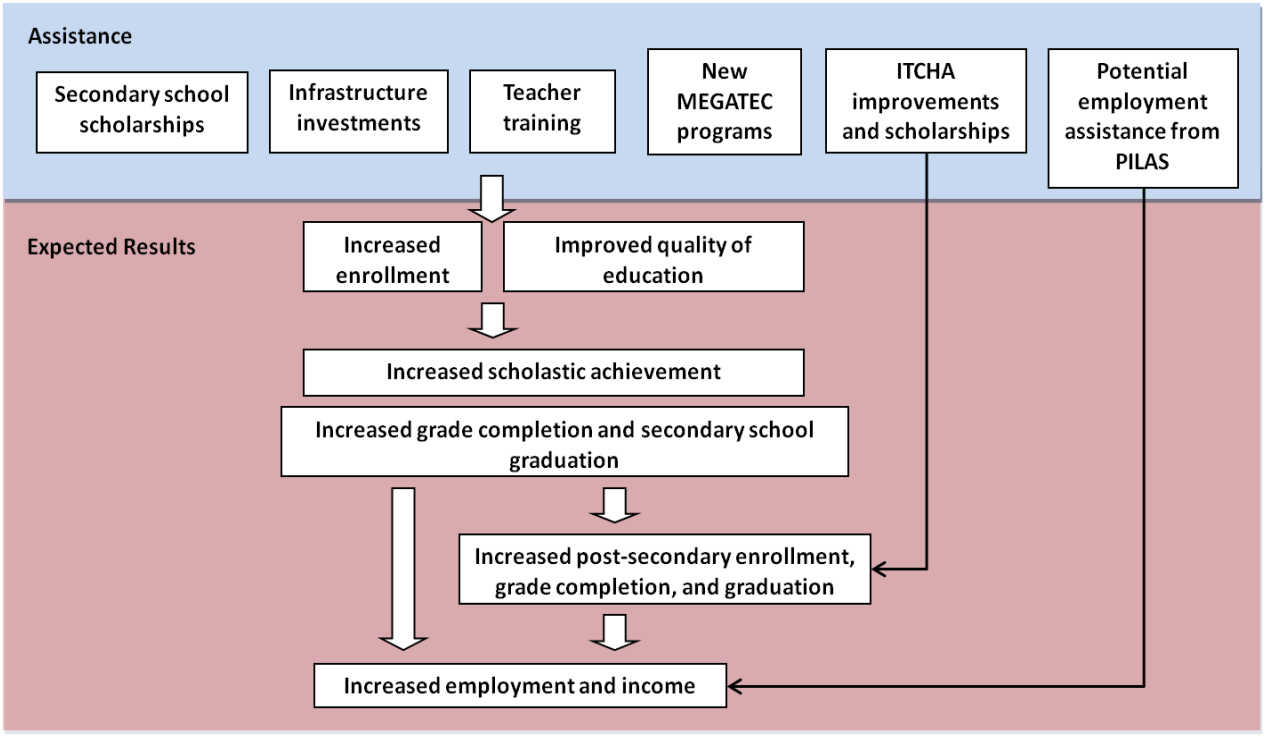
Figure ES.1 summarizes how all the interventions under the Formal Technical Education Sub-Activity were intended to interact and improve outcomes. The sub-activity's range of investments—scholarships, school improvements, teacher training sessions, new technical programs, improvements at ITCHA, and the labor insertion program 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 school programs, particularly technical ones. 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 logic model hypothesized that increased enrollment and better instruction would generate a higher number of secondary school graduates in the region, which would lead to increased employment and income among these 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 and post-secondary school graduates in finding salaried employment or starting their own businesses.

[3]Certificate programs are short-term technical programs in agroforestry, milk production, solid and organic waste management, and other skills to be introduced to 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.

[4]The full name of the MEGATEC program is Módulo Educativo Gradual de Aprendizaje Técnico y Tecnológico.

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

Figure ES.1. Logic model of interventions under the Formal Technical Education Sub-Activity



Source: Report authors, based on analysis of documents created by the Consortium for International Development in Education (known as CIDE for its initials in French) and FOMILENIO.

Table ES.1 provides an overview of planned activities, implementation targets, key assumptions, and final outcomes for the secondary schools, scholarships, and ITCHA interventions. As illustrated, implementation targets focused on the number of scholarships administered, teachers trained, and students enrolled in secondary and post-secondary education. In addition, the compact cited the key benchmark of a 50 percent employment rate after one year for secondary school graduates and a 37 percent increase in secondary school graduates' income as a result of completing secondary education due to secondary school strengthening activities and scholarships (compared with the income of 9th-grade graduates). Similarly, the compact articulated the key benchmark of a 70 percent employment rate for ITCHA graduates and the final outcome of a 42 percent increase in ITCHA graduates' income (compared with incomes of secondary school graduates). These benchmarks and expected outcomes were based on baseline levels for secondary and ITCHA graduates under the assumption that students who enrolled in and graduated from strengthened schools as a result of the sub-activity would experience education and labor market outcomes similar to those of students from previous years.

Table ES.1. Planned activities, targets, benchmarks, and outcomes of the Formal Technical Education Sub-Activity

Component	Activities	Implementation targets	Key benchmarks	Final outcomes
Scholarships and middle school strengthening	• New infrastructure—including classrooms, labs, and bathrooms • New technical degree and certification programs • Teacher training • Annual scholarships of $400 per student for secondary education	• 3,600 secondary and post-secondary scholarships administered • 9,000 students enrolled in secondary schools	• 71 percent graduation rate[a] • 50 percent employment rate among graduates	• 37 percent increase in graduates' income
ITCHA	• Construction of a new post-secondary school, including classrooms, labs, cafeteria, and auditorium • New technical degree programs/materials • Annual scholarships of $1,500 per student for ITCHA	• 1,100 ITCHA students enrolled in 2012 (revised to 540 by 2012)	• 73 percent graduation rate[a] • 70 percent employment among graduates	• 42 percent increase in graduates' income

Source: MCC El Salvador Compact

[a] Not mentioned in compact but noted in September 2012 MCC-FOMILENIO monitoring and evaluation plan.

As designated in the compact, MINED was the principal implementing entity for the Formal Technical Education Sub-Activity, and FOMILENIO was 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 teachers at ITCHA and the 20 secondary schools receiving assistance.

B. Research questions and methods

1. Research questions for the scholarships and strengthening of secondary schools interventions

The scholarship program for secondary education was designed to work in conjunction with investments to strengthen 20 pre-selected secondary schools. Due to the shared target population and objectives of these two interventions, the evaluation of each addressed a common set of research questions that we have classified into six research domains, as follows:

1. **Program design/implementation.** How were the secondary school strengthening and scholarship programs designed and implemented? Did implementation meet original targets and expectations?

2. **Description of participants.** What are the characteristics (age, gender, initial household income, and so on) 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 program for strengthening secondary school on students' education and labor market outcomes, including secondary school enrollment, grade completion, graduation, additional education, employment, and income? What is the impact on student educational and labor outcomes of the offer of scholarships in some programs within strengthened schools?

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?

6. **Sustainability.** Are secondary school improvements and scholarships being maintained? Are schools well positioned to provide students in the region with a high quality secondary technical education in future years?

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 results of 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 implement 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 (Domain 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 Domains 3 and 4, all of the research questions above were introduced in late 2013 at the request of MCC to complement existing impact evaluations of the scholarships and strengthening secondary schools programs.

2. Evaluation design for non-impact questions

To answer the research questions regarding the design, implementation, and sustainability of the secondary school strengthening and scholarship interventions (Domains 1, 2, 5, and 6), we used a mixed-methods evaluation design. This type of design combines the use of a mix of quantitative data sources (such as available administrative and monitoring data) and qualitative data (generally interviews with program implementers and participants) to better understand implementation and programmatic impacts or lack of impacts. Using both qualitative and quantitative methods, we addressed each research question with the most appropriate mix of data sources, comparing and contrasting qualitative and quantitative findings.

Data sources. To better understand secondary school strengthening efforts and scholarship interventions, we conducted semi-structured, in-person interviews and focus groups with MINED, CIDE, MCC, and former FOMILENIO representatives; secondary school principals and teachers; and secondary school students. We did this during program implementation in 2011, and again after the implementation period in 2015. During these qualitative interviews and focus groups, we asked stakeholders for their perspectives on the quality and completeness of implementation, the potential effects of the strengthening intervention on student outcomes, and the sustainability of FOMILENIO investments in the post-compact period.

Analysis. In 2015, Mathematica synthesized qualitative and quantitative data to describe implementation of the scholarship and secondary school strengthening interventions (Domain 1). In particular, we used administrative data to quantify the extent of the intervention—including the number of scholarships awarded and infrastructure improvements completed. We analyzed transcripts from interviews with CIDE, FOMILENIO, and MINED staff; principals; teachers; and students to distill these stakeholders' perceptions of the quality of implementation. To characterize participants (Domain 2), we used scholarship application data and follow-up student surveys to summarize the demographic and socioeconomic characteristics of secondary students, and also distilled students' reports on their backgrounds, obstacles to progression in school, and career goals. To support the interpretation of impact findings (Domain 5), we analyzed transcripts from in-person interviews with principals, teachers, and MINED and FOMILENIO representatives to distill stakeholders' perspectives on the sub-activity's effects on enrollment, graduation, and labor market. To analyze the sustainability of sub-activity investments in scholarships and secondary school strengthening (Domain 6), we defined several conditions—including a strong demand-based curriculum, capable educators, and adequate school infrastructure—that would be necessary for strengthened secondary schools to give students in the region a high quality secondary technical education in future years. We then used administrative and interview data to assess strengthened schools in each of these dimensions.

3. Evaluation design for the impact of secondary school strengthening

The objective of this impact evaluation was to assess whether the intervention to strengthen secondary schools improved educational and labor market outcomes for students attending strengthened schools. To estimate the impact of the intervention, we used a propensity score matching design, whereby we selected a comparison group of schools that were similar to strengthened schools before the intervention. The limitation of this method, as with any design that uses a matched comparison group, is that we cannot guarantee that the intervention and comparison groups were similar on unobserved characteristics before the intervention.

We should also mention that our analysis compared students in schools in which improvements were completed and FOMILENIO scholarships awarded versus students in non-strengthened schools in which scholarships were not offered. For this reason, the impacts we estimated could not separate the effects of the strengthening program from those of the scholarship program. As a result, this evaluation measured the combined effects of secondary school infrastructure improvements, teacher training sessions, new technical degree and certificate programs, and scholarships on students' educational and labor market outcomes.

Intervention group. The secondary school strengthening intervention targeted technical schools in the Northern Zone that had a high level of need and relatively strong labor market

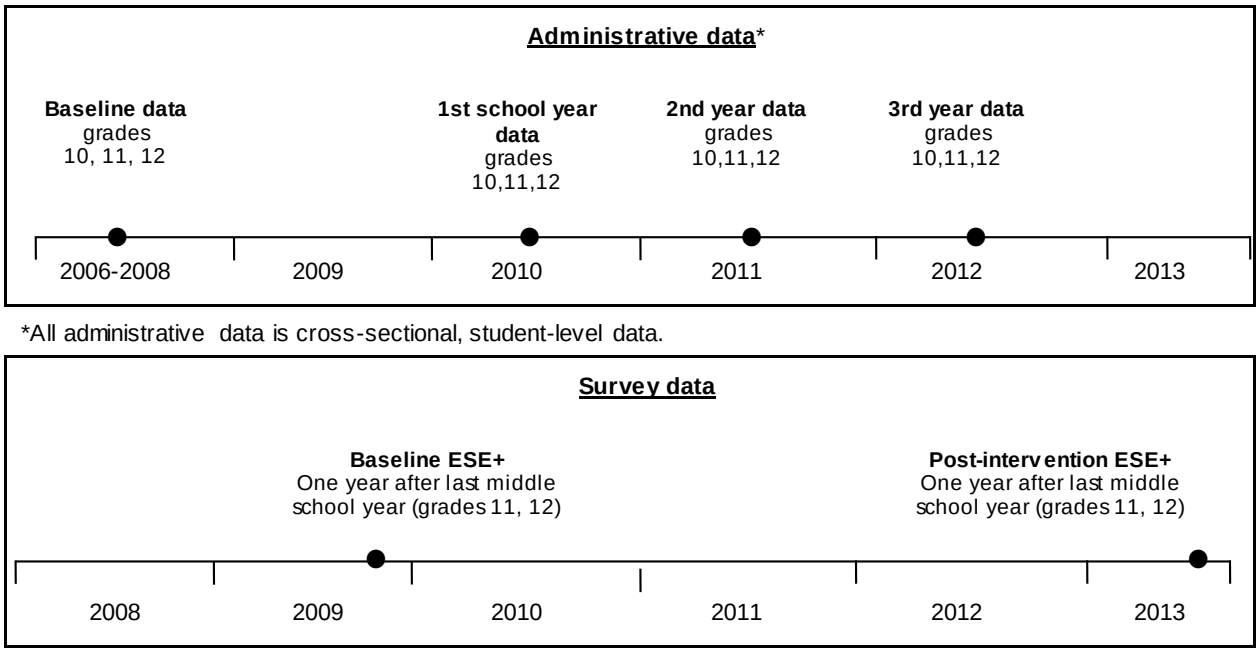
demand for technical secondary school graduates. MINED identified 75 secondary schools in the Northern Zone that were eligible to receive the intervention, and CIDE selected 20 schools—approximately two in each of 11 micro-regions—with the highest need for school improvements. These 20 schools received infrastructure investments and teacher training from 2009 to 2011, and introduced new degree and diploma programs in 2010.

Comparison group. We used propensity score matching to identify a comparison group with observable characteristics similar to those of the intervention group before strengthening investments occurred. Matching was based on data from School Census collected in 2006 and 2007, as well as the data that CIDE collected to select the intervention schools. For each intervention school, the comparison school whose propensity score was closest to that of the intervention school (and was not selected previously) was included in the comparison group. We matched each intervention school to a unique comparison school, for a total of 40 schools (20 intervention and 20 comparison schools). In general, we found that the intervention and comparison groups were, on average, balanced on observable characteristics measured with 2006 and 2007 Census data, but with a few differences in the data collected by CIDE.

Outcome indicators and data sources. Two types of outcome indicators were of interest to stakeholders: (1) educational outcomes, such as enrollment, grade completion, on-time grade progression, and academic achievement; and (2) labor market outcomes, such as employment, income, and continuation in post-secondary education. We constructed baseline education indicators, such as enrollment, pass rates, and dropout rates, with school-level data from the Census data 2006 to 2008, and we constructed final education indicators with student-level records collected for the 40 schools in the study (Figure ES.2). These records had information on student enrollment at the beginning of the year and the status of each student (either passed, failed, or dropped out) at the end of the year for 2010 and 2011, and enrollment at the beginning of the year for 2012. These student-level records allowed us to construct outcome indicators, such as enrollment, dropout within school year, progressed on time, and repeated grade. For academic achievement, we used school-level data on MINED's Learning and Skills Test for Secondary Education Graduates (PAES). In addition, we used survey data to construct labor market indicators. Baseline labor indicators were constructed with survey data collected for the study in 2009, and final labor indicators were constructed with survey data collected for the study in 2013, one year after students were scheduled to complete their secondary education. These student surveys allowed us to construct such outcomes as secondary school graduation, enrollment in post-secondary education, employment, and income.

Impact estimation for secondary schools. We estimated the impact estimates for the school-level outcomes with a regression specification that compared outcomes of schools strengthened by FOMILENIO (intervention group) with outcomes of those that received no services from FOMILENIO (comparison group), controlling for baseline characteristics. An advantage of this framework is that the statistical precision of the impact estimates is improved by controlling for baseline characteristics.

Figure ES.2. Data collection time line: secondary school strengthening



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

4. Evaluation design for the impact of scholarships

In this section, we focus on the effect of providing students with scholarships to study in strengthened secondary schools. The objective of the impact evaluation of the scholarship program was to determine whether recipients of scholarships for the strengthened schools were better off than they would have been without the scholarship. 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 was logistically feasible because at the end of 2009, there were more applicants to the scholarship activity than scholarships available for some schools and educational programs. This oversubscription allowed us to proceed with random assignment of scholarships among eligible applicants within each oversubscribed school and educational program.

An important limitation of this study is that the scholarship program was implemented in tandem with FOMILENIO-financed activities for strengthening the secondary schools at which the programs were offered. Under this strengthening program, all schools participating in the scholarship program received infrastructure improvements, and their teachers and administrators received training. These improvements most likely affected 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. Thus, the estimated impacts should be interpreted as the effect of the offer of a scholarship to study in certain programs in secondary schools strengthened by FOMILENIO.

Implementation of random assignment. The Fundación Empresarial para el Desarrollo Educativo (FEPADE) was hired by FOMILENIO to administer the scholarship program. At the end of 2009, to promote scholarships for the 2010 school year, FEPADE staff visited all 162 primary schools that feed into the 17 secondary schools offering FOMILENIO scholarships. FEPADE assessed applicants' eligibility and deemed 1,524 applications eligible to receive a scholarship. As agreed with the stakeholders, random assignment was to be done only in programs and schools that were oversubscribed. A total of 15 educational programs in 12 schools were oversubscribed, with 1,160 eligible applicants and 636 available scholarships.

In December of 2009, Mathematica randomly assigned scholarships to applicants in a public event sponsored by FOMILENIO and MCC. Of the 1,160 eligible applicants, 636 were randomly assigned to receive the scholarship offer (treatment group), 449 were randomly assigned not to receive scholarships (control group), and 75 were placed on a waiting list for scholarships (non-research group). However, only 70 percent of students who were offered a scholarship actually claimed it. As a result, FEPADE had a substantial number of unclaimed scholarships for the 2010 school year, but a lack of eligible applicants 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 preserve the integrity of the randomized allocation of scholarships, we selected these students according to their random number from the original selection process, following the same approach we used for assigning the 75 students on the waiting list (non-research group). We excluded from the evaluation the 100 students originally included in control group who were designated as eligible to receive the scholarship. This transfer of students from the control group to the non-research group reduced the size of the study sample, which in turn reduced the study's statistical power. However, it met the more pressing need to award the majority of available scholarships for the academic year. Mathematica also removed 2 schools from the research sample because in one school, most control students had been given the scholarship and in the other, there were only 2 students in the control group.

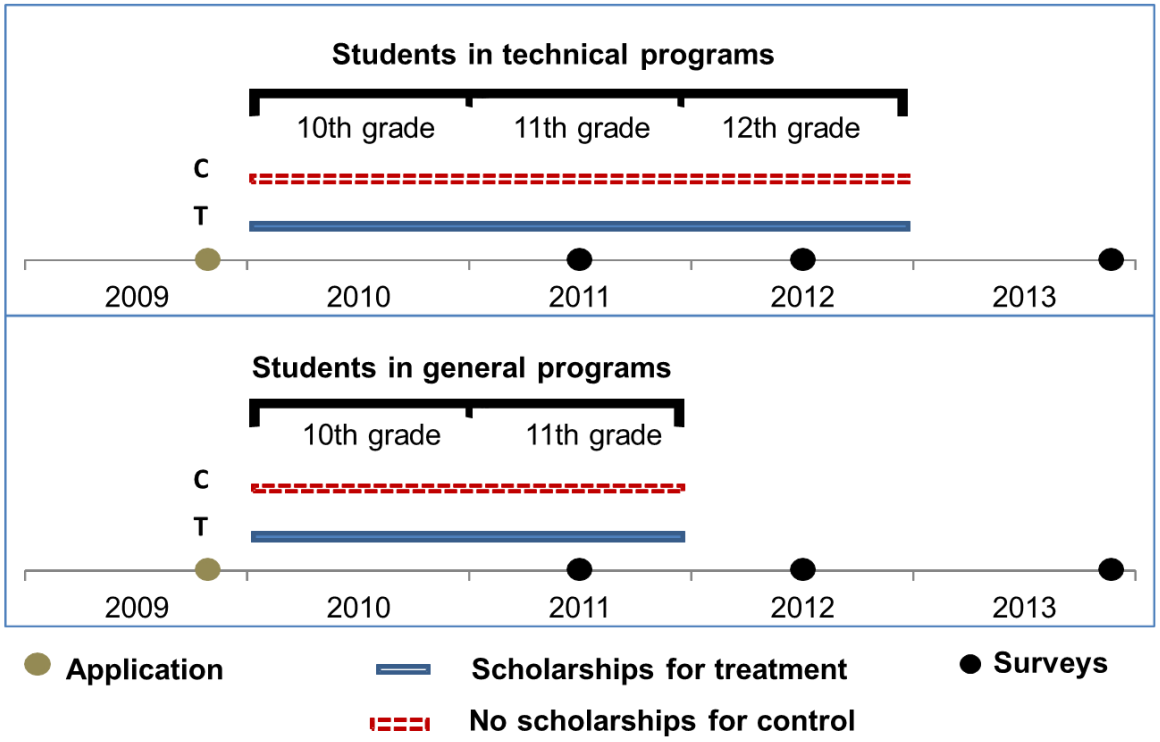
As a result of these changes, the evaluation was conducted in 13 educational programs at 10 schools with 751 students, 515 of whom were randomly assigned to the scholarship group and 236 of whom remained in the control group.

Outcome indicators and data sources. Two types of outcome indicators were of interest to the stakeholders: (1) educational outcomes, such as enrollment, grade completion, on-time grade progression, and academic achievement (which originally had 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 originally had been planned to be collected through a student survey). However, student-level administrative records were not available. Therefore, MCC hired a data collector to conduct three rounds of a student survey for the evaluation of the scholarship intervention in 2011, 2012, and 2013. We constructed educational outcome indicators using data collected from the 2011 and 2012 student surveys (Figure ES.3). We constructed labor and postsecondary education indicators from the 2013 student survey. This time line allowed 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. We also used data from the

scholarship application to obtain students' characteristics, such as household income, household size, grades, urban, age, and gender.

Impact estimation. We estimated impacts using a regression analysis that compared outcomes of students who were offered a scholarship (treatment group) with outcomes of students not offered a scholarship (control group), controlling for baseline characteristics obtained from the scholarship application.

Figure ES.3. Scholarship and data collection time line, 2009–2013



5. Research questions and evaluation design for the ITCHA improvements

We could not conduct an impact evaluation of the ITCHA conversion, as this would require information on an alternate institution to which ITCHA could be compared—for example, a similar technological center that would not be strengthened. 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. In light of these concerns, we used a mixed-methods performance evaluation design to analyze the ITCHA/MEGATEC intervention. This design uses a mix of qualitative information gleaned from stakeholder interviews and focus groups, as well as quantitative information from administrative records and student follow-up surveys.

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

1. **Design/implementation.** How were ITCHA strengthening efforts designed and implemented? Did implementation meet original targets and expectations? How were MEGATEC degree programs implemented at ITCHA and its linked secondary schools?
2. **Description of participants.** What are the characteristics (age, gender, income, and so on) of ITCHA students? What are students' professional aspirations and constraints to education and employment?
3. **Results.** Did enrollment, graduation, and employment outcomes meet stakeholders' expectations? Why or why not?
4. **Results for key subgroups.** Who likely benefited most from the ITCHA/MEGATEC investments? Were results different for girls versus boys?
5. **Explanation for results.** What are potential reasons that results did or did not meet expectations? If results were different for girls versus boys, why?
6. **Sustainability.** Are ITCHA improvements and scholarships being maintained? Is ITCHA well positioned to provide students in the region with a high quality post-secondary technical education in future years?

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 these investments have on students' enrollment and graduation rates as well as employment and income outcomes.

Data sources. Mathematica staff conducted two rounds of interviews and focus groups to ask stakeholders about their perceptions of program implementation, new MEGATEC programs, and improved infrastructure. The first round of qualitative data collection occurred in summer 2011—immediately after the commencement of new activities at the newly constructed ITCHA. The second round occurred in summer 2015, approximately 2.5 years after completion of the compact. The first round included interviews and focus groups with ITCHA students; ITCHA staff; principals of linked schools; and representatives of FOMILENIO, MCC, CIDE, and MINED. Data collection focused on stakeholders' experiences with school improvements, training, new degree programs, and scholarships. It also sought information about their views of the overall quality of program implementation (Domain 1). The second round of interviews focused on learning more about how ITCHA programs have operated in the post-compact period and documenting stakeholder perceptions on students' education and labor market outcomes (Domains, 3, 4, and 5). In addition, MCC contracted a data collector to implement a follow-up survey to two cohorts of ITCHA students after their graduation. In late 2013, the data collector interviewed students from the 2011–2012 cohort, and in mid-2015, the data collector interviewed students from the 2012–2013 cohort. These student surveys provided information on the sex, age, and other demographic characteristics of ITCHA students (Domain 2), as well as their employment and income outcomes following post-secondary school (Domains 3 and 4).

Analysis. In 2015, Mathematica analyzed qualitative and quantitative data to address the research questions in Domains 1 and 2. To characterize implementation (Domain 1), we analyzed transcripts from interviews with CIDE, FOMILENIO, and MINED staff; principals; teachers; and students to distill these stakeholders' perceptions of the quality of implementation—including the usefulness of new ITCHA classrooms, labs, and equipment. We also compared programmatic outputs to predefined compact goals and documented stakeholders' explanations for why goals were (or were not) met.

We also conducted a quantitative analysis of ITCHA student survey data in 2015 (Domain 3). As part of the quantitative analysis, we calculated outcomes such as enrollment, completion, and graduation for all ITCHA students who were surveyed in 2013 and 2015 and presented these outcomes by degree of study, as well as across all degrees of study. To present and discuss results among subgroups of ITCHA students (Domain 4), we also compared and contrasted males' and females' graduation rates, employment rates, and income. In addition, we used qualitative data from in-person interviews with principals, teachers, and MINED and FOMILENIO representatives to gather contextual information on results (Domain 5)—particularly related to variations in employment outcomes for civil engineering students compared with alternative tourism students, and male versus female students. To analyze the sustainability of ITCHA operations (Domain 6), we defined several conditions—including a strong demand-based curriculum, capable educators, and the adequate school infrastructure—that would be necessary for the institute to provide students in the region with a high quality post-secondary technical education in future years, and used administrative and interview data to assess strengthened schools in each of these dimensions.

C. Results of the secondary school strengthening evaluation

From 2009 to 2011, 20 needy schools received large-scale capital improvements, teacher training, and new degree and diploma programs. As a result of the strengthening intervention, 20 secondary schools in the Northern Zone received 49 new classrooms (39 were additions and 10 replaced existing classrooms), 15 new laboratories, 8 new computer labs, and 124 new bathroom stalls. Principals and students were generally satisfied with infrastructure improvements. During in-person interviews in 2011 and 2015, principals and students expressed their appreciation for the new classrooms, laboratories, and bathrooms constructed under the sub-activity, and noted that they generally used new infrastructure for their intended purpose—even more than five years after they were constructed. However, one principal reported that two classrooms were not built with FOMILENIO funds, despite CIDE's initial plans. In addition, three principals said that although sanitary services were well built, their sewer connections or filtration systems were not functional; as a result, they had not been used in recent years.

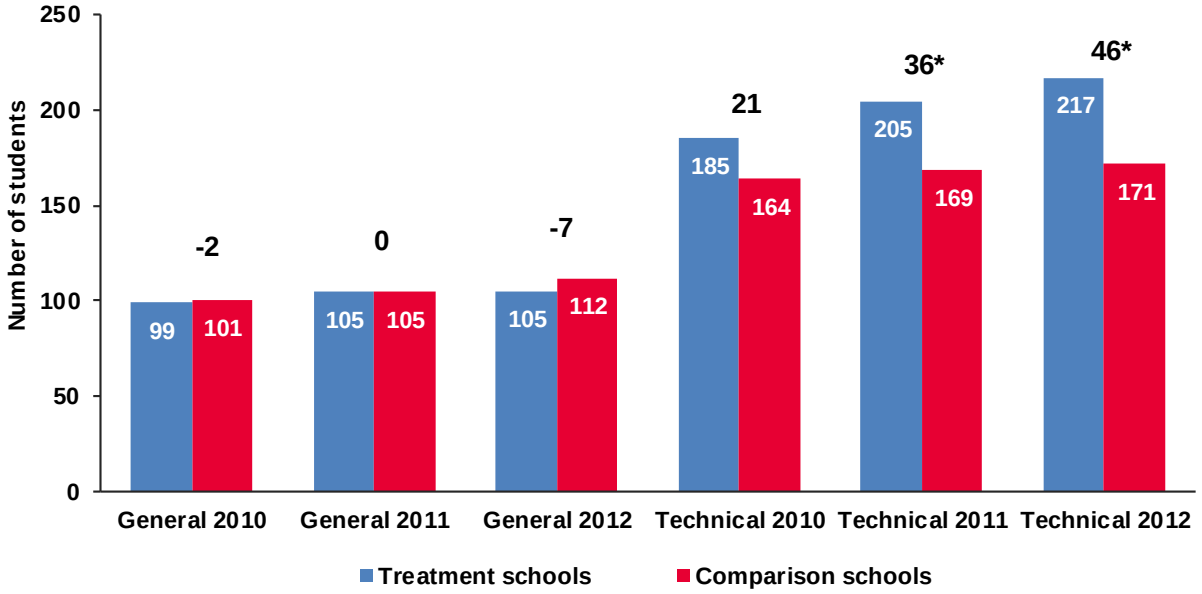
A minority of principals said that they would have liked to have been more involved in the design and execution of infrastructure investments. One principal noted a design flaw in accessing the second story of a building built with FOMILENIO funds and remarked that the school staff could have identified this issue if they had been consulted when plans were drawn up. Another principal expressed regret at not being involved in monitoring the construction budget, as there was no assurance that completed infrastructure improvements amounted to the grand total the school was promised. Another principal said he wished that after construction he

had been given the blueprints of the improvements that were made to the school, to help inform future improvements to power and water lines.

Four secondary schools introduced MEGATEC degree programs in 2010 in alternative tourism and civil engineering, and 10 of the 20 strengthened schools introduced certificate programs. As part of the sub-activity, CIDE, MINED, and FOMILENIO chose two new degrees—civil engineering and alternative tourism—to be developed as MEGATEC degree programs at ITCHA and chose four secondary schools that would be linked to the new programs. Stakeholders also developed new certificate programs—including milk production and community organizing—that would be introduced in strengthened schools. Throughout 2009, CIDE staff worked with various stakeholders to develop the degree and certificate programs' core curricula and train all newly contracted MEGATEC teachers; all programs were first introduced in early 2010. During interviews in 2011, stakeholders expressed appreciation for the new degree and certificate programs, although some had reservations about whether the alternative tourism curriculum had strong potential for labor market insertion.

In combination with scholarships, secondary school improvements had a positive effect on enrollment in technical programs. After taking into account differences in enrollment at baseline, we find statistically significant impacts of school strengthening on enrollment in technical programs in 2011 and 2012. On average, treatment schools had about 36 more students enrolled in technical programs than comparison schools in 2011 and 46 more students in 2012 (Figure ES.4). This trend likely reflects the impact of secondary school improvements—including new technical degree programs and infrastructure at strengthened schools—on students' motivation to enroll as well as schools' capacity to serve additional students. However, it also likely reflects some impact of FOMILENIO scholarships on enrollment, as these scholarships were offered in 17 of the 20 treatment schools, but not in any of the 20 comparison schools. Thus, the finding of increased enrollment is a likely the result of enhancing students' demand for technical education (primarily through scholarships) while enhancing the supply of high quality technical education (through new programs, additional classrooms, and infrastructure).

Figure ES.4. Impacts of secondary school strengthening on enrollment, by program and year (number of students)



Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from Final Enrollment, School Census 2006–2008.

Note: Treatment means are regression adjusted using ordinary least squares and include covariates to account for the average enrollment across the baseline years (2006, 2007, and 2008). Comparison means are unadjusted. Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Strengthening efforts had a positive effect on student achievement. Administrative and survey data illustrate that in 2012 (the third year of the interventions), treatment school students had significantly higher PAES global and science scores than comparison school students, after controlling for baseline differences in student achievement. These findings suggest that the secondary strengthening intervention had a positive effect on students' achievement, particularly in science. Interviewed stakeholders related these positive impacts to such factors as better laboratories, more practice, and the technical degree and diploma programs introduced as part of the intervention—particularly the competency-based approach to learning, which reinforced problem-solving and analytical skills. Furthermore, it appears that these positive impacts on achievement were driven by girls' PAES scores. In the strengthened schools, academic achievement was similar for boys and girls, but in the comparison group, girls' performance is lower than boys.

Strengthening efforts had effects on enrollment and academic achievement, but not on other educational outcomes. Based on this analysis, secondary school strengthening investments had no impact on progressing to the next grade on time and graduation rates. It therefore appears that the primary effect of scholarships, infrastructure investments, and new degree and certificate programs was to attract a larger number of students into technical programs that would have not enrolled otherwise. Once these students were enrolled, however, scholarships, new infrastructure, and degree and certificate programs played no detectible role in motivating or allowing students to progress in, and graduate from secondary school. However, these investments did strengthen the quality of education, to the extent that students in strengthened schools experienced higher test scores than their counterparts in comparison schools.

Strengthening secondary schools had no effect on employment and income one year after students were scheduled to complete general or technical degrees, but had a marginal effect on enrollment in technical vocational post-secondary education. We find that about one-third of the students in our sample reported being employed one year after they were scheduled to complete a general or technical degree for both strengthened and comparison schools. However, a larger percentage of students from strengthened schools reported being enrolled in a technical vocational institution than in the comparison schools. This is likely related to the four strengthened schools with MEGATEC programs linked to the ITCHA. The students from these schools were able to transfer to this vocational post-secondary institution and complete their post-secondary degree within only one year, often with full or complete scholarships.

The intervention had a negative impact on labor market outcomes for students in technical programs but this is likely related to their larger enrollments in post-secondary education. Technical program students in treatment schools were less likely to be employed, worked few hours, and had lower total income, on average, than technical program students in comparison schools. However, this should not be interpreted as an entirely negative finding, as there is suggestive evidence that the lower employment rates for technical students in the treatment group were due in part to more students in this group than in the comparison group enrolling in post-secondary (vocational) education. Presumably, enrollment in post-secondary education could pay dividends in future years if students obtain more specialized and higher-paying jobs as a result of their advanced studies.

The intervention had no perceptible impact on employment indicators for girls or for boys. But boys' employment rates are almost double girls' employment rates. For both girls and boys, treatment and comparison students tended to report similar employment and full-time employment rates. Interestingly, boys had much higher employment rates and more hours worked than girls, on average. For example, male employment rates in the treatment and comparison groups were 44 and 50 percent, respectively. In contrast, the employment rates were 25 and 27 percent among girls in the treatment and comparison groups, respectively. Stakeholders perceived that this finding reflected persistent cultural values and gender stereotypes in El Salvador: in general, boys are expected to find employment and girls are expected to remain at home—even after completing secondary school.

D. Results for the scholarship program

The FOMILENIO scholarships program in strengthened schools provided scholarships to students with economic need. FOMILENIO offered scholarships in the 17 of the 20 strengthened schools that offered a technical degree or a certificate. Scholarships for secondary education were for $400 awarded for the first year and could be renewed up to two years. FOMILENIO and MINED formed a scholarship committee to manage the scholarship allocation across those schools. The committee also selected the educational programs in which the scholarships would be offered and the number of scholarships for each program. Programs selected for scholarships were largely new MEGATEC degree programs and certificate programs in which FOMILENIO and MINED staff wanted to stimulate student interest, and the number of scholarships designated for each program reflected stakeholders' estimates of the size of the incoming 10th grade class, as well as their desire to fill degree and certificate programs to capacity.

FOMILENIO exceeded the targets for awarded scholarships. From 2009 to 2012, FOMILENIO financed 4,330 secondary school scholarships. This total includes 3,409 secondary school scholarships, 586 post-secondary scholarships for ITCHA students, and 335 post-secondary scholarships for non-ITCHA students. This surpassed the compact goal of 3,600 secondary and post-secondary scholarships awarded from 2007 to 2012.

Scholarships were generally popular, but some students noted disbursement delays and uncovered school expenses. Students expressed satisfaction with the scholarships, but reported that at $30 a month, scholarships did not cover their educational costs—particularly related to transportation and food. In addition, disbursement delays linked to MINED's annual budget approval process hampered second- and third-year students' receipt of scholarships.

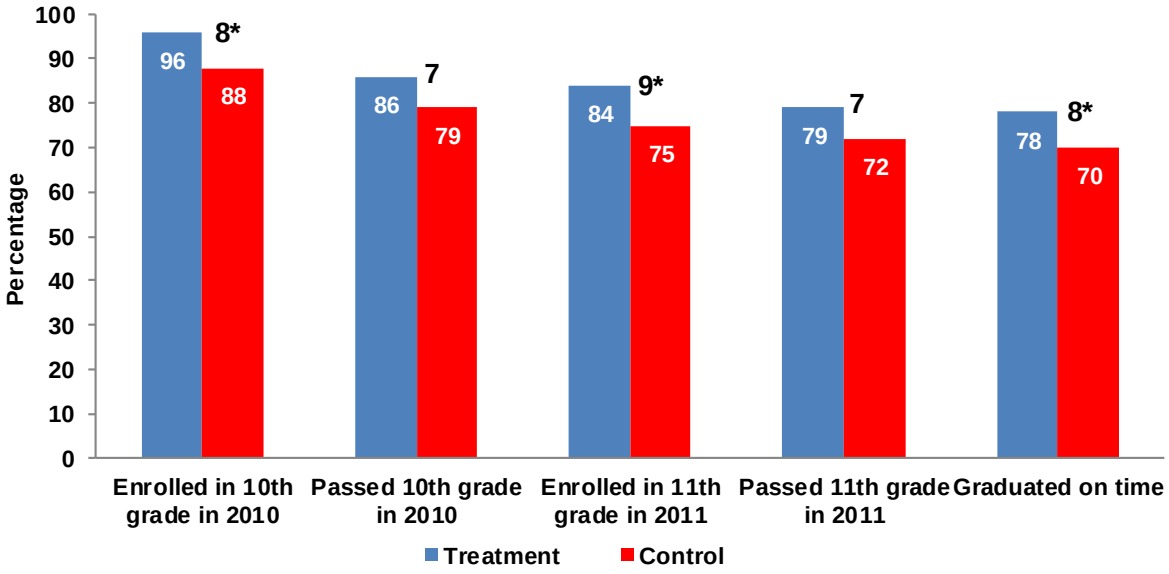
MINED fulfilled its commitment to renew second- and third-year FOMILENIO scholarships during the post-compact period, but did not fund new first-year scholarships in 2013 or 2014. After the compact ended in 2012, MINED fulfilled its commitment to fund second- and third-year secondary school scholarships until the last cohort of FOMILENIO scholarship recipients finished secondary school in 2014. Under this arrangement, the annual secondary school scholarship amount remained at $400 per year. A FOMILENIO representative noted, "Yes, [MINED] fulfilled their end of the bargain." However, the FOMILENIO representative expressed disappointment that during 2013 and 2014, MINED did not devote funds to new scholarships for students entering their first year of secondary school. According to the representative, MINED had committed to financing additional scholarships in the post-compact period. However, this agreement did not specify the exact number of scholarships, the scholarship amount, the total budget that MINED would devote to scholarships, the exact years the scholarships would be offered, or their terms and conditions. According to the FOMILENIO representative, the lack of detail in this commitment represented a lost opportunity for FOMILENIO to secure a strong counterpart contribution from MINED for additional scholarships in the region.

In 2015, MINED funded a new round of secondary school scholarships in the Northern Zone. In 2015, MINED introduced 458 need-based scholarships (valued at $183,200) to first-year students at the 17 technical schools that received FOMILENIO scholarships. The amount of

the new scholarships is the same as the FOMILENIO scholarship—$400 per year—and they primarily fund technical programs. If students continue to be eligible, they can renew their scholarship for two more years—2016 and 2017. However, because MINED has limited resources for scholarships in the Northern Zone, the next round of first-year scholarships will not be available until 2018; in other words, no first-year students will get scholarships in 2016 or 2017, similar to 2013 and 2014. MINED's continued investment in scholarships to support technical education in the region is a positive development, but its total number of first-year scholarships from 2015 to 2017 (458) falls far below the number of first-year FOMILENIO scholarships awarded from 2010 to 2012 (3,259).

FOMILENIO scholarships in the strengthened schools had a positive impact on enrollment, continuation, and graduation from secondary school. Students offered scholarships for the strengthened schools were 8 percentage points more likely both to enroll in secondary school and to earn a secondary degree than students not offered scholarships (Figure ES.5). Because they were awarded primarily for technical programs, scholarships also influenced students to choose technical over general degree programs. These findings validate the fundamental logic of the scholarship program, in which modest scholarships can incentivize needy students to enroll in and complete technical degree programs. However, because the scholarships were offered only in schools that also were strengthened with infrastructure and curriculum improvements, the effects we find on enrollment reflect both the offer of the scholarship and strengthening of the schools.

Figure ES.5. Impact of scholarships on enrollment, completion, and graduation, by study group



Source: Student follow-up surveys administered in July 2012 and July 2013.

Notes: Graduation on time means graduation from a general program in 2011 or from a technical program in 2012. Means are regression adjusted using ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income); indicator variables of each program where randomization was conducted were included as covariates to account for random assignment within programs. Means are weighted to account for the different probabilities of assignment to the treatment across programs and for nonresponse. Some numbers may not add up, due to rounding.

* Impact estimate is statistically significant at the .05 level.

The scholarships' positive effects were concentrated among boys. Scholarships played a large role in motivating boys to enroll in and complete secondary school but no clear role in girls' education outcomes (statistically significant impacts of between 14 and 20 percentage points for boys' key educational outcomes versus no statistically significant impacts for girls). This effect was not foreseen in the program's original design, which envisioned comparable effects of scholarships for both boys and girls. Interestingly, the larger effects among boys are due to the fact that a nontrivial portion of boys who were not offered scholarships generally did not enroll in secondary school, but girls tended to enroll regardless of whether they received the scholarship offer. Several stakeholders noted that scholarships serve as a stronger motivator for boys than girls because they reduce boys' strong incentives to emigrate or find low-skilled work to provide for their families.

Scholarships had a negative effect on students' employment but a positive effect on post-secondary technical education in 2013. Students offered scholarships were less likely to be employed than those not offered scholarships (34 percent versus 43 percent; statistically significant at the 5 percent level). Furthermore, students offered the scholarship worked fewer hours per week than those not offered scholarships. This negative effect on employment is likely related to the scholarship's positive and statistically significant effect on enrollment in post-secondary technical education (19 percent versus 6 percent among students not offered scholarships; statistically significant at the 5 percent level). This can, in turn, be related to the fact that four strengthened schools introduced degree programs linked to the ITCHA, and graduates from these schools were able to complete post-secondary degrees at ITCHA in one year, often with a full or partial scholarship. Thus, we can conclude that the scholarships, and likely the link with ITCHA, played some role in motivating students to forego immediate entry into the labor force in favor of pursuing a technical post-secondary degree. In part, this fulfils the program's objective of increased enrollment in post-secondary technical education. However, one year after students' projected graduation from secondary school, it does not appear that student outcomes have fulfilled the program's goals of increased employment and income among graduates. Perhaps, however, these goals could be realized in a longer time frame—for example, three or four years after secondary school graduation.

When we analyze the effects of FOMILENIO scholarships on students who actually received at least one scholarship payment, we find similar but larger effects than in our analysis of students who simply received the scholarship offer. Students who received (but did not necessarily accept) the offer of a scholarships were 11 percentage points more likely to enroll in 11th grade; 10 percentage points more likely to complete 11th grade; and 13 percentage points more likely to enroll in, complete, and pass 12th grade than students who did not receive a FOMILENIO scholarship. In contrast, students who accepted scholarships were 14 percentage points more likely to graduate with a technical degree than those who did not receive one and 16 percentage points more likely to enroll in a post-secondary technical-vocational education institution. However, we also find that scholarship recipients were 12 percentage points less likely to be employed than non-recipients and worked about 5.7 fewer hours per week. In summary, we find that the scholarships' positive effects on secondary enrollment and graduation, positive effects on post-secondary technical enrollment, and negative effects on employment are larger among scholarship recipients—to the extent that one in 10 scholarship recipients likely attended and completed secondary school as a direct result of the scholarship.

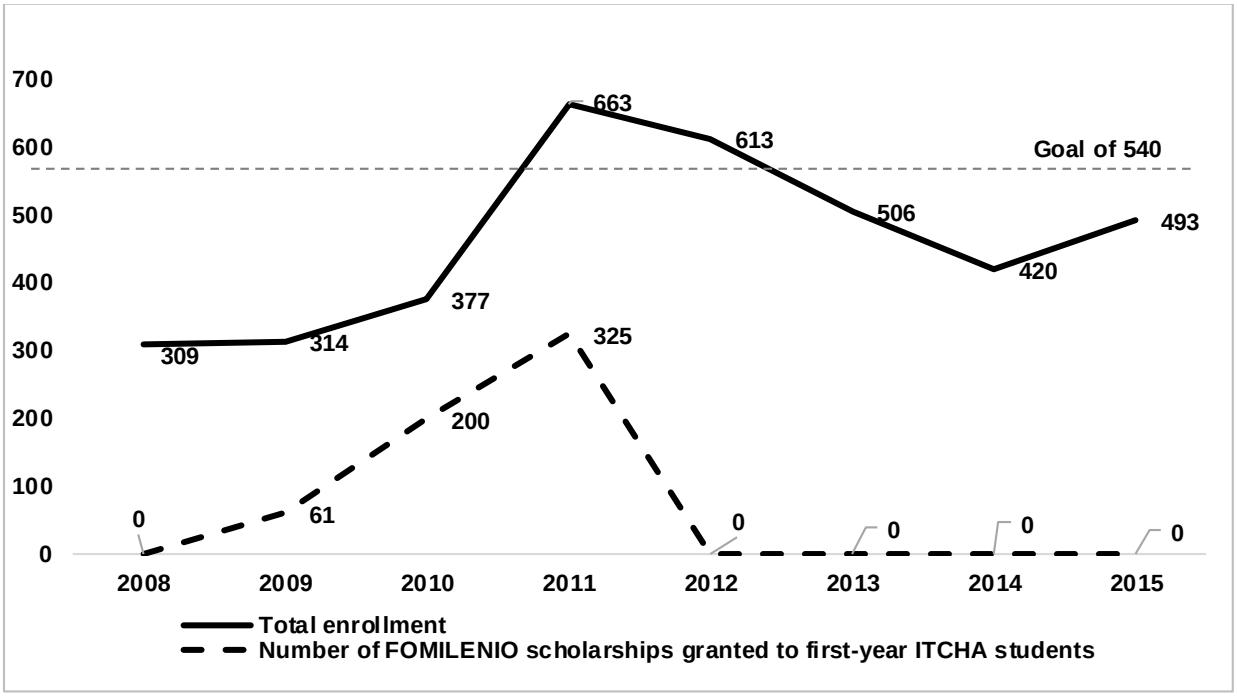
E. Results of the ITCHA/MEGATEC intervention

Compact funds financed a new, fully equipped ITCHA facility. ITCHA's new facility was completed in April 2011 after some construction delays. The new facility included nine classrooms and 14 computer and technical laboratories. Although construction was more expensive than originally planned, total investments in ITCHA did not exceed the original budget. ITCHA administrators, teachers, and students reported being very satisfied with the new facility. Students reported that new classrooms were large and each student had a desk, unlike with the previous facility. Teachers stated that ITCHA's new offices met their needs and the school's administrative area had greatly improved. However, some ITCHA teachers reported that the configuration of the new non-MEGATEC labs was not optimal. The teachers reasoned that if they had been consulted, they could have helped design labs that were more conducive to high quality instruction.

Stakeholders designed and introduced new MEGATEC degree programs without major complications. In addition to infrastructure investments, FOMILENIO and CIDE staff designed the new competency-based MEGATEC degree programs in a collaborative effort, and the two new MEGATEC programs were introduced at ITCHA and linked schools in 2010. Challenges to implementing the new degree programs at ITCHA and four linked secondary schools included crowded classrooms, initial discrepancies in academic standards between ITCHA and secondary schools, and student doubt about the new programs' legitimacy. However, stakeholders noted that teacher training was excellent, and they praised newly contracted MEGATEC teachers' enthusiasm for the degree programs as an asset to program intervention. At follow-up, teachers noted improvements in the quality of education linked to the new competency-based programs, but they would have liked more guidance with student assessment, less redundancy in competency-based modules, and more realistic goals with respect to students' mastery of the material.

Enrollment grew dramatically by 2011 but then decreased in the post-compact period. Enrollment at ITCHA more than doubled from slightly more than 300 in 2008 to more than 650 in 2011 (Figure ES.6). Stakeholders attributed this dramatic growth mostly to the availability of FOMILENIO scholarships from 2009 to 2011. However, ITCHA enrollment dipped substantially from 2012 to 2014, and total enrollment never again reached FOMILENIO's revised monitoring and evaluation target of 540 from 2013 onward. Enrollment increased slightly in 2015, possibly in response to 100 additional first-year scholarships MINED provided that year.

Figure ES.6. ITCHA total enrollment and scholarships, 2008 to 2015 (number of students and first-year scholarships)



Source: Administrative data provided by ITCHA.

Scholarships likely played a pivotal role in students' enrollment at ITCHA. Most former ITCHA students reported that scholarships enabled them to enroll in post-secondary school. Approximately three-fourths of interviewed ITCHA students across both cohorts who had scholarships to attend ITCHA reported that they would not have been able to attend without a scholarship, compared with one-fourth of students who said they would have studied at ITCHA regardless of the scholarship, either with support from their parents or by working.

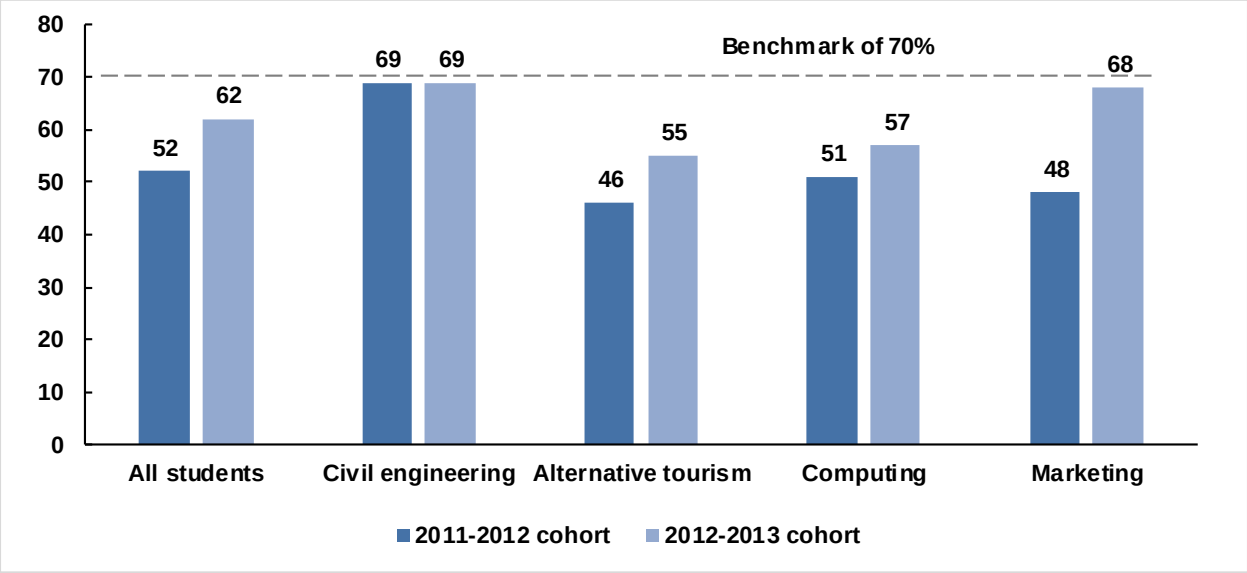
ITCHA students had good academic achievement and had healthy graduation rates. On average, ITCHA students reported grade point averages (GPAs) of around 8.0 out of 10 during their two years at ITCHA. ITCHA students' graduation rates, at 85 percent and above in both cohorts, surpassed the key FOMILENIO monitoring and evaluation benchmark of a 73 percent graduation rate.[6] Students from linked secondary MEGATEC programs had a 100 percent graduation rate in 2013.

ITCHA students' employment rates at follow-up—below 65 percent—did not meet initial targets. Across all degree programs, employment rates at followup were 52 to 62 percent in the 2011–2012 and 2012–2013 cohorts, respectively (Figure ES.7). These rates are below the target outlined in the compact of 70 percent employment one year after ITCHA graduation. In follow-up interviews, ITCHA administrators and FOMILENIO representatives suggested that economic factors played a large role in these employment rates, as there was limited demand in the region for individuals with technical skills in marketing, computers, and tourism. These

[6] This graduation rate of 85 percent is among students enrolled in two-year ITCHA programs.

employment rates also reflect students' continued education: 7 percent of all interviewed ITCHA students across both cohorts reported not working at follow-up because they were engaged in university studies.[7]

Figure ES.7. Employment of ITCHA students at follow-up (percentages)



Source: 2013 and 2015 ITCHA follow-up surveys.

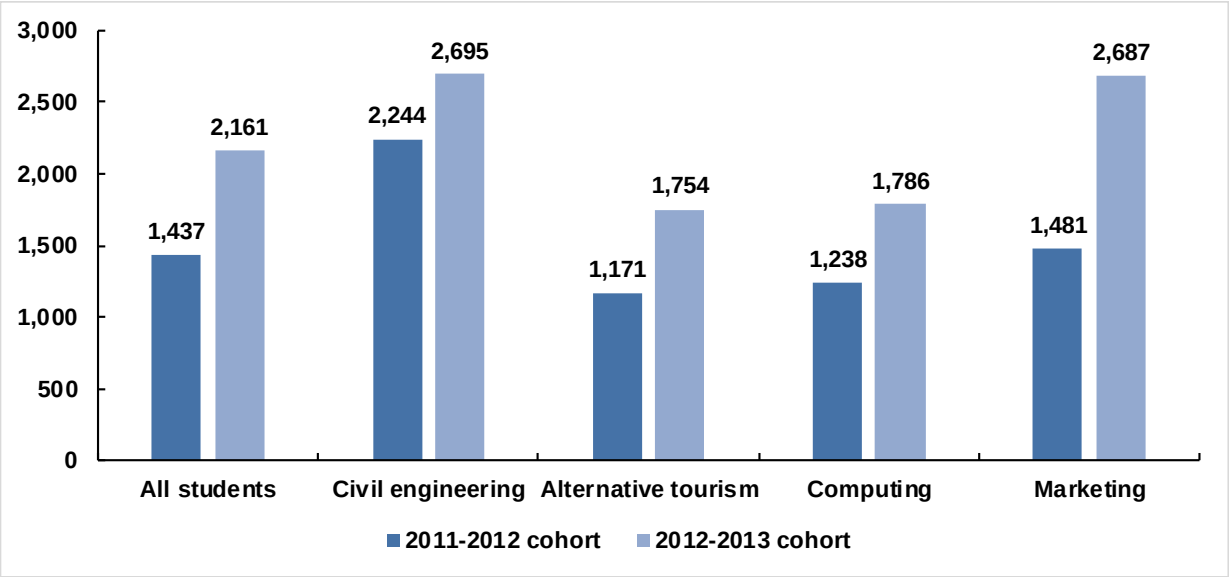
Note: The sample size is 319 former students in the 2011–2012 cohort and 242 former students in the 2012–2013 cohort.

Employment rates were highest among civil engineering students and lowest among tourism and computing students. Employment rates were higher for civil engineering students (69 percent in both cohorts) than for students in other programs. In contrast, the employment rate for alternative tourism and computing programs was below 60 percent for both cohorts. According to ITCHA administrators, civil engineering graduates have secured high quality jobs linked to public and private construction projects throughout the country in recent years. In contrast, tourism in the country is dependent upon Salvadoran nationals' disposable income and sense of security in the country, which have deteriorated in recent years. ITCHA staff also noted that a lack of public investment in tourism—particularly mountain tourism in the Northern Zone—likely hurt the employment rates of tourism students.

Civil engineering graduates had the highest total income of all ITCHA degree programs. In both cohorts, engineering graduates had the highest annual income at follow-up (Figure ES.8). In the 2011–2012 cohort, the high average monthly salary reported by engineering students was driven by high salaries earned by several students who secured well-paid surveying jobs within a year of graduating. Also notable is that the income of marketing students in the 2012–2013 cohort was relatively high, comparable to that of civil engineering students.

[7] These rates were 6 and 9 percent for the 2011–2012 and 2012–2013 cohorts, respectively.

Figure ES.8. ITCHA students' average annual income at follow-up (USD)



Source: 2013 and 2015 ITCHA follow-up surveys.

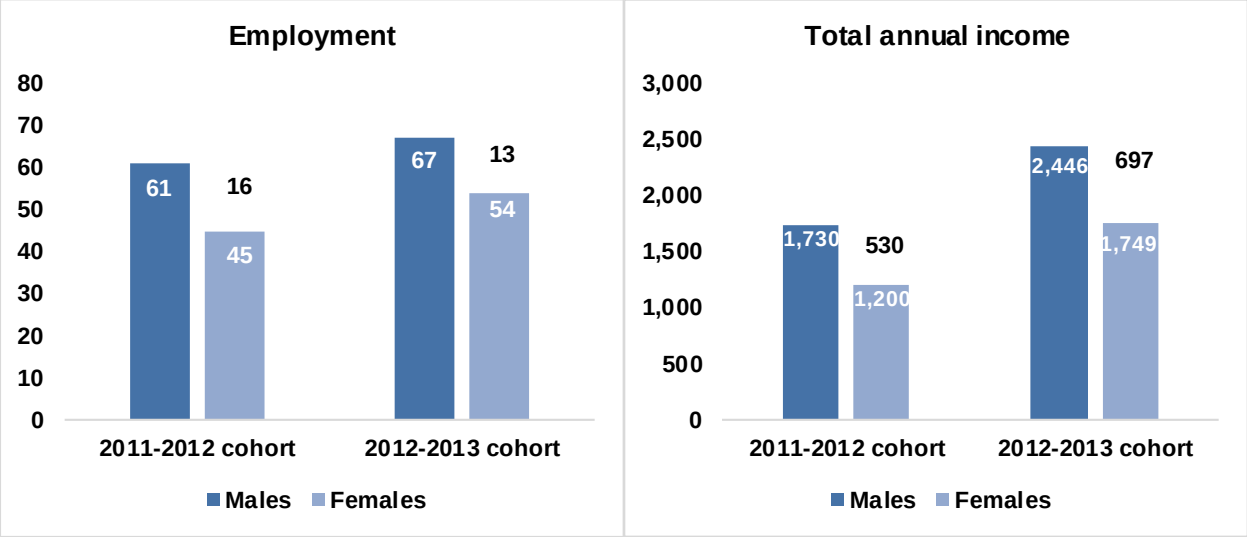
Notes: The sample size is 319 former students in the 2011–2012 cohort and 242 former students in the 2012–2013 cohort.

The data shown include labor market income as well as other income, including remittances and scholarships.

ITCHA dropouts had lower employment rates and monthly salaries than ITCHA graduates, but they had similar annual incomes. In both cohorts, ITCHA dropouts reported slightly lower employment rates than graduates at follow-up. These findings are in line with dropouts' higher rates of university enrollment. Comparing dropouts who reported jobs to graduates who reported jobs, dropouts had lower monthly salaries (around $240 for graduates versus around $185 for dropouts). Total annual income was well-balanced between dropouts and graduates, due in part to dropouts' non-labor income (including scholarships) and relatively higher number of months worked in the past year compared with ITCHA graduates in the 2011–2012 cohort. However, it should be noted that the sample size for dropouts is relatively small—as low as 21 for the 2012–2013 cohort. For this reason, these results should be interpreted with caution.

There was a gender imbalance in employment rates and annual income at follow-up. Despite no meaningful differences in GPA or graduation rates across all degree programs, females in both ITCHA cohorts reported employment rates 13 to 16 percentage points lower than males. Employed males also made at least $55 more, on average, than employed females on a monthly basis. This difference exists within degree programs, with male engineering students reporting monthly salaries that are at least $50 higher, on average, than female engineering students; a similar wage differential exists among male and female tourism students. Reflecting gender differences in wages as well as employment rates, males' annual total income was more than $500 higher than that of females in the 2011–2012 cohort and nearly $700 higher in the 2012–2013 cohort (Figure ES.9). ITCHA staff cited discrimination and gender norms as a factor in these imbalances.

Figure ES.9. ITCHA students' employment and income at follow-up, by gender



Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size in the 2011–2012 cohort is 144 men and 175 women across all degree programs. The sample size in the 2012–2013 cohort is 144 men and 98 women across all degree programs.

F. Sustainability analysis

We assessed the sustainability of subactivity investments in strengthened secondary schools and ITCHA. For this analysis, we define sustainability as the presence of five key conditions that will enable strengthened schools to provide students in the region with a high-quality technical education in future years: (1) a sound, demand-based curriculum, (2) capable educators, (3) continued enrollment in improved schools, (4) continued maintenance and upgrades of school infrastructure and equipment, and (5) leadership and financial support from MINED. First, we assess the sustainability of secondary-level FOMILENIO investments—including training and infrastructure improvements to 20 schools, in addition to secondary scholarships. Next, we assess the sustainability of FOMILENIO investments in ITCHA and linked MEGATEC programs.

Tables ES.2 and ES.3 summarize our sustainability findings for secondary schools and ITCHA, respectively. In secondary schools as well as ITCHA, there appears to be a strong technical curriculum in place, as well as a mechanism to modify the curriculum based on labor market demand. In addition, there is adequate to strong potential for sustained enrollment, infrastructure, and political leadership at the secondary and post-secondary levels. However, the lack of a formal teacher training program—particularly for technical subjects—poses a threat to improved schools' ability to provide students with a high-quality technical education in future years.

Table ES.2. Sustainability assessment: secondary school strengthening

Key element	Findings	Sustainability Potential
Sound, labor demand-based curriculum	Stakeholders agree that technical degree programs have a strong curriculum. Technical graduates appear to be more attractive to employers than general graduates in the region.	Strong
Capable educators	A lack of consistent, formal teacher training for general and technical programs poses a threat to maintaining a cadre of capable teachers.	Weak
Continued secondary enrollment	Enrollment in strengthened secondary schools fell into the post-compact period, likely due to the discontinuation of FOMILENIO scholarships. New MINED scholarships may help stabilize enrollment in the region after a dip in enrollment in 2013 and 2014. These scholarships would have to be awarded to needy students finishing 9th grade, as opposed to students already enrolled in 10th grade, to better improve enrollment in secondary schools.	Adequate
Infrastructure and equipment	Secondary schools have been diligent in maintaining infrastructure improvements. However, technology updates are needed—particularly the purchase of new computers. MINED funds are available for maintenance but not for new purchases and construction. In follow-up interviews, MINED emphasized schools' own responsibility in finding funding for new infrastructure.	Adequate
Leadership and support	MINED appears committed to continuing secondary scholarships in the region and supporting strengthened schools. However, staffing constraints will likely limit MINED's interactions with strengthened schools in the Northern Zone in future years.	Adequate

Source: Authors' analysis.

Table ES.3. Sustainability assessment: ITCHA/MEGATEC investments

Key element	Findings	Sustainability Potential
Sound curriculum based on labor demand	In general, stakeholders support the institute's move to a competency-based curriculum. ITCHA updates its curriculum periodically to reflect current labor market demand. This is particularly important for the alternative tourism degree program, which had low employment rates at follow-up due to weak demand for tourism services.	Strong
Capable educators	ITCHA administrators expressed confidence in their training program, but students and teachers requested better and more regular technical training. In addition, the replacement of two CIDE-trained teachers hurt students' achievement, according to stakeholders.	Weak
Continued post-secondary enrollment	ITCHA enrollment and graduation was at an all-time high in 2011, but it dipped in the post-compact period, likely as a result of fewer scholarships. However, recent increases in the number of MINED and other scholarships may stabilize future enrollment.	Adequate
Infrastructure and equipment	New classrooms and labs are still operational, but ITCHA is already experiencing space constraints, particularly with respect to computer labs and workshops. Of primary importance in the near term is updating computers; ITCHA appears to have the funds to make this investment on a rolling basis over the next several years.	Adequate
Leadership and support	Political support for MEGATEC education is strong. MINED has committed to maintaining and expanding MEGATECs throughout the country, including ITCHA.	Strong

Source: Authors' analysis.

G. Lessons learned

Stronger consultation with school staff with respect to infrastructure investments could have enhanced implementation of the school strengthening component. Program implementers worked with each secondary school to conduct a needs assessment and tailor the strengthening intervention—including degree programs, infrastructure investments, and scholarships—to each school's needs. However, interviews with school principals in 2015 suggested that additional consultation with school staff could have enhanced program implementation. For example, consultation meetings between program implementers and school staff to discuss preliminary construction plans could have uncovered potential design flaws in preliminary plans and enhanced transparency in the design, budgeting, and construction process. In future interventions of this kind, program implementers could consider not only conducting formal needs assessments (as they consistently do), but also building a formal stakeholder consultation phase into implementation plans. In these consultations, school staff (and potentially parents and students) could have the opportunity to better understand planned capital investments and suggest modifications.

In future education investments, Millennium Challenge Accounts (MCAs) could negotiate more detailed post-compact commitments. In the interest of continuing scholarships in the Northern Zone after the compact, FOMILENIO and MINED representatives signed an agreement in which MINED committed to continuing to fund new technical scholarships in FOMILENIO-strengthened secondary schools after the compact expired in late 2012. However, a FOMILENIO source was disappointed with the lack of new MINED scholarships during these years, suggesting that MINED should have been held to stronger and more specific commitments regarding the number of scholarships it would administer, the scholarship amount, and the years of administration. In future post-compact negotiations, MCAs could attempt to achieve more definitive commitments from government counterparts regarding their continued investments in scholarships, infrastructure, or teacher training. Such commitments are particularly important with scholarships, which have been shown to have a positive impact on secondary school enrollment in the region.

In regions with weak labor market demand, investments in technical education may generate limited immediate employment. The evaluations found no effects of secondary school improvements and scholarships on students' employment levels around one year after their projected graduation dates. Stakeholders attributed these relatively low employment levels, in part, to a lack of labor market demand and job opportunities in the region. In the context of weak labor market demand, investments in human capital of these kinds may have limited short-term effects on employment rates. However, these human capital development efforts could have positive long-term effects, particularly if some portion of students are able to start successful businesses, or if governmental or nongovernmental actors succeed in attracting investment and businesses opportunities to the region in future years.

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I. INTRODUCTION AND OVERVIEW

In this report, we present the final results of the evaluations of three interventions under the Formal Technical Education Sub-Activity of the first Millennium Challenge Corporation (MCC)-El Salvador compact. These interventions were (1) a secondary school[8] 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). The impact evaluation of the secondary school strengthening program employed a quasi-experimental design, whereas that of the secondary school scholarship program employed an experimental design. Last, the performance evaluation of the ITCHA intervention employs a mixed-methods performance evaluation design. From 2007 to 2015, we planned and implemented these evaluations in consultation with MCC, the Millennium Challenge Account of El Salvador (known as FOMILENIO in Spanish), and other stakeholders. 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 of 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 report.

We have organized this report into seven chapters, as follows: In this first chapter, 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 II, we present the full set of research questions and the overarching impact evaluation design for the secondary school and scholarship evaluations. In Chapter III, we present the performance evaluation design for the ITCHA strengthening intervention. In Chapter IV, we present secondary school strengthening findings and in Chapter V, the scholarship findings. In Chapter VI, we present the ITCHA findings; in Chapter VII we provide an assessment of the sustainability of the sub-activity's investments.

A. Background on the MCC-El Salvador Compact and 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 included other activities that provided substantial investments in water

[8]Throughout this document, when we use the term "secondary schools," 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.

supply and sanitation facilities and services, increased 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 advance economic growth and reduce poverty in the country's Northern Zone.[9] Specifically, the objectives of the three projects for the Northern Zone were to increase human and physical capital (Human Development), increase production and employment (Productive Development), and reduce travel cost and time (Connectivity). The compact established a counterpart entity under the government of El Salvador, FOMILENIO, which was charged with administering the compact's three projects.

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 could "gain marketable skills and thereby increase their opportunities for employment and income generation."[10] 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. The sub-activity would also provide $9 million to improve 20 technical secondary schools in the Northern Zone with large-scale infrastructure investments in classrooms, laboratories, and bathrooms; new technical degree and certificate program[11] offerings; teacher training in pedagogy; and student assessment.

In addition, it was scheduled to invest $7 million to strengthen ITCHA. This included large-scale infrastructure investments, teacher training in pedagogy, and student assessment. As part of the ITCHA intervention, FOMILENIO also supported the Salvadoran Ministry of Education (MINED)'s development of two new technical degree programs to be introduced at ITCHA and four feeder secondary schools under the Gradual Educational Model of Technical and Technological Learning[12] (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 in which students learn relevant theory and engage in hands-on practice to build their understanding and key skill sets. Students who complete technical programs at "linked" 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

[9]El Salvador Compact, Projected Long Term Results, http://www.mcc.gov/pages/countries/evaluation/el-salvador-compact.

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

[11]Certificate programs are short-term technical programs in agroforestry, milk production, solid and organic waste management, and other skills to be introduced to 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.

[12]The full name of the MEGATEC program is Módulo Educativo Gradual de Aprendizaje Técnico y Tecnológico.

insertion program, known as PILAS (Programa de Inserción Laboral Sostenible), to help recent technical school graduates find salaried employment or start their own businesses.[13]

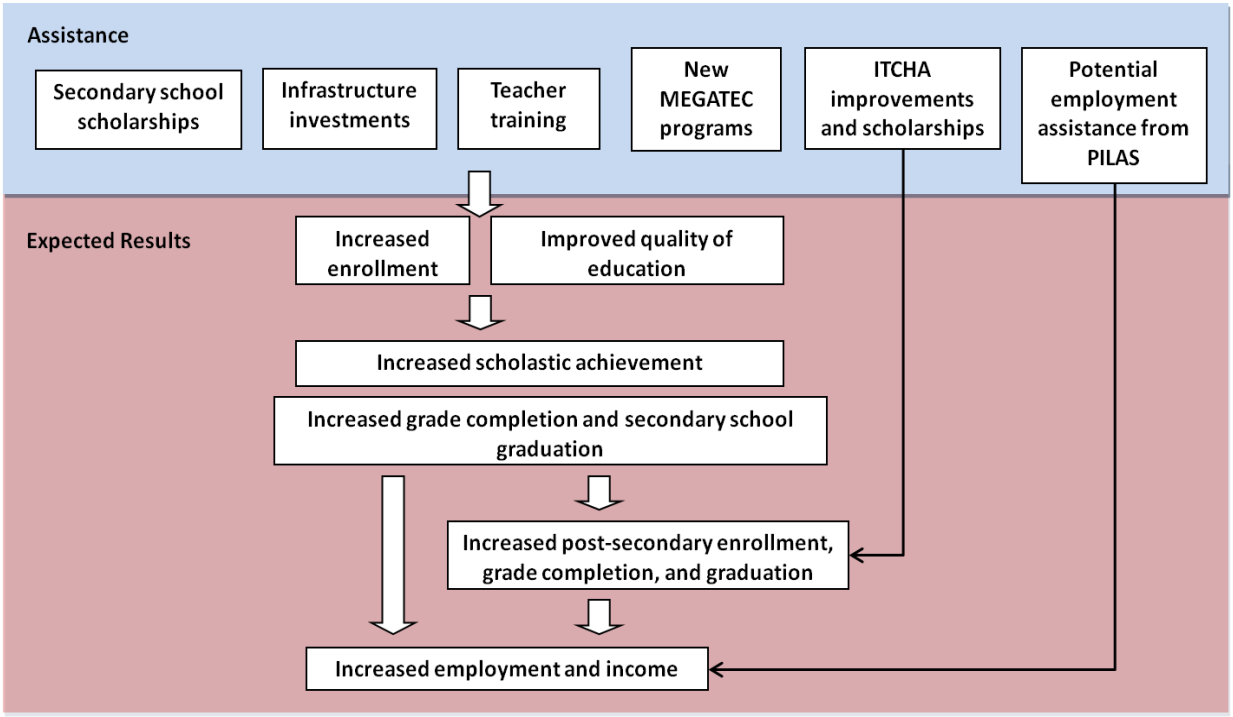
1. Program logic

Figure I.1 summarizes how the interventions under the Formal Technical Education sub-activity were intended to interact and improve outcomes. The 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 school programs, particularly technical ones. 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 model hypothesizes that increased enrollment and better instruction would generate a higher number of secondary school graduates, which in turn would lead to increased employment and income among these 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 and post-secondary school graduates in finding salaried employment or starting their own businesses.

It is important to note that stakeholders did not envision that the sub-activity would increase graduation and employment rates in the Northern Zone. Rather, they made the assumption that these rates would remain the same as baseline levels, but that sub-activity investments—including school improvements and scholarships—would significantly increase the number of students who enrolled in and graduated from secondary and post-secondary degree programs in the region. As such, the sub-activity's primary benefit stream was enhanced employment and income of students who otherwise wouldn't have attended secondary and post-secondary school in the absence of school strengthening and scholarships.

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

Figure I.1. Logic model of interventions under the Formal Technical Education Sub-Activity

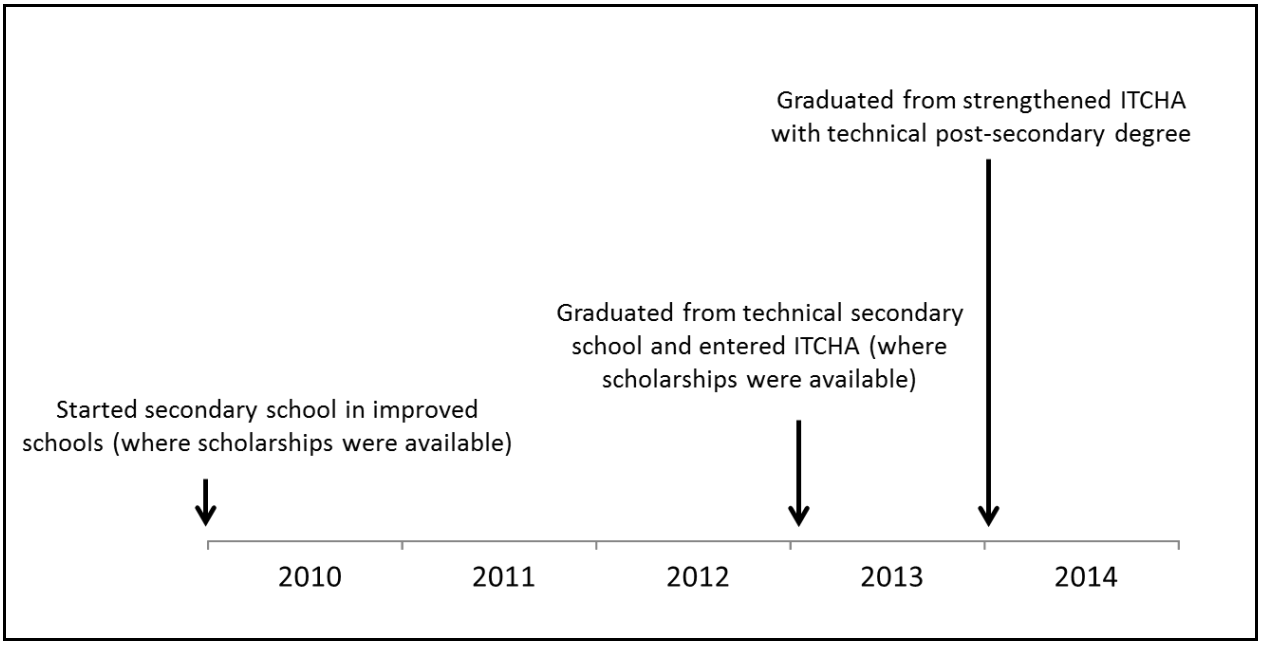


Source: Report authors, based on analysis of documents created by the Consortium for International Development in Education (CIDE) and FOMILENIO.

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 strengthened secondary schools. For this reason, MCC and FOMILENIO 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.

FOMILENIO-funded secondary school improvements, teacher training, and outreach activities for scholarships began in 2009. Therefore, 2010 is the first school year in which students enrolled in improved secondary schools and ITCHA, and scholarships for secondary schools and ITCHA were granted on a large scale. Based on this schedule, the first cohort of students that 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 levels, and secondary and post-secondary scholarships—entered secondary school in early 2010 and completed a superior post-secondary degree at ITCHA in late 2013, more than one year after the conclusion of the compact period in 2012 (see Figure I.2).

Figure I.2. Progression of the first cohort of participants, Formal Technical Education Sub-Activity



2. Program targets and objectives

Table I.1 provides an overview of planned activities, implementation targets, key assumptions, and final outcomes 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. In addition, the compact cited the key benchmark of a 50 percent employment rate after one year for secondary school graduates and a 37 percent increase in secondary school graduates' income as a result of completing secondary education (compared to the income of 9th-grade graduates). Similarly, the compact identified the key benchmark of a 70 percent employment rate for ITCHA graduates and the final outcome of a 42 percent increase in ITCHA graduates' income (compared to incomes of secondary school graduates). As noted before, these benchmarks and expected outcomes were based on baseline levels for secondary and ITCHA graduates, under the assumption that students who enrolled and graduated from strengthened schools as a result of the subactivity would experience similar outcomes to students from previous years. (See Appendix C for a more complete list of benchmarks and targets identified in the compact and FOMILENIO M&E plans).

3. Program implementers

As designated in the compact, MINED was the principal implementing entity for the Formal Technical Education Sub-Activity, and FOMILENIO was 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 ITCHA and the 20 secondary schools receiving assistance.

Table I.1. Planned activities, targets, benchmarks, and outcomes of the Formal Technical Education Sub-Activity

Component	Activities	Implementation targets	Key bench-marks	Final outcomes
Scholarships and middle school strengthening	• New infrastructure—including classrooms, labs, and bathrooms • New technical degree and certification programs • Teacher training • Annual scholarships of $400 per student for secondary education	• 3,600 secondary and post-secondary scholarships administered • 9,000 students enrolled in secondary schools	• 71 percent graduation rate [a] • 50 percent employment rate among graduates	• 37 percent increase in these graduates' income
ITCHA	• Construction of a new post-secondary school, including classrooms, labs, cafeteria, and auditorium • New technical degree programs/materials • Annual scholarships of $1,500 per student for ITCHA	• 1,100 ITCHA students enrolled in 2012	• 73 percent graduation rate [a] • 70 percent employment among graduates	• 42 percent increase in income

Source: MCC El Salvador Compact.
[a] Not mentioned in compact but noted in September 2012 MCC-FOMILENIO monitoring and evaluation plan.

4. 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 of these activities registered positive projected ERRs, meaning that the long-term expected benefits of secondary school improvements, scholarships, and ITCHA improvements outweighed their total costs.

FOMILENIO and MCC developed separate ERRs for secondary and post-secondary interventions. For the secondary school and scholarship interventions, they envisioned the primary benefits of investments to be driven by additional secondary school enrollees and therefore additional secondary school graduates, largely due to increased school capacity and availability of scholarships. As a result of completing secondary school, these graduates would earn higher wages during their professional careers (compared to completing 9th grade), thus generating an initial ERR of 20 percent over a 40-year time horizon.[14] This ERR was over

[14] An ERR is a comparison of the costs and benefits of a public investment. In the case of the Technical Education Sub-Activity the costs of a project reflect the necessary financial expenses on training, infrastructure, scholarships, and other school improvements. The benefits include the increased income of secondary and post-secondary

MCC's minimal ERR threshold of 12 percent for El Salvador, which at the time of compact signing was used to determine whether investments had a sufficient level of cost-effectiveness to secure approval. (MCC currently uses a minimum of 10 percent.) However, this ERR estimate was revised downward to 6.5 percent after the compact was signed. Similarly, FOMILENIO and MCC foresaw that the ITCHA strengthening intervention's main benefit would be the increased income that ITCHA graduates would generate over the long term as a result of obtaining post-secondary technical degrees (compared to secondary degrees).[15]

It should be noted that the ERRs for secondary and post-secondary school improvements and scholarships do not explicitly account for benefits derived from a higher quality of education provided at these educational levels—particularly among individuals who would have attended secondary and post-secondary school in the absence of the intervention. However, we expect that in addition to the increased number of graduates, the quality of technical education in the region could also improve as a result of the sub-activity's investments in curriculum, teacher training, and new infrastructure. Hence better technical secondary and post-secondary education programs, in combination with additional graduates from the programs, could combine to improve students' education and labor market outcomes.

5. Evaluations of the Technical Education Sub-Activity

In 2007, MCC contracted with 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 served to determine whether the sub-activity had met key M&E objectives, 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. Beginning in 2013, in response to additional research questions requested by MCC, Mathematica designed evaluation components to document program implementation and explore its associations with estimated impacts using qualitative data. In 2014, Mathematica also finalized plans for an additional survey of ITCHA students, which occurred in mid-2015. In 2015, Mathematica staff completed final data collection activities and analyzed all final qualitative and quantitative data presented in this report.

B. Evidence base for sub-activity investments

As described above, the three main interventions implemented under the Formal Technical Education 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

graduates due specifically to the proposed project. A positive ERR implies that the investment's benefits outweigh its costs.

[15]A more detailed discussion of ERRs for the Formal Technical Education Sub-Activity can be found on MCC's website at www.mcc.gov/documents/err/mcc-err-elsalvador-formalteched.xlsm.

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), rigorous research on the effect of scholarships has not been conducted in countries with contexts similar to El Salvador. However, a growing body of research from Latin American countries has shown 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 that comply with a specific condition, such as attending appointments or enrolling in school. Thus, 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; Fiszbein and Schady 2009), probably due to deficiencies within schools.

- **School infrastructure and teacher training.** Two 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 attribute causal effects of school improvements on educational outcomes have, in general, studied infrastructure improvements combined with other programs (such as teacher training or free uniforms). For example, a study in Mexico found that infrastructure improvements, coupled with distribution of textbooks and teacher training, improved academic performance (López-Acevedo 1999). In this and similar studies, 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 high-income 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. Thus, it is not possible to make general conclusions regarding the effectiveness of teacher training programs, particularly in countries in Central or South America.

- **Technical education.** Limited literature exists on the effectiveness of technical competency-based education similar to the MEGATEC model. We found one relevant study of technical formal education in Mexico at the upper secondary levels using a competency-based approach (López-Acevedo 2001). The study found that upper secondary technical education had a positive impact on income and employment in students' fields 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 also changed as a result of the design change, this study could not estimate the effect of competency-based education on students' employment and income.

II. EVALUATION DESIGN FOR SECONDARY SCHOOL INTERVENTIONS

The secondary school scholarship program was designed to work in conjunction with secondary school strengthening investments in 20 pre-selected secondary schools. Due to the shared target population and objectives of these interventions, the evaluation of each addressed 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, and describe the methodological approach used to answer these questions.

A. Research questions for the strengthening of secondary schools and scholarship interventions

In conducting the scholarship and secondary school evaluations, we addressed six research domains, 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? Why or why not?
2. **Description of participants.** What were the characteristics (age, gender, initial household income, and so on) of scholarship recipients and secondary school students? What were students' professional aspirations and constraints related to education and employment?
3. **Impact on outcomes.** What was 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 was 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 could provide context for understanding impact findings? What factors help explain (potential) differences in impacts for girls versus boys? What was the ex-post statistical power, and could it help explain the lack of impacts (in cases where no impacts are found)?
6. **Sustainability.** Are secondary school improvements and scholarships being maintained? Are strengthened schools well positioned to provide students in the region with a high-quality secondary technical education in future years?

The impact-related questions (Domains 3 and 4) guided the original impact evaluation designs for each intervention, which were developed since 2007. The rest of the research questions presented above were introduced in late 2013 at the request of MCC to complement existing impact evaluations of the scholarship and secondary school programs. Next, we present a brief summary of the evaluation design for all non-impact questions (Domains 1, 2, 5, and 6). Full details on the evaluation design for these interventions can be found in Campuzano et al. 2014.

B. Evaluation design for non-impact questions of the secondary and scholarship interventions

To answer the research questions regarding the design, implementation, and sustainability of the secondary school strengthening and scholarship interventions, we used a mixed-methods evaluation design. This type of design combines the use of a mix of quantitative data sources (such as available administrative and monitoring data) and qualitative data (generally interviews with program implementers and participants) to better understand implementation and programmatic impacts or lack of impacts. Using both qualitative and quantitative methods, we addressed each research question with the most appropriate mix of data sources, comparing and contrasting qualitative and quantitative findings. (See Table II.1 for the methods and data sources used for each research domain.)

1. Data sources and time line

To better understand secondary school strengthening efforts and scholarship interventions, we conducted semi-structured, in-person interviews and focus groups with MINED, CIDE, MCC, and former FOMILENIO representatives; secondary school principals and teachers; and current secondary school students during program implementation in 2011, and again after the implementation period in 2015. During these qualitative interviews and focus groups, we asked stakeholders for their perspectives on the quality and completeness of implementation (Domain 1); students' socioeconomic background, enrollment and graduation challenges they faced, and long-term career goals (Domain 2); their perceptions on why the impacts found may (or may not) have occurred (Domain 5); and questions related to sustainability (Domain 6). Administrative data and programmatic reports from CIDE, FOMILENIO, and MINED also provided basic information on program outputs (Domain 1), including the type and number of infrastructure improvements, teacher training sessions, and scholarships distributed.

Mathematica staff collected qualitative data in mid-2011 and again in late 2014 and early 2015 related to the scholarship and secondary school strengthening programs (see sample sizes in Table II.2 as well as semi-structured telephone interviews in late 2014 with principals of the 20 secondary schools that received new infrastructure, curricula, and training as part of the secondary school strengthening intervention. In addition, in mid-2015, we conducted in-person interviews with four principals, focus groups with secondary school teachers, and focus groups with secondary school students from the 20 schools that received assistance. Focus groups and interviews in 2011 were largely devoted to understanding program implementation, whereas interviews and focus groups in 2014 and 2015 (more than two years after the formal close of the FOMILENIO compact) concentrated on contextualizing impact findings, identifying lessons learned, and assessing program sustainability.

Table II.1. Research questions, evaluation design, and data sources for all research domains of the secondary school and scholarship interventions

Research domains 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, in both quality and quantity? Why or why not?	Mixed methods, with comparison of final outputs to M&E targets	
2. Description of participants		
What were the characteristics (age, gender, initial household income, and so on) of scholarship recipients and secondary school students?	Mixed methods	Scholarship application and survey data
What were students' professional aspirations and constraints related to education and employment?		Focus groups with students and teachers
3. Impact		
What was 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 (propensity score matching)	School census and student survey data
What was the impact of the offer of scholarships in some programs within strengthened schools on student educational and labor outcomes (including enrollment, grade progression, graduation, employment, and income)?	Experimental design	School census and student survey data
4. Impacts for key target subgroups		
Were impacts different for girls versus boys? Did some groups experience positive or negative outcomes relative to other groups?	Secondary school strengthening: Quasi-experimental design (propensity score matching) Scholarships: Experimental design	School census and student survey data
5. Explanation for impact findings		
What aspects of implementation could provide context for understanding impact findings?	Mixed methods	Stakeholder interviews and focus groups; programmatic reports
What factors may help explain variations in impacts by gender?		Synthesized implementation and impact findings
What was the ex-post statistical power, and could it provide context for the lack of impacts (in cases where no impacts are found)?		Updated power calculations
6. Sustainability		
Are secondary school improvements and scholarships being maintained? Are strengthened schools well positioned to provide students in the region with a high-quality secondary technical education in future years?	Mixed methods	Stakeholder interviews and focus groups; administrative records

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

M&E = monitoring and evaluation.

Table II.2. Sample sizes for interviews on secondary school strengthening and scholarships

Evaluation component	Respondent type			
	Principals	Teachers	Students	FOMILENIO, MINED, CIDE, and MCC
Additional qualitative component for scholarship and secondary school interventions	20 secondary school principals	Focus groups with 25 secondary school teachers in 6 schools	Focus groups with 41 students in 6 schools	Interviews with 6 representatives

2. Analysis for non-impact domains

In 2015, Mathematica synthesized qualitative and quantitative data to describe implementation of the scholarship and secondary school strengthening interventions (Domain 1). In particular, we used administrative data to quantify the extent of the intervention—including the number of scholarships awarded and infrastructure improvements completed. We analyzed transcripts from interviews with CIDE, FOMILENIO, and MINED staff; principals; teachers; and students to distill these stakeholders' perceptions of the quality of implementation—including the amount and administration of scholarships, and the utility of new classrooms, labs, and equipment. Particularly important to characterizing implementation (Domain 1), we compared programmatic outputs to predefined compact goals and documented stakeholders' explanations for why goals were (or were not) met. To characterize participants (Domain 2), we used scholarship application data and follow-up student surveys to summarize the demographic and socioeconomic characteristics of secondary students, and also distilled students' reports on their backgrounds, obstacles to enrollment and progression in school, and career goals.

To support the interpretation of impact findings (Domain 5), we analyzed transcripts from in-person interviews with principals, teachers, and MINED and FOMILENIO representatives to distill stakeholders' perspectives on the sub-activity's effects on enrollment, graduation, and labor market outcomes (for example, we coded principals' responses to interview questions regarding enrollment trends at their schools, including whether they believed scholarships and school improvements drove these trends). In addition, we updated power analyses for the scholarship and secondary school evaluations to provide appropriate context regarding the evaluation's ability to detect impacts that may have occurred.

To analyze the sustainability of sub-activity investments in scholarships and secondary school strengthening (Domain 6), we first defined several conditions that would be necessary for strengthened secondary schools to provide students in the region with a high-quality secondary technical education in future years: (a) a strong employer demand-based curriculum, (b) capable educators, (c) continued enrollment in improved schools, (d) the continued maintenance and upgrades of school infrastructure and equipment, and (e) leadership and financial support from MINED. Next, we used administrative and interview data to assess secondary school improvements and scholarships related to each of these dimensions. For example, we used budgetary information provided by MINED to determine the availability of resources to fund technical scholarships in the Northern Zone in upcoming school years and distilled stakeholders'

accounts of teacher training programs and teacher turnover to assess the continued availability of human capital to educate students and administer scholarships.

3. Limitations of the qualitative analysis

It is important to note that the qualitative methods detailed in this section 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 thus may not generalize to those teachers and students who differ systematically from those in the sample.

C. Evaluation design for the impact evaluation of the secondary school intervention

In this section, we summarize the design for the impact evaluation of the secondary school strengthening intervention discussed in detail in Campuzano et al. 2010a and Campuzano et al. 2014. The objective of this impact evaluation was to assess whether the intervention improved educational and labor market outcomes for students attending the 20 intervention schools (Table II.3).

1. Quasi-experimental design

To estimate the impact on students who attended the 20 secondary schools selected for the intervention, we compared the outcomes of students in these 20 strengthened schools with the outcomes of a comparison group, defined as students in 20 schools that were not strengthened under the sub-activity. The selected evaluation design for the secondary school strengthening intervention was a matched comparison group approach using propensity score methods.[16] The difference in outcomes between what we observed in the treatment group and in the selected comparison group represents our impact estimate. We used propensity score matching to identify a comparison group with observable characteristics similar to those of the treatment group before the intervention. The limitation of this method, as with any design that uses a matched comparison group, is that we cannot guarantee that the intervention and comparison groups were similar on unobserved characteristics before the intervention.

We should also mention that our analysis compared students in schools in which improvements were completed and FOMILENIO scholarships awarded versus students in non-strengthened schools in which scholarships were not offered. For this reason, the impacts we estimated could not separate the effects of the strengthening program from those of the scholarship program. As a result, this evaluation measured the combined effects of secondary school infrastructure improvements, teacher training sessions, new technical degree and certificate programs, and scholarships on students' educational and labor market outcomes.

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

2. Selection of the treatment group

The secondary school strengthening intervention targeted schools with technical programs in the Northern Zone that had a high level of need and relatively strong labor market demand for technical secondary school graduates. MINED identified 75 secondary schools in the Northern Zone that were eligible to receive the intervention. FOMILENIO contracted for CIDE's services to develop the criteria on which 20 of the 75 technical secondary schools would be selected for school improvements. 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 reflected that a school demonstrated a high level of need according to the selection criteria; a low score reflected a low level of need.[17]

An additional concern among stakeholders was to attain a wide geographic distribution of the intervention throughout the Northern Zone. For this reason, FOMILENIO, MINED, and CIDE agreed on a procedure to select the two highest ranked schools in each of the 11 microregions of the Northern Zone. Through this procedure, they attained wide geographic distribution and gave preference 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; nine microregions had 2 schools selected. Appendix A, Table A.1 lists the selected schools.

3. Selection of the comparison group

The 55 schools eligible for the intervention but 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 treatment group and the 55 schools in the potential comparison group based on data from MINED's School Census 2006 and 2007. On average, characteristics of treatment schools were significantly different from those of the potential comparison schools. Thus, our objective was to identify a comparison group of 20 schools among the 55 that had school-level characteristics most similar to those of the treatment group.

We used propensity score matching to identify a comparison group with observable characteristics similar to those of the treatment group before the intervention. The data for school selection came from the School Census collected in 2006 and 2007, as well as the data that CIDE collected for the selection of the intervention schools. Given that the number of potential comparison schools was small (55 schools), we used the nearest-neighbor algorithm (without replacement) to select the comparison schools. This algorithm assigned each intervention school to a comparison school whose propensity score was closest to that of the intervention school (that is, the school that produced the smallest arithmetic difference in scores) and was not selected previously. After a comparison school was matched to an intervention school, it was 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 and 20 comparison schools; see Appendix A, Table A.1 for a complete list of these 40). In general, we found that the intervention and comparison groups were, on average, balanced on observable characteristics measured with 2006 and 2007 Census data, but with a few differences in the data

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

collected by CIDE.[18] In Chapter V, we briefly discuss the baseline equivalence analysis conducted with school Census data from 2008, 2009, and student survey data from 2009, discussed below.

4. Data sources and outcome indicators for secondary school

We constructed the outcome indicators for the impact evaluation of the secondary school strengthening intervention from data from administrative databases and surveys collected for this study. Next, we briefly discuss each data source and the outcome indicators constructed from them in more detail. Table II.3 presents a summary of the outcomes and data sources.

School-level data from administrative records. MINED collects data on all of the schools in El Salvador through the Enrollment Census—at the beginning of each school year with the Initial Enrollment Census and at the end of each year with the Final Enrollment Census. We constructed the following school-level outcomes with these data: enrollment at the beginning of the school year, completion rates at the end of the school year, fail rates at the end of the year, and drop-out rates at the end of the year (Table II.3). We used data from the 2006, 2007, 2008, and 2009 Enrollment Census as baseline data. In addition, we generated student achievement indicators with school-level achievement scores provided by MINED's national Learning and Skills Test for Secondary Education Graduates (known as PAES for its initials in Spanish), given to all 11th graders in the country to test language, mathematics, science, and social studies.

Table II.3. Specifications and data sources for 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 years 2006 to 2008	Initial enrollment, School Census
	A student-level binary variable of whether the student enrolled in each grade—10, 11, 12—each study year, 2010–2012	School records
Dropouts within school year	Percentage of students who dropped out during the school year in grades 10, 11, or 12; school-level variable years 2006 to 2008	Final Enrollment, School Census
	A student-level binary variable of whether the student dropped out of school during each study year, 2010–2012	School records
Progressed to the next grade	A student-level binary variable of whether the student enrolled in the next grade, grades 11, 12, study years 2011 and 2012	School records
Repeated grade	A student-level binary variable of whether a student is enrolled in the same grade the next year; grades 10, 11, 12, study years 2011 and 2012	School records
Academic achievement	School average of students' PAES test scores in grade 11; school-level variable years 2006 to 2012	MINED records

[18] See "Revised Final Impact Evaluation Design for Technical Middle School Activity" memo, dated November 3, 2009, for a detailed explanation of the comparison group selection.

Outcome indicator	Description	Data source
Secondary school graduation	Student-level binary variable of whether the student graduated from secondary school in grades 11 or 12; years 2009 and 2013	Student survey
Employment	Student-level variable of student employment status at the time of the survey, including part- and full-time employment; years 2009 and 2013	Student survey
Income	Student-level variable of student income in the 12 months preceding the survey (includes formal and informal labor income, as well as remittances and other common sources of non-labor income); years 2009 and 2013	Student survey
Post-secondary education	Student-level variable of student post-secondary education; years 2009 and 2013	Student survey

PAES = MINED's Learning and Skills Test for Secondary Education Graduates.

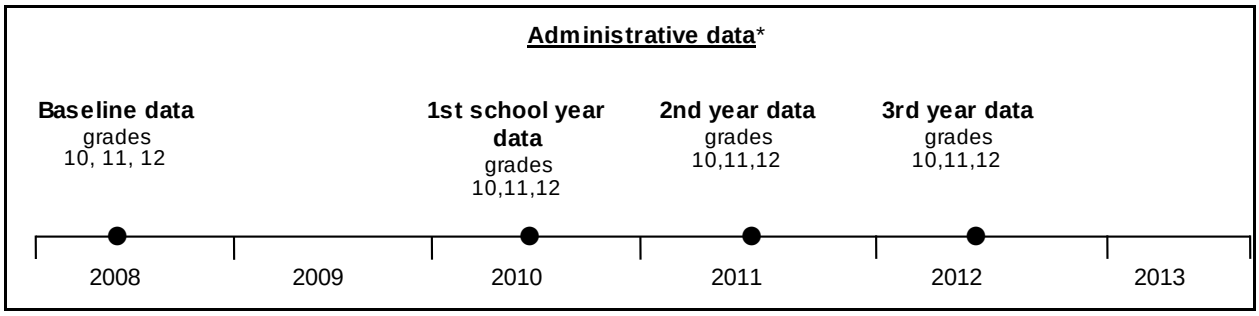
Student-level data from school records. Our original evaluation design assumed that MINED would provide us with student-level data from their administrative records. However, MINED experienced complications with student identification codes and was not able to provide us with student-level records. MCC, therefore, contracted a data collector (General Directorate of Statistics and Census, known as DIGESTYC for its initials in Spanish) to visit the schools in the study and collect administrative records at the student level. The administrative school records had information on student enrollment in the 2010, 2011, and 2012 school years, as well as the status of each student at the end of 2010 and 2011 (pass, fail, or dropout).[19] The main student-level outcomes we constructed from this data source were (1) enrollment in grades 10, 11, and 12 in 2010, 2011, and 2012, respectively; (2) repeated grade in 2011 and 2012; (3) progress to the next grade in 2010 and 2011; and (4) within-year dropout in 2010, 2011, and 2012 (see Table II.3).

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 with a survey purposively prepared for this study—the Student Follow-up Survey (known as ESE for its initials in Spanish). The main outcome indicators we constructed with these data are secondary school graduation, employment, income, and post-secondary education (see Table II.3. CIDE collected baseline data for post-secondary outcomes in 2009; we refer to them as baseline ESE. The sample frame for this survey consisted of a list of students who enrolled in their last grade of secondary school in 2008 regardless of whether they finished the school year or dropped out. We included two types of students in the survey: those in the general track in 11th grade in 2008, which was their last year of secondary school, and those in the technical track in 12th grade in 2008, which was their last year of secondary school. The school year in El Salvador starts in January and end in November. We interviewed these students in October and November 2009, almost one year after they were expected to finish the last year of their secondary education.

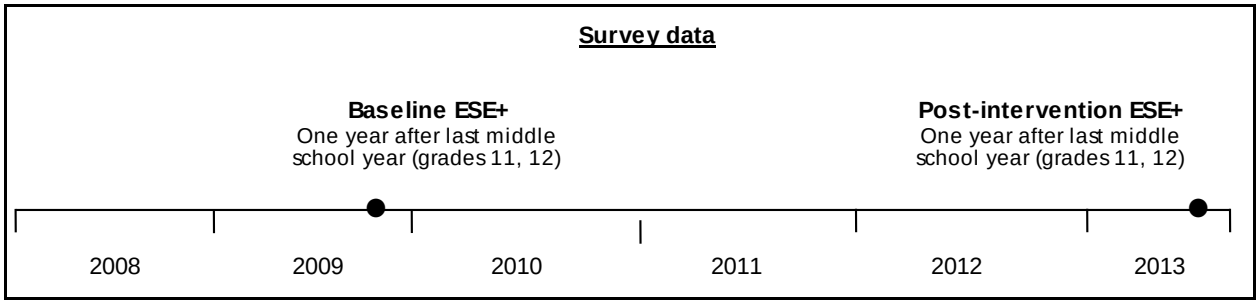
[19]See interim results memo ESVED2-31, Campuzano et al. 2013a, and design report, Campuzano et al. 2014 for details.

Similarly, the post-intervention data came from what we refer to as "follow-up ESE." MCC contracted DIGESTYC to administer the followup ESE at the end of 2013. The sample frame for this survey consisted of a list of students enrolled in their last year of secondary school in 2012, regardless of whether they successfully completed the school year or dropped out. We interviewed these students at the end of 2013, one year after they were expected to have graduated from secondary school. This group included students in the technical track registered in 12th grade in 2012 and those in the general track registered in 11th grade in 2012 (see Figure II.1).

Figure II.1. Data collection time line: secondary school strengthening



*All administrative data is cross-sectional, student-level data.



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

5. Impact estimation for secondary schools

As explained earlier, the matching procedure allowed us to select a comparison group of schools with baseline characteristics that were, on average, comparable to those of the treatment group. According to the school-level data from the Enrollment School Census, however, some characteristics were significantly different between the intervention and comparison groups. For this reason, we used a regression framework, explained below, to control for any initial differences at the school level. An additional advantage of this framework is that the statistical precision of the impact estimates is improved by controlling for covariates, such as school baseline characteristics, in a regression model.

We estimated the impact estimates for the school-level outcomes with a regression specification that compared outcomes of schools strengthened by FOMILENIO (treatment group) with outcomes of those that received no services from FOMILENIO (comparison group),

controlling for baseline characteristics. The basic model in an ordinary least squares regression can be expressed as follows:

$$(1)\ y_s = \alpha + \beta x_s + \lambda T_s + \eta_s$$

where y_s is the outcome of interest for school s; x_s is a vector of baseline characteristics of school s; T_s is an indicator equal to one if school s was in the treatment group and zero if it was in the comparison group; and η_s is a random error for school s. We used data from 2006, 2007, and 2008 for baseline controls. Schools were notified at the end of 2008 that they had been selected for the intervention, so they could have modified their behavior in 2009 in response to the implementation of the intervention. Thus, to avoid including any anticipatory effects of the intervention in control variables, we did not include data from 2009 as covariates in the regressions. The estimate of λ is the estimated impact of the intervention on the outcome of interest at the school level.

For the impact analysis of student-level outcomes, we used student-level data. This model compared outcomes of students enrolled in the schools strengthened by FOMILENIO (treatment group) with outcomes of those enrolled in the schools not strengthened by FOMILENIO (comparison group), controlling for baseline characteristics and accounting for clustering of students in schools. We used a random effects specification that allowed us to account for the clustering of students in schools and assess standard errors correctly. The basic model can be expressed as follows:

$$(2)\ y_{is} = \alpha + \beta x_s + \lambda T_s + \eta_s + \varepsilon_{is}$$

where y_{is} is the outcome of interest for student i in school s; x_s is a vector of baseline characteristics of school s (baseline data come from school-level data from the 2006, 2007, and 2008 Enrollment Census); T_s is an indicator equal to one if school s was in the treatment group and zero if it was in the comparison group; η_s is a random error term for school s; and ε_{is} a random error term for student i in school s.[20] The parameter estimate for λ is the estimated impact of the intervention on the outcome of interest at the student level. The model presented in equation 2 takes into account the nested structure of the data; in this case, students are nested or clustered into schools. For survey outcomes, we also weight each observation for their probability of selection into the survey and non-response. In this case, we did not estimate random effects at the school level, but adjust the standard errors for students clustered in schools.

We performed an additional subgroup analysis of impacts by gender by adding an indicator variable for gender to the statistical model above and interacted with treatment. This allowed us to determine whether impacts on graduation, enrollment, and income differ for boys versus girls. As an exploratory (and descriptive) analysis, we also tried to determine whether any type of participants experienced positive or negative outcomes relative to other types. For example, we will compare and contrast technical degree students' employment rates and annual incomes with those of general degree students one year following their projected graduation date.

[20]Note that the parameter of interest—the coefficient of the treatment indicator—did not vary between schools. We thus could not treat schools as fixed effects in our regression model.

D. Evaluation design for the impact of the scholarship program

In this section, we focus on research questions 4 and 5 for the scholarship intervention (see Table II.1). Above we presented the evaluation design for secondary school strengthening investments, which is a package of school improvements that included scholarships for some schools and programs. However, MCC is also interested in assessing the effect of scholarships in the context of investments in infrastructure, curricula, and teacher training. In this section, we focus on the effect of offering youths scholarships to study in strengthened secondary schools. We should note that because all the scholarships were awarded for programs of study in improved schools, we cannot separate the effect of scholarships from the rest of secondary school investments. The purpose of the impact evaluation of the scholarship program was to determine whether FOMILENIO's scholarship recipients were better off than they would have been without the scholarship. Mathematica staff began designing and implementing the impact evaluation of this program in 2007; an interim report already has been completed (Campuzano et al. 2013b). The brief description presented here is based primarily on the design memorandum completed in 2010 (Campuzano and Blair 2010b) and updated in 2014 (Campuzano et al. 2014).

1. Experimental design

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 allowed us to proceed with random assignment of scholarships among eligible applicants within each oversubscribed school and educational program. In 2010, oversubscription existed in 15 educational programs in 12 of the 17 schools selected for the scholarships (see Appendix A, Table A.2). As a result, randomization of scholarships was possible for these 15 programs. The 17 schools out of the 20 strengthened schools that were selected for scholarships had a technical program or a diploma option.

An important limitation of this analysis is that the scholarship program was implemented in tandem with FOMILENIO-financed activities for strengthening the secondary schools at which the programs were offered. Under this strengthening program, all 17 schools participating in the scholarship program received infrastructure improvements, and most of their middle school teachers and administrators received teacher training. These improvements most likely would have affected students' educational outcomes independently of the effect of the scholarship program. However, this evaluation could not separate the effects of the monetary scholarship from the effects of other secondary school improvements. Thus, these estimated impacts should be interpreted as the effect of the offer of a scholarship to study in certain programs in secondary schools strengthened by FOMILENIO.

Student assignment process. At the end of 2009, to promote scholarships for the 2010 academic school year, Fundación Empresarial para el Desarrollo Educativo (FEPADE) staff visited all 162 primary schools that feed into the selected 17 secondary schools. FEPADE received 1,841 scholarship applications, which the staff reviewed to assess eligibility. FEPADE's review deemed 1,524 applications as eligible to receive a scholarship. As agreed with

stakeholders, random assignment was to be done only in schools and programs that were oversubscribed. A total of 15 schools and programs were oversubscribed, for a total of 1,160 eligible applicants and 636 available scholarships. 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. We used this list to develop a computer program that randomized eligible applicants into three groups: (1) the treatment group (scholarships), (2) the control group (no scholarships), and (3) the nonresearch group (students on a waiting list who could replace those in the treatment group if they dropped out in the first few weeks of the school year).[21]

In late 2009, we randomly assigned scholarships 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 had been awarded to at least 36 students in the control group in one school—Dr. Francisco Martínez Suárez. To avoid contamination of the control group, we excluded all intervention and control students from this school from the evaluation; however, the students who received scholarships were allowed to keep them. We also excluded all intervention and control students from Carolina, another school, 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 treatment group.[22] As a result, FEPADE had a substantial number of unclaimed scholarships for the 2010 school year, but a lack of eligible applicants 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 preserve the integrity of the randomized allocation of scholarships, we selected these students according to their random number from the original selection process.[23] This transfer of students from the control group reduced the size of the study sample, which in turn reduced the study's statistical

[21]Mathematica conducted random assignment by school and educational program. Within each school and program, the computer program assigned a random number to each student. We assigned the students with the highest numbers to the treatment group up to the point at which scholarships no longer were available; we placed the next five highest numbers on the waiting list and the rest of the students (those with the lower random numbers) in the control group.

[22]FEPADE 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 places for them. Others decided to enroll in schools that were not selected for scholarships. We have requested that FEPADE document applicants' reasons for refusing the scholarship.

[23]The original assignment process placed the students with the highest random numbers in the treatment 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 treatment and 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, we placed those students with the highest random numbers in a nonresearch group that was offered a scholarship at that time, and kept students with the lowest random numbers in the control group, without offering them a scholarship. This approach decreased the sample size of the study but respected the randomness of the process.

power. 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 was conducted in 13 educational programs at 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). We excluded from the evaluation (nonresearch group) the 100 students from the original control group who were designated as eligible for scholarships, using the same approach we used for assigning the 75 students originally placed on the waiting list.

2. Data sources and outcome indicators for the scholarship program

Unlike the secondary school strengthening intervention, which was implemented at the school level, the scholarship intervention was implemented at the student level; for this reason, we needed to obtain the outcome indicators for the scholarship evaluation at the student level. Two types of outcome indicators were of interest to the stakeholders: (1) educational outcomes, such as enrollment, grade completion, continuation in school, and academic achievement (which originally had 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 originally had been planned to be collected through a student survey). However, as in the secondary school strengthening evaluation, student-level administrative records were not available. For this reason, MCC hired DIGESTYC to conduct three rounds of a student survey for the evaluation of this program. Table II.4 provides descriptions and data sources of the outcome indicators discussed above.

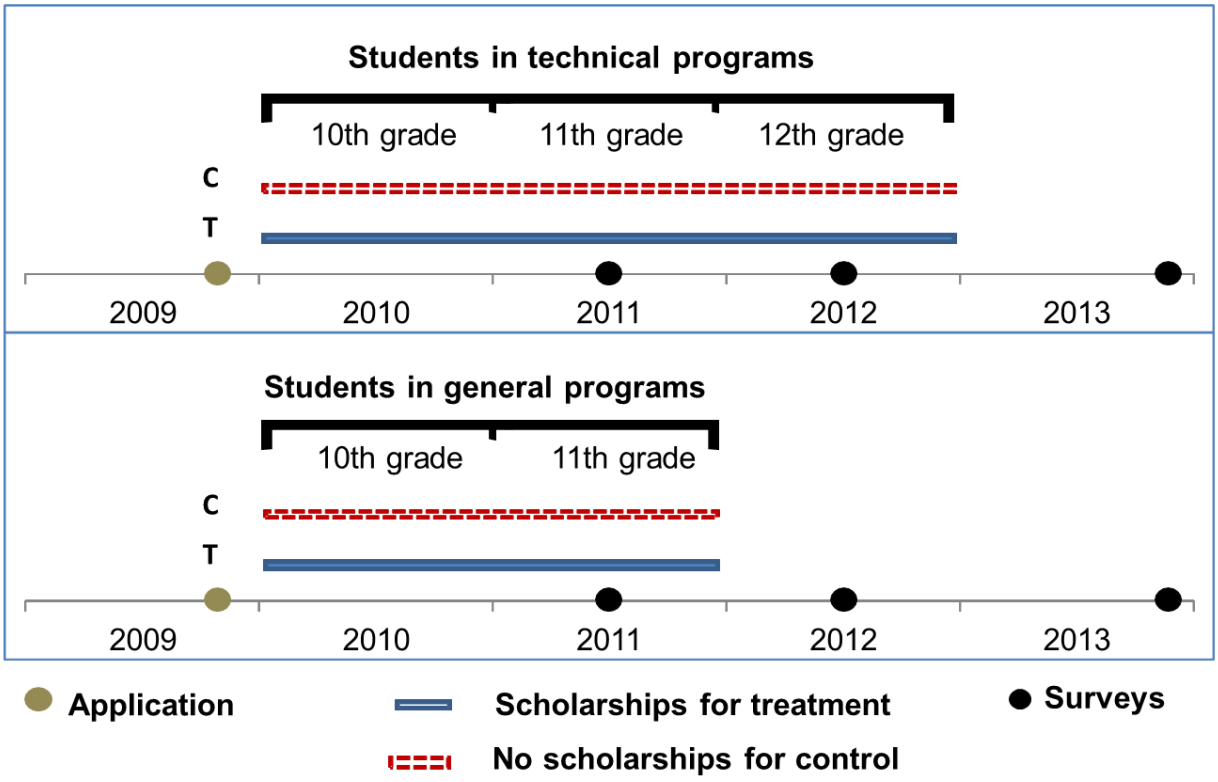
Table II.4. Descriptions and data sources of outcome indicators: scholarships

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
Passed 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 variable 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

Time frame and data collection. DIGESTYC conducted the first round of data collection in July and August 2011, the second round in July and August 2012, and the third round in October 2013 (see Figure II.2). 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 had data on student employment almost two years after they finished general secondary school because the data were collected at the end of 2013. For students who registered for a technical secondary education in 2010, however, we had data on student employment one year after they finished technical secondary school in 2012 because the data were collected in 2013.

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

Figure II.2. Scholarship and data collection time line, 2009–2013



3. Estimating scholarship impacts

We estimated impacts using a regression analysis that compared outcomes of students who were offered a scholarship (treatment group) with outcomes of students not offered a scholarship (control group), controlling for initial differences between the two groups. The basic model can be expressed as follows:

$$(3) \quad Y_{it} = \alpha + \beta\chi_{is} + \lambda T_{is} + \eta_s + \varepsilon_{is}$$

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 came from application forms and included 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 allowed us to control for differences across school or programs); and ε_{is} is a random error term for student i in school s. The coefficient λ is the estimated impact of the scholarships on the outcome of interest. In addition, all of the impact estimates were weighted to account for differential assignment probability within program of study and for nonresponse. Standard errors also account for students clustered in schools.

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

We also estimated impacts by gender by adding an indicator variable for gender and an interaction of gender with treatment to the statistical model above. This allowed us to determine whether impacts on graduation, enrollment, and income differed for boys versus girls.

III. EVALUATION DESIGN FOR THE ITCHA/MEGATEC INTERVENTION

This chapter presents the research questions related to the ITCHA/MEGATEC intervention and discusses the quantitative and qualitative evaluation methods we use to address them.

A. Research questions and basic design

For the ITCHA evaluation, we address a series of questions, organized into the following six research domains:

1. **Design/implementation.** How were ITCHA-strengthening efforts designed and implemented? Did implementation meet the original targets and expectations? How were MEGATEC degree programs implemented at ITCHA and its linked secondary schools?
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, graduation, and employment outcomes meet stakeholders' expectations? Why or why not?
4. **Results for key subgroups.** Did some groups experience positive or negative outcomes relative to other groups? Were results different for girls versus boys?
5. **Explanation of results.** What are potential reasons that results (enrollment, achievement, graduation, employment, and income) did or did not meet expectations? What factors may help explain variations in results?
6. **Sustainability.** Are ITCHA improvements and scholarships being maintained? Is ITCHA well positioned to provide students in the region with a high-quality post-secondary technical education in future years?

Mixed-methods design. We could not conduct an impact evaluation of the ITCHA conversion because this would require information on an alternate institution with 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, 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.

In light of these concerns, we used a mixed-methods performance evaluation design to analyze the ITCHA/MEGATEC intervention. This design relies on a mix of qualitative information gleaned from stakeholder interviews and focus groups, along with quantitative information from administrative records and student follow-up surveys. (See Table III.1 for an indication of which methods and data sources were used to answer the research questions in each research domain.) Below, we provide more detail on qualitative and quantitative data collection and analysis. (Full details on the evaluation design for these interventions can be found in Campuzano et al. [2014].)

Research questions addressed with qualitative data. In total, Mathematica staff conducted two rounds of interviews and focus groups to ask stakeholders about their perceptions of program implementation, new MEGATEC programs, and improved infrastructure. The first round of qualitative data collection occurred in summer 2011—directly following the commencement of new activities at the newly constructed ITCHA—and the second round occurred in summer 2015, approximately 2.5 years following the compact's completion. This first round included interviews and focus groups with ITCHA staff, principals of linked schools, and FOMILENIO, MCC, CIDE, and MINED representatives. Data collection focused on stakeholders' experiences with school improvements, training, new degree programs, and scholarships and their views on the overall quality of program implementation (Domain 1). The second round of interviews focused on learning more about how MEGATEC programs have operated in the post-compact period and documenting stakeholder perceptions on students' education and labor market outcomes (Domains 3, 4, and 5). Questions about outcomes delved into stakeholders' perceptions on the main factors driving key enrollment and graduation trends, along with the primary reasons some groups may have fared better than others in terms of achievement, graduation, and employment.

During both rounds of qualitative data collection, Mathematica staff also held focus groups with current ITCHA students and secondary students enrolled in MEGATEC programs to learn more about their socioeconomic backgrounds, academic achievement, and career goals (Domain 2), as well as their experience at ITCHA and linked secondary schools (Domain 1). Particularly in the second round of data collection in 2015, we also explored sustainability issues (Domain 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.

Research questions addressed with quantitative data. We used existing administrative data, provided primarily by FOMILENIO and ITCHA administrators, to summarize program implementation (Domain 1) and assess the evolution of enrollment and graduation rates during and after the compact period (Domain 3). In addition, Mathematica conducted two follow-up surveys of former ITCHA students (discussed in depth below). These student surveys provided information on the sex, age, and other demographic characteristics of ITCHA students (Domain 2), as well as their employment and earnings outcomes following post-secondary school (Domains 3 and 4).

Table III.1. Data sources and evaluation designs for ITCHA research questions

Research domains and questions	Mixed-methods approach	Data sources
1. Design/implementation		
How were ITCHA-strengthening efforts designed and implemented?	Compilation and synthesis of stakeholder reports; triangulation of reports with program outputs	Interviews and focus groups with stakeholders, administrative records, and programmatic reports
Did implementation meet original targets and expectations?	Comparison of final outputs to M&E targets	
How were MEGATEC degree programs implemented at ITCHA and its feeder secondary schools?	Compilation and synthesis of stakeholder reports	
2. Description of participants		
What are the characteristics of ITCHA students? What are students' professional aspirations and constraints to education/employment?	Compilation and synthesis of stakeholder reports; summary statistics with survey data	Survey data and focus groups with students
3. Results		
Did enrollment, graduation, and employment outcomes meet stakeholder expectations?	Comparison of final results to outcome goals (for example, comparison of actual enrollment with M&E benchmarks)	ITCHA administrative data and student survey data, interviews, and focus groups
4. Results for key subgroups		
Did some groups experience positive or negative outcomes relative to other groups? Were results different for girls versus boys?	Quantitative analysis of primary outcomes by gender, degree program, etc.	Student survey data and ITCHA records
5. Explanation for results		
What are potential reasons that results (enrollment, achievement, graduation, employment, and income) did or did not meet expectations? What factors may help explain variations in results?	Compilation and synthesis of stakeholder reports	Interviews and focus groups with stakeholders; synthesized findings on implementation and results
6. Sustainability		
Are ITCHA improvements and scholarships being maintained? Is ITCHA well positioned to provide students in the region with a high-quality post-secondary technical education in future years?	Compilation and synthesis of stakeholder reports and administrative records	Interviews and focus groups with stakeholders; administrative records

B. Interviewee selection and sample sizes

Qualitative data collection. In 2011 and 2015, Mathematica staff identified and interviewed ITCHA administrators with direct experience with FOMILENIO investments (including scholarships), student enrollment and achievement, and MEGATEC degree programs. Similarly,

interviews with MINED, CIDE, MCC, and FOMILENIO representatives targeted program implementers and supervisors who had the most direct experience with the subactivity's investments and activities. Mathematica staff interviewed 10 representatives from these organizations in 2011 and 6 representatives from the same organizations in 2015 (Table III.2). In most cases, we conducted the 2015 interviews with the same stakeholders we interviewed in 2011.

In addition, Mathematica staff visited two linked secondary schools in 2011 and the other two linked secondary schools in 2015. Schools were selected based on their distance from San Salvador and from each other, with the objective of visiting all four linked schools during the study period. During each visit, we interviewed the school principal and conducted one focus group with teachers and up to two focus groups with students. We relied on school principals to select teachers for focus groups. During all visits, we requested that school principals include teachers who taught a variety of technical as well as general degree programs. This variety allowed us to compare and contrast teachers' perspectives on their degree programs and students. In total, we spoke with 17 secondary school teachers.

Similarly, we conducted focus groups with a sample of over 40 students from the full population of active students at visited secondary schools (Table III.2). In all student focus groups, we asked school principals to select students before the site visit who represented a range of academic programs, grades of study, and academic achievement. We also scheduled the visits during days and times that would enable us to speak with students from multiple programs and years of study in one afternoon. This allowed us to compare and contrast the experiences of students enrolled in general versus technical secondary programs. Students who were under 18 were required to obtain parental permission before participating in focus groups.

In addition, we conducted focus groups with ITCHA teachers and students in 2011 and 2015, involving 7 teachers and 34 students across the two years (Table III.2). We relied on ITCHA administrators to select teachers and students for focus groups. In 2015, we requested that ITCHA administrators include at least one teacher from each degree program, as well as at least two students from each of the institute's degree programs. No parental consent was required for ITCHA students, who were all at least 18 years old.

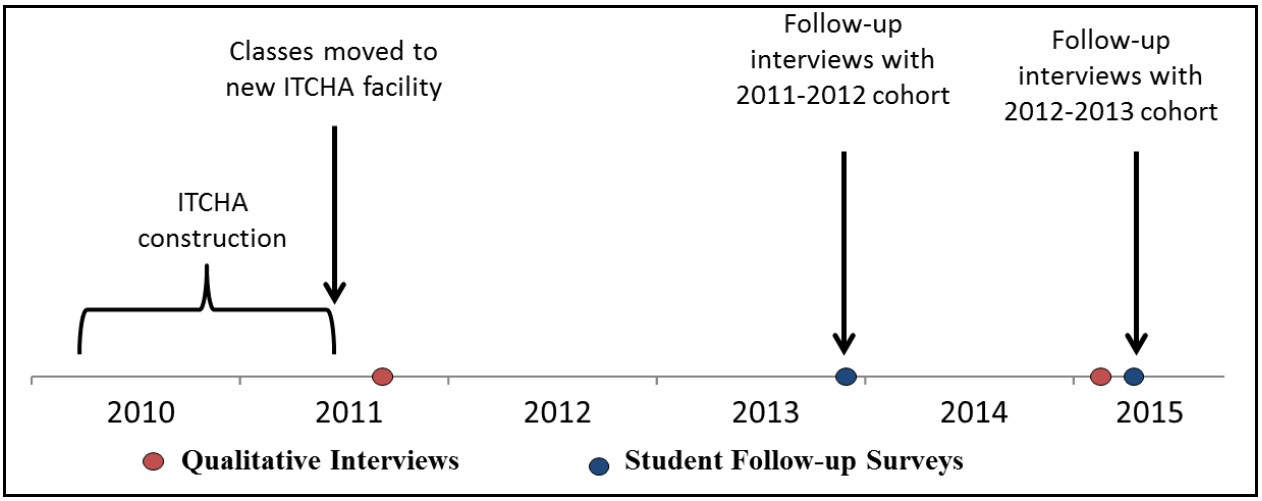
Table III.2. Sample sizes for ITCHA qualitative and quantitative data collection, 2011–2015

Principals/administrators	Teachers	Former ITCHA students	Current ITCHA and secondary school students	FOMILENIO, MINED, MCC, and CIDE representatives
2011: 3 ITCHA administrators and 2 secondary school principals (in person)	2011: Interviews with 2 ITCHA teachers and 1 secondary school teacher	2013: Follow-up surveys with 319 former ITCHA students from the 2011–2012 cohort	2011: 2 focus groups with 20 ITCHA students and a focus group with 4 secondary students	2011: Interviews with 10 representatives
2015: 5 ITCHA administrators and 4 secondary school principals (2 in person and 2 via telephone)	2015: Focus groups with 5 ITCHA teachers and 16 secondary school teachers	2015: Follow-up surveys with 244 former ITCHA students from the 2012–2013 cohort	2015: 2 focus groups with 14 ITCHA students and 2 focus groups with 43 secondary students	2015: Interviews with 6 representatives

Quantitative data collection. MCC contracted DIGESTYC to implement a follow-up survey to two cohorts of ITCHA students after their graduation. In November and December 2013, DIGESTYC interviewed students from the 2011–2012 cohort. In July and August 2015, DIGESTYC interviewed students from the 2012–2013 cohort, including secondary school MEGATEC graduates who transferred directly to their second year of ITCHA studies in 2013 (Figure III.1). These follow-up surveys were intended to target all students who enrolled in ITCHA in each cohort. DIGESTYC used contact information provided by ITCHA administrators to identify those students.

The number of completed interviews for the 2011–2012 and 2012–2013 cohorts were 318 and 244 students, respectively. These sample sizes represent 79 percent (318 of 403 students) and 77 percent (244 of 318 students) of the total number of students who initially enrolled in each cohort. These response rates reflect the relatively high emigration rate of ITCHA students, which was 7 percent for the 2011–2012 cohort sample and 8 percent for the 2012–2013 cohort sample. Generally, these students emigrated to the United States or another region of El Salvador, and efforts to reach them via email or phone were unsuccessful.

Figure III.1. Time line for ITCHA data collection



Both 2013 and 2015 student surveys were used (1) to assess whether former ITCHA students (including both graduates and nongraduates) found employment approximately one year after their projected graduation date and (2) to quantify their employment income. As noted, the 2014 follow-up survey is unique because it included the first cohort of students who progressed through both secondary and post-secondary MEGATEC programs. For this reason, the results from the 2014 survey allowed us to compare educational and labor market outcomes of (1) students who completed secondary MEGATEC programs before enrolling in ITCHA versus (2) students who were first introduced to MEGATEC programs at ITCHA. This is an interesting comparison because the first group has three years of secondary school study and one year of post-secondary school study in their field, whereas the second group (students who did not complete MEGATEC secondary school programs) has only two years of post-secondary study in their field.

C. Data analysis

In 2015, Mathematica analyzed qualitative and quantitative data to describe ITCHA's program design, implementation, and ITCHA students to address the research questions in Domains 1 and 2. To characterize implementation (Domain 1), we analyzed transcripts from interviews with CIDE, FOMILENIO, and MINED staff; principals; teachers; and students to distill these stakeholders' perceptions of the quality of implementation—including the usefulness of new ITCHA classrooms, labs, and equipment. Particularly important to characterizing implementation (Domain 1), we compared programmatic outputs to predefined compact goals and documented stakeholders' explanations for why goals were (or were not) met. We also triangulated stakeholders' varied accounts on how the MEGATEC degree programs were implemented at ITCHA and its linked schools, including how activities are structured and students are graded. In particular, we compared and contrasted teacher, principal, and student accounts of new degree programs.

To characterize participants (Domain 2), we used follow-up ITCHA student surveys to summarize the demographic and socioeconomic characteristics of ITCHA students. We supplemented this information with qualitative data from focus groups with students, in which we asked them about their family background and professional goals.

We also conducted a quantitative analysis of data from ITCHA student surveys in 2015 (Domain 3). As part of this analysis, we calculated the outcomes in Table III.3 for all ITCHA students who were surveyed in 2013 and 2015 and presented these outcomes by degree of study, as well as across all degrees of study. To present and discuss results among subgroups of ITCHA students (Domain 4), we compared and contrasted males' and females' graduation rates, employment rates, and income. We also compared the outcomes of linked MEGATEC students versus nonlinked students and the outcomes of students who graduated from ITCHA versus students who did not graduate. In addition, we used qualitative data from in-person interviews with principals, teachers, and MINED and FOMILENIO representatives to gather contextual information on results (Domain 5)—particularly related to variations in employment outcomes for civil engineering graduates compared with alternative tourism graduates, and male versus female graduates.

To analyze the sustainability of ITCHA/MEGATEC investments (Domain 6), we first defined several conditions that would be necessary for ITCHA and linked secondary schools to provide students in the region with a high-quality technical education in future years: (1) a strong, demand-based curriculum; (2) capable educators; (3) continued student interest and enrollment in MEGATEC programs and ITCHA; (4) the continued maintenance of ITCHA and linked school infrastructure and equipment; and (5) leadership and financial support from MINED. Using administrative data as well as qualitative interview data, we examined whether each of these conditions was met as of followup visits in mid-2015.

D. Limitations

The qualitative methods detailed in this chapter have key limitations. As with most qualitative analysis, stakeholder interviews and focus groups are illustrative and do not constitute a representative sample of all teachers and students affected by the subactivity. The results of the qualitative analysis for the ITCHA evaluation, therefore, may not apply to all teachers and students who differ systematically from those in the sample.

In addition, the quantitative analysis described above is not an impact analysis. Without an adequate comparison group of students who did not attend ITCHA, we cannot rigorously estimate the impact of an ITCHA education on student outcomes, particularly labor market outcomes. For this reason, we decided to conduct a descriptive quantitative analysis of ITCHA students' outcomes. However, our findings do not reflect the impacts of FOMILENIO investments in MEGATEC programs in the Northern Zone.

Table III.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 second year at ITCHA (on time)	Binary variable of whether the student passed the second year of study, as reported by the student, on schedule given the student's enrollment date	Administrative records
Graduated from ITCHA (on time)	Binary measure of whether the student received a superior technical degree from ITCHA, as scheduled given the student's enrollment date	Administrative records
Employed one year after attending ITCHA	Binary measure of whether a student reported being employed part or full time	Follow-up survey
Employed full-time one year after attending ITCHA	Binary measure in which a student is considered to have full-time employment if he or she reported working at least 40 hours per week	Follow-up survey
Hours worked weekly	Number of hours the student reported working on a typical week	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, 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, the employment and earnings outcomes for the ITCHA analysis will be calculated with the same methods used to calculate these outcomes for the secondary school and scholarship analyses.

IV. FINDINGS FOR THE SECONDARY SCHOOL STRENGTHENING INTERVENTION

In this chapter, we report implementation and impact results for the secondary technical school strengthening intervention of the Formal Technical Education Sub-Activity. The term *technical secondary schools* refers to secondary schools that offer at least one technical degree program, often in addition to a general degree program. 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.[24] This design reflected the primary objective of the sub-activity—to strengthen technical education in the Northern Zone.

Background on secondary degree programs in El Salvador. Students in El Salvador can choose between two-year general and three year technical secondary school degree programs. We summarize these two types of programs below.

- General secondary programs are two year programs (grades 10 and 11) that cover the following areas of study: language and literature, math, natural science, social studies, foreign language, computing, and life skills. Students take several courses concurrently during grading periods, and there are four grading periods per academic year. Grading for general classes closely follows the approved Ministry curriculum, and is generally designed to measure students' knowledge in each area of study. Students' grades are often based on a combination of quizzes, tests, and activities. At the end of each grading period, students either take an exam or complete a final activity, and this constitutes as much as 40 percent of their final grade. In addition, students give themselves a self-assigned grade on their performance, which can count for as much as 10 percent of their final grade.
- In contrast, technical secondary programs are three year programs (grades 10, 11, and 12) in which the first two years of study cover general areas (described above) and technical subjects, and the third year of study covers solely technical subjects. In 2015, there were 31 approved technical secondary degree programs in El Salvador. Most of these programs used a competency-based approach, in which students complete a series of modules linked to targeted competencies. For example, the civil engineering MEGATEC curriculum has 7 primary competencies, which map to a total of 31 modules that students must complete over three years. Modules can last from between 2 and 6 weeks, and students often complete only one module at a time before moving to the next module in the sequence.
- All activities in technical degree programs are structured around the "six stages of complete action" that students must complete to master the material: inform, plan, decide, execute, control, and evaluate. Lesson plans provide teachers with specific instructions for each of these six stages. For example, there is a civil engineering module on housing construction. In the inform phase, teachers are instructed to teach students about housing materials and designs commonly used in the country; in the planning phase, students discuss the materials and processes they would use to build a house; in the decision phase, students develop plan to build a house. Next, they execute a small project—for example, a presentation in which they present and defend their plan. In the control phase, students implement any changes suggested by the teacher, and in the evaluate phase, teachers and students alike assign a grade to their work.

The secondary school strengthening intervention is actually a package of services and investments, which includes improved infrastructure, new degree and diploma programs, and scholarships. In this analysis, we assess the overall impact of this full package of services, as it is impossible to separate the impact of any individual service or investment in the strengthening intervention.

[24] When students enroll in secondary schools, they decide in which type of degree they want to enroll—either general or technical (but not both).

In Section A of this chapter, we provide general implementation findings. In Sections B and C, we describe the sample of students in the scholarship impact analysis and assess baseline equivalence of treatment and comparison groups, respectively. In Sections D through F, we summarize the impact results. We conclude the chapter with a summary of findings (Section G) and study limitations (Section H).

A. Implementation findings

Stakeholders selected 20 needy schools for new academic programs, capital improvements, and teacher training. MINED identified 75 secondary schools in the Northern Zone eligible to receive the strengthening intervention. CIDE, as the technical support contractor for the sub-activity, developed criteria under which schools were selected to receive the intervention, including poverty rates in the region; the potential for successful implementation, including school leadership; 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) to be strengthened by FOMILENIO (see, Appendix A, Table A.1 for a list of the schools selected). Based on a needs assessment, CIDE developed proposals for improving each school's infrastructure and educational programs; the final improvements were finalized among MINED, CIDE, the school, and FOMILENIO. Although each school would receive a unique set of 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.[25]

1. Infrastructure improvements

Infrastructure improvements were largely in place for the 2010 school year. FOMILENIO contracted with five construction firms to improve the infrastructure in the 20 secondary schools (as well as ITCHA); construction largely took place during 2009. 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 bathroom stalls (Table IV.1). 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 the end of the compact period, FOMILENIO paid CIDE and subcontractors a total of approximately $4 million for secondary school infrastructure and equipment improvements. As a result, FOMILENIO met its compact target of strengthening 20 schools with large-scale infrastructure investments.

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

Table IV.1. 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 1 school and 3 computer labs in 3 schools
Bathrooms	124 bathroom stalls in 19 schools	26 bathroom stalls in 2 schools
Stakeholders training		
Number of stakeholders trained in additional secondary school workshops	540 teachers, administrators, and school board members as of September 2011a	

Source: CIDE administrative data.

[a]Including ITCHA staff, 566 teachers, administrators and school board members were trained.

Principals and students were satisfied with infrastructure improvements, with some exceptions. During in-person interviews in 2011 and 2015, principals and students expressed their appreciation for the new classrooms, laboratories, and bathrooms constructed under the sub-activity, and noted that they generally used new infrastructure for their intended purpose—even more than five years after initial construction. However, one principal reported that two classrooms were not built with FOMILENIO funds, despite CIDE's initial plans. In addition, three principals said that although sanitary services were well built, their sewer connections or filtration systems were not functional; as a result, they had not been used in recent years. Regarding these issues, a FOMILENIO representative said there was indeed variation in quality among the project's five contractors. The representative said, "One contractor wasn't great…the quality of the work and the materials that they used were an issue."

A minority of principals said that they would have liked to be more involved in the design and execution of infrastructure investments. One interviewed principal noted a design flaw in accessing the second story of a building built with FOMILENIO funds and remarked that the school staff could have identified this flaw if they had been consulted when plans were drawn up. The principal said, "In these projects, they don't let people interfere—they just say, 'This is the design.'" Another principal expressed regret at not being involved in monitoring the construction budget, as there was no assurance that completed infrastructure improvements amounted to the grand total the school was promised. Another principal mentioned that he wished he had been given the blueprints of the improvements that were made to the school following construction, which could have prevented problems with future improvements to power and water lines.

2. New degree and certificate programs and teacher training

Four secondary schools introduced MEGATEC degree programs in 2010. As part of the sub-activity, CIDE, MINED, and FOMILENIO chose two new degrees—civil engineering and alternative tourism—to be developed as MEGATEC degree programs at ITCHA and chose four secondary schools that would be linked to the new programs. The new MEGATEC programs

were based on a competency-based educational approach that prioritized students' practical skills rather than their general knowledge. Secondary schools were selected for the two new degree programs due to their geographic proximity to ITCHA and their potential for employment related to the new programs. Two secondary schools, Instituto Nacional de Aguilares and Benjamín Estrada Valiente, were selected to offer the civil engineering technical secondary school degree program; two others, San Ignacio and La Palma, were selected to offer the alternative tourism technical secondary school degree program. These linked secondary schools provided students with the opportunity to transfer to ITCHA as second-year post-secondary students upon their completion of a technical secondary school degree.

Ten strengthened schools introduced certificate programs. In addition, with the objective of diversifying the course options that some of the improved schools offered, CIDE developed seven certificate programs (referred to as diplomados in Spanish) in areas in each school's locality that had potential for economic development (Table IV.2). Ten secondary schools were selected to implement these programs: five schools implemented one of the certificate programs as part of their general secondary school degrees, and five implemented them as part of their technical secondary school degrees (mostly under Business Accounting; see Table IV.2). These certificate programs also were developed under the competency-based educational approach, which focuses on mastery of specific knowledge and skills. The programs featured several hours of coursework and hands-on practice in technical areas, in addition to students' regular course load.

Stakeholders expressed appreciation for the new degree and certificate programs, although some had reservations about the alternative tourism curriculum. During interviews in 2011 and 2015, principals, teachers, and students alike praised the new degree and certificate programs for their focus on competencies and their linkages with labor demand in the region. Principals noted that as a result of new programs, students had acquired a range of practical skills, including creating organic gardens for the community, organizing community service projects, and planning events and excursions. However, one principal said that parents did not support the alternative tourism degree, arguing that there were few employment opportunities in the region for the program's graduates. The principal expressed concern that demand for the tourism degree would wane in future years, particularly if potential students and parents saw that recent graduates were not finding gainful employment.

Table IV.2. New certificate and academic programs, by school

Secondary school	Certificate program	Degree program under which certificate was offered
Anamoros	Milk production	General
Carolina	Organic and hydroponic crops	General
Chapeltique	Agroforestry	General
El Sauce	Solid and organic waste management	Technical: business accounting
	Solid and organic waste management	General
General Juan Orlando Zepeda	Community organizing	Technical: health
Jutiapa	Financial accounting	Technical: business accounting
La Reina	Milk production	General
Nueva Concepción	Organic and hydroponic crops	General
Osicala	Community organizing	Technical: secretarial studies
	Community organizing	Technical: business accounting
Sesorí	Fair trade assessment	Technical: business accounting
Secondary school	**MEGATEC degree program**	
Aguilares	Civil engineering	
Benjamín Estrada Valiente	Civil engineering	
San Ignacio	Alternative tourism	
La Palma	Alternative tourism	

Source: CIDE administrative records.

CIDE designed and conducted teacher and stakeholder training focused on competency-based education. As the intervention's primary technical contractor, CIDE developed the curricula for the new degree and certificate programs, and trained all newly hired ITCHA and secondary school teachers who taught these programs. Throughout 2009, CIDE staff worked with various stakeholders to develop and refine the programs' core competencies and teaching modules. From November 2009 to August 2010, CIDE conducted intensive training on the civil engineering and alternative tourism degree programs for ITCHA staff, as well as teachers and principals at the four linked secondary schools. Training featured seven workshops totaling 136 hours and approximately two years of coaching, in which CIDE staff observed teachers in the classroom and offered constructive feedback. As part of secondary school strengthening efforts, CIDE staff also administered a general two-day training to 540 secondary school teachers, administrators, parents, MINED staff, and other stakeholders throughout 2009 and 2010. These less intensive training sessions were designed to introduce stakeholders to competency-based educational approaches that they could apply to technical, general degree, and certificate programs, and help them develop lesson plans, educational charts, and assessment materials needed to teach courses. The training also included modules in group work, budgeting, fundraising, and building community partnerships, such as formal internship arrangements with local businesses and mayor's offices. Overall, CIDE trained 540 school staff, thus surpassing the compact target of 500 trained educators under the sub-activity.

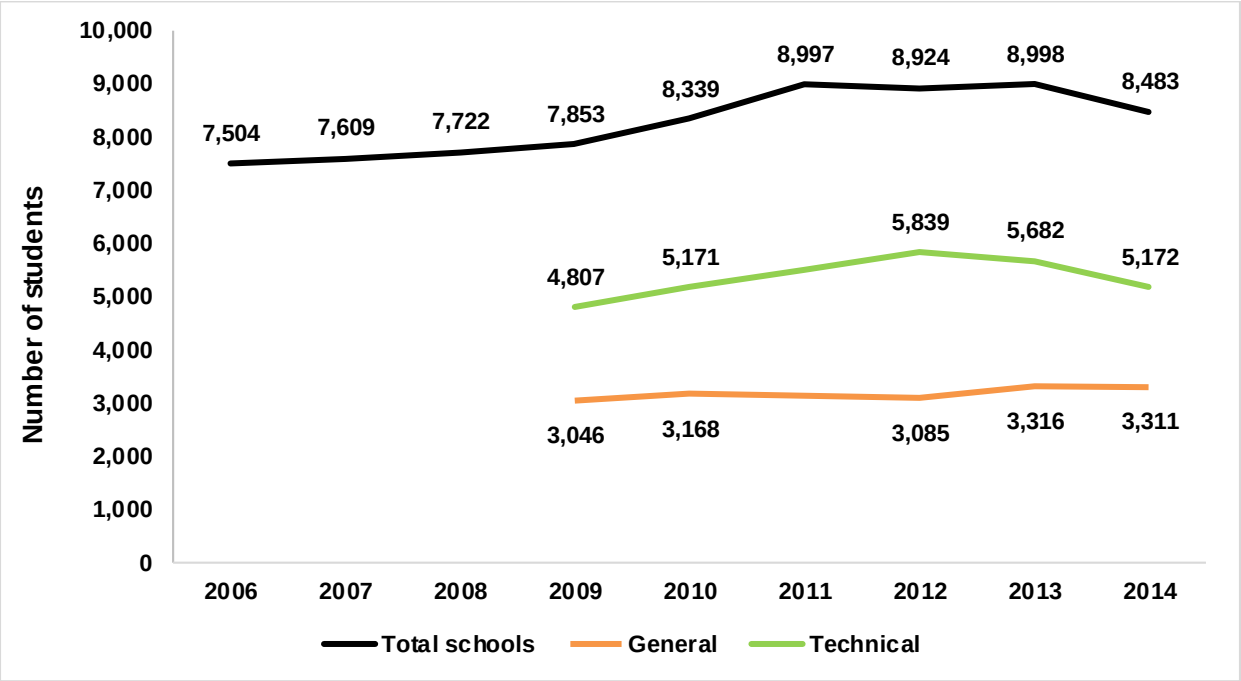
FOMILENIO representatives and school staff reported high satisfaction with the training offered by CIDE. In follow-up interviews, all 20 school principals said they were satisfied with the training provided by CIDE and FOMILENIO—both the technical training and follow-up for the new degree and certificate programs, as well as the general two-day training. Principals praised the staff who conducted the training. One principal said, "MINED has expanded the competency-based focus at a national level, and because of the FOMILENIO trainings, we feel like we have an advantage [over other schools]." A FOMILENIO representative seconded this satisfaction, saying "in areas like in the technical program and in the diploma programs [CIDE] did a great job, particularly in in-class follow-up. They came to the classroom, videotaped the classes, and gave each teacher feedback about their performance. That was one of the big successes." However, in focus groups, some teachers noted that the general training was useful but too brief. One teacher said, "We didn't have enough time to really absorb the general training for the [non-technical] areas…They didn't invest much in the training for general classes." However, other teachers reported applying skills they used in the two-day training to their general classes. For example, one teacher reported introducing more group work and presentation requirements in English and social studies classes as a result of the training.

3. Overall enrollment trends and post-compact follow-up

Enrollment in the strengthened schools increased during the compact period but leveled off post compact. According to MINED's school census data, enrollment in the 20 strengthened secondary schools increased sharply during the compact period (Figure IV.1). In 2011, enrollment was close to the compact's goal for the Formal Technical Education sub-activity of 9,000 enrolled students. However, enrollment decreased by around 500 students in 2014 to a level on par with 2010. The majority of interviewed principals attributed a large portion of the increase in enrollment from 2010 to 2012 to the availability of FOMILENIO scholarships in most strengthened schools during these years, and attributed the decrease after the compact period (particularly in 2014) to the discontinuation of new FOMILENIO scholarships in the post-compact period. In addition, they said that new degree programs and infrastructure also boosted enrollment in the 20 schools during these years, but these improvements did not have as large an effect as scholarships. However, it is important to note that although these enrollment trends likely reflected some effects of FOMILENIO scholarships, new degree and diploma programs, and new infrastructure, they could also reflect factors outside of the sub-activity, including immigration and economic trends in the region. The impact analysis below controls for these trends to the extent possible.

Enrollment in technical programs increased during the intervention period, whereas enrollment in general programs appeared to stagnate from 2009 to 2012. During the compact period from 2009 to 2012, enrollment in technical programs in the 20 strengthened schools increased by over 1,000 students—or around 50 students per school—whereas enrollment in general programs remained largely unchanged. However, in the post-compact period, we see a decrease in enrollment in technical programs and an increase in enrollment in general programs. These trends may reflect the availability of scholarships, particularly for technical programs, from 2010 to 2012, and the discontinuation of these scholarships starting in 2013.

Figure IV.1. Enrollment in strengthened secondary schools, 2006 to 2014



Source: 2006–2014, Initial Enrollment, School Census.

MINED provided some ad hoc follow-up post compact, but stakeholders would have liked more support. Following the close of the compact in late 2012, MINED provided some follow-up support to strengthened schools, largely by helping solve immediate staffing issues. For example, when a teacher in charge of a dairy production diploma program resigned, MINED staff arranged for a production expert to train the teacher's replacement in milk analysis and production techniques. MINED staff has also cultivated linkages with universities to provide teachers with regular technical instruction, and helped schools coordinate technical visits with local businesses. However, principals and teachers noted that MINED provided no formal technical training related to diploma and technical degree programs, as all training responsibilities for the MEGATEC programs are handled by ITCHA. In follow-up interviews, teachers and principals also expressed frustration that since the sub-activity period expired, they had no direct MINED contact with whom they could discuss infrastructure problems, including faulty engineering machinery and infrastructure in need of repair. FOMILENIO staff played this role during the intervention, but there was no defined MINED contact post compact. In addition, they said that their annual budget allocation covers some computer and machinery maintenance costs but not new equipment purchases, which were necessary by the time of the interviews—more than five years after computers and lab equipment had been donated.

4. Lessons learned from implementation

Stronger consultation with school staff with respect to infrastructure investments could have enhanced implementation. Program implementers worked with each school to conduct a needs assessment and tailor the strengthening intervention—including degree programs, infrastructure investments, and scholarships—to each school's needs. However, interviews with school principals in 2015 suggested that additional consultation with school staff could have

enhanced program implementation. For example, consultation meetings between program implementers and school staff to discuss preliminary construction plans could have uncovered potential design flaws in preliminary plans and enhanced transparency in the design, budgeting, and construction process. In future interventions of this kind, program implementers could not only conduct formal needs assessments (as they consistently do), but also build a formal stakeholder consultation phase into implementation plans. In these consultations, school staff (and potentially parents and students) could have the opportunity to better understand planned capital investments and suggest modifications, as needed.

A higher level of involvement in implementation among MINED staff would have been helpful for follow-up and ties between MINED and school staff. Reflecting on MINED's follow-up efforts, a FOMILENIO representative noted that more direct involvement from MINED in the sub-activity, including training sessions and school construction, may have strengthened ties between MINED and improved schools, thus encouraging stronger follow-up efforts on the part of MINED. The FOMILENIO representative said that something as simple as providing MINED staff with funds to travel to training sessions may have facilitated more involvement and buy-in from MINED during implementation, which in turn might have strengthened their commitment to the 20 improved schools. A MINED representative expressed a similar sentiment regarding the need for a higher level of MINED involvement in interventions of this kind, making the point that building capacity within MINED to manage them could strengthen the sustainability of future investments in technical education. Future school improvement projects of this kind could consider a more substantial role for MINED in the teacher training and infrastructure investments, with the intent of building the ministry's capacity to assume similar duties in the future, enhancing its commitment to the project, and facilitating a direct relationship between MINED and participating schools.

B. Program participants

In focus groups with students and teachers at 6 strengthened schools, as well as interviews with principals from all 20 strengthened schools conducted from 2011 to 2015, we asked about students' living arrangements, education, and plans for the future. Below is a summary of their responses.[26]

Most students live nearby, often in non-nuclear arrangements. Quite often, students reported living with one parent (generally their mothers) or living with other relatives, generally because one or both parents resides in the U.S. Students reported walking to school or taking a bus or taxi—often paying less than $1.50 a day in transportation costs. Students who lived nearby often went home to eat lunch, whereas others brought their lunch or ate at a nearby cafeteria.

[26] It should be noted that focus groups with students in 2015 pertained to a different cohort of students than the cohorts included in the impact analysis. However, we assume similarities in the interviewed students' characteristics compared to earlier student cohorts.

General students have a somewhat different profile from technical students. Students in general programs noted that they have a mix of students in their programs, including some who want to graduate from secondary school as soon as possible (in just two years) and some who want to continue on to university studies. In focus groups, students in technical programs emphasized that they chose the longer three-year programs because these provided either a higher probability of finding a job after graduation or an academic advantage with respect to university or post-secondary technical studies.

Most students in the linked secondary schools want to continue on to post-secondary education. In focus groups, the majority of secondary school students enrolled in MEGATEC technical programs expressed a desire to continue studying at ITCHA and then go on to university studies. These students noted the improved job prospects upon graduating from ITCHA and were encouraged by recent equivalency agreements that ITCHA had signed with universities in the area, which would grant as many as two years of credits upon students' enrollment in these universities. Some students expressed trepidation at the prospect of studying in San Salvador, given crime concerns, instead opting to stay in Chalatenango or a nearby department. Several said they would be willing to work while they pursued their post-secondary education; a minority of students said they will seek work immediately upon graduating from secondary school, given their responsibilities to their families.

Financial issues, migration, and academic difficulties are the largest obstacles to graduation, according to students and school principals. Principals mentioned financial issues, migration, academic difficulties, and security concerns as the primary reasons students drop out or fail to graduate. They noted that the inability of students' parents and relatives to pay school expenses—largely travel expenses—often compelled students to drop out of secondary studies. In focus groups, students generally reported that they felt safe traveling to and from school, and in their interactions with other students at school. However, a large portion of students expressed frustration with some of their classes, saying they often failed to understand key concepts in math, science, and English courses. Regarding students' academic difficulties, one principal said, "Some get really frustrated because they don't have what it takes to do well at this level, often because of past deficiencies. Some teachers try to give them extra credit and extra practice, but many end up dropping out anyway."

Teachers noted that students face weak incentives to excel in school, given poor job prospects and plans to emigrate. Several teachers and principals noted that a nontrivial portion of secondary school students in the Northern Zone had little motivation to excel academically and advance in their education, and that this trend had worsened in recent years. Teachers and principals conjectured that the trend was related to students' plans to travel to the U.S. in the near-future, their limited job prospects in the region, and regular remittances from relatives abroad. One principal said, "Since they have a lot of family in the U.S., they figure that they will have better opportunities there; jobs and better salaries." In a results workshop with program implementers in early 2016, stakeholders noted that improving schools and providing better education is unlikely to improve employment and income if new graduates continue to face poor job prospects and low salaries in the region.

Teachers noted that students often have deficiencies in basic skills when they begin secondary school. In focus groups, teachers also mentioned that students often begin grade 10 with deficiencies from primary school, including penmanship problems, a lack of basic computer and research skills, and minimal exposure to foreign languages. Teachers reported that these deficiencies compromise students' abilities to master basic concepts by the end of the year and progress to the next grade. One teacher said, "The goal is that they are bilingual by the end of the program here, but that's actually impossible given their lack of fundamental knowledge." Teachers reported working with students to correct these deficiencies in grades 10 and 11, often at the expense of covering topics that appear on the PAES.

C. Baseline equivalence

The next sections focus on the impact evaluation analysis. We first provide a brief description of the baseline equivalence between the 20 strengthened schools and the 20 schools selected as comparisons. We then discuss the impacts on educational outcomes using school records, followed by the impacts on post-secondary and labor outcomes using student surveys.

As explained in Chapter II, we used a quasi-experimental design to estimate the impact of the secondary school intervention on student outcomes. We matched the 20 secondary schools selected for the intervention (the treatment group) to 20 secondary schools in the Northern Zone that were not selected to participate in the intervention (the comparison group) and had similar characteristics based on the 2006 and 2007 Enrollment Census data. The comparison group is intended to represent what would have happened to the treatment group in the absence of the treatment. Thus, the initial stage in our analysis was to provide evidence that the treatment and comparison groups were similar at baseline. This baseline analysis was composed of two parts. First, we assessed the baseline equivalence of schools' educational outcomes using school-level administrative data from the Enrollment Census from 2008 and 2009. Second, we assessed the baseline equivalence of students' labor and post-secondary outcomes using survey data from a cohort of students who finished secondary school in 2008. Below we summarize those results.

School-level equivalence on educational indicators. MINED provided data for educational outcomes at the 40 secondary schools from the 2008 and 2009 Enrollment Census. We found that the treatment and comparison schools were, on average, minimally different statistically across the key educational measures, such as enrollment, drop-out rates, pass rates, and academic achievement (Campuzano and Persaud 2011). However, some of the differences in enrollment were large in magnitude. Thus, our impact estimation includes school-level variables as controls to account for the large initial differences.

Student-level equivalence on post-secondary indicators. MCC was interested in assessing employment and income one year after students were expected to graduate from secondary school. At the end of 2009, we collected labor market and post-secondary education data on a sample of students in the 40 schools included in the study that were scheduled to finish secondary school in 2008. We included two types of students in this sample—students enrolled in their last year of technical secondary school (grade 12) and those enrolled in their last year of general secondary school (grade 11). This cohort of students attended the 40 secondary schools before the intervention started, so it provides baseline information for post-secondary outcomes. We found that in terms of graduation from secondary school, post-secondary education, employment, and income, students who attended treatment schools were similar to those who

attended comparison schools, with no statistically significant differences found between the two groups (Blair et al. 2010).

D. Impacts on educational outcomes using school records

Although FOMILENIO started strengthening the 20 secondary schools that were part of the intervention during 2009, the first year of the intervention was actually 2010 because it was in that school year when infrastructure improvements and new academic programs became available to students. For this reason, we estimated impacts on educational outcomes for the first three years of the intervention—2010, 2011, and 2012. We used two data sources to measure these impacts: school records collected for this study at the student level and survey data reported by students in follow-up interviews. In this section, we present impact estimates based on school records.

We constructed the outcomes of interest using student-level data obtained from school records for the 2010, 2011, and 2012 school years. Because student records were collected in July 2012, outcome indicators, such as dropout or completion of grade, were available only for the 2010 and 2011 school years. We decided to use data from the student-level school records collected for this study instead of school-level data from the Enrollment Censuses because we found several problems in measuring drop-out and pass rates with the latter, especially for the 2011 Census. Using student-level data provides more accurate estimates of dropout and pass rates, since we can follow the status of each student in the sample. In addition, it increases statistical power due to a larger sample of students. We should note, however, that we measured academic achievement with school-level data provided by MINED.

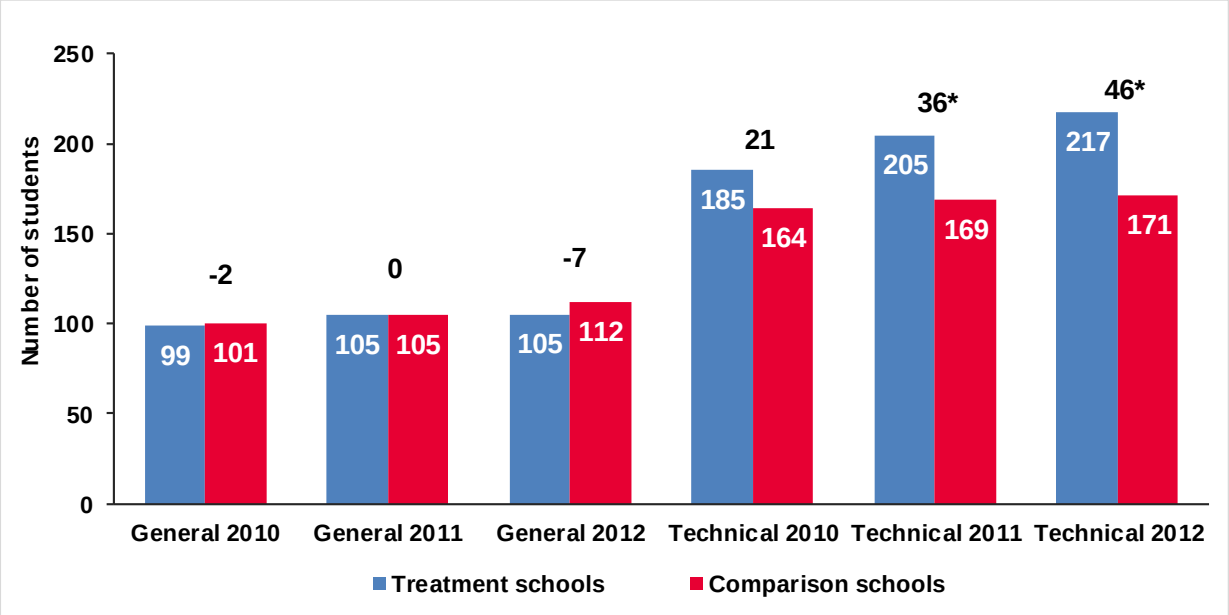
For most of the educational indicators, we conducted two types of analysis. First, we estimated impacts for school years 2010, 2011, and 2012. For each school year, we looked at results by grade (10, 11, and 12) and secondary program of study (general and technical). We refer to this first set of analysis as the cross-sectional analysis. These results provide an overall picture of the impacts on these grades and years. (We discuss the impacts in the text and present more information in tables in Appendix B.) Second, we conducted a longitudinal analysis that follows two target cohorts over time. Our main cohort of interest is the one that began secondary school in 2010; this cohort would have received their entire secondary education during the first three years of the intervention. (We refer to this cohort as the 2010 cohort.) Students in the 2010 cohort that enrolled in general programs should have graduated at the end of 2011; those in the 2010 cohort that enrolled in technical programs should have graduated in 2012. The school records we collected allowed us to follow the 2010 cohort during the two or three years of their secondary education, depending on the program of study. (The focus of our evaluation is the 2010; however we have some years of data in other cohorts. Appendix B provides additional impact estimates for the cohort that began secondary school in 2011, referred to as the 2011 cohort. Since we collected the school records in mid-2012, we can only follow this cohort for one and a half years of secondary school.)

Because all of the students in the sample were enrolled in school in 2010, we could not analyze enrollment at the student level. Some variation of the enrollment measure would have been required to analyze impacts; that is, we would have needed data on students not enrolled in secondary school. As the sample consisted only of students who were enrolled in 10th grade in 2010, the lack of the required variation precluded us from estimating enrollment impacts at the

student level. Thus, unlike the other outcomes analyzed below, we examined enrollment at the school level. We aggregated student level records at the school level to estimate impacts on enrollment. (See Table B.1 in Appendix B for impacts by year and type of secondary program.)

The school strengthening intervention had a positive impact on enrollment in technical programs in 2011 and 2012, but no impact on enrollment in general programs. After taking into account differences in enrollment at baseline, we find statistically significant impacts of the strengthening intervention on enrollment in technical programs in 2011 and 2012 (Figure IV.2), but not enrollment in general programs in either year. Treatment schools had about 36 more students enrolled in all grades of technical programs than comparison schools in 2011, and 46 more students in 2012. This result likely reflects the impact of secondary school improvements—including new technical degree programs and infrastructure at strengthened schools—on students' motivation to enroll in technical programs as well as schools' capacity to serve additional students. However, it also likely reflects some of the impact of FOMILENIO scholarships on enrollment, as these scholarships were available in 17 of the 20 treatment schools, but not in any of the 20 comparison schools.

Figure IV.2. Impacts of secondary school strengthening on enrollment, by program and year (number of students)



Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from Final Enrollment, School Census 2006–2008.

Note: Treatment means are regression adjusted using ordinary least squares and include covariates to account for the average enrollment across the baseline years (2006, 2007, and 2008). Comparison means are unadjusted. Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

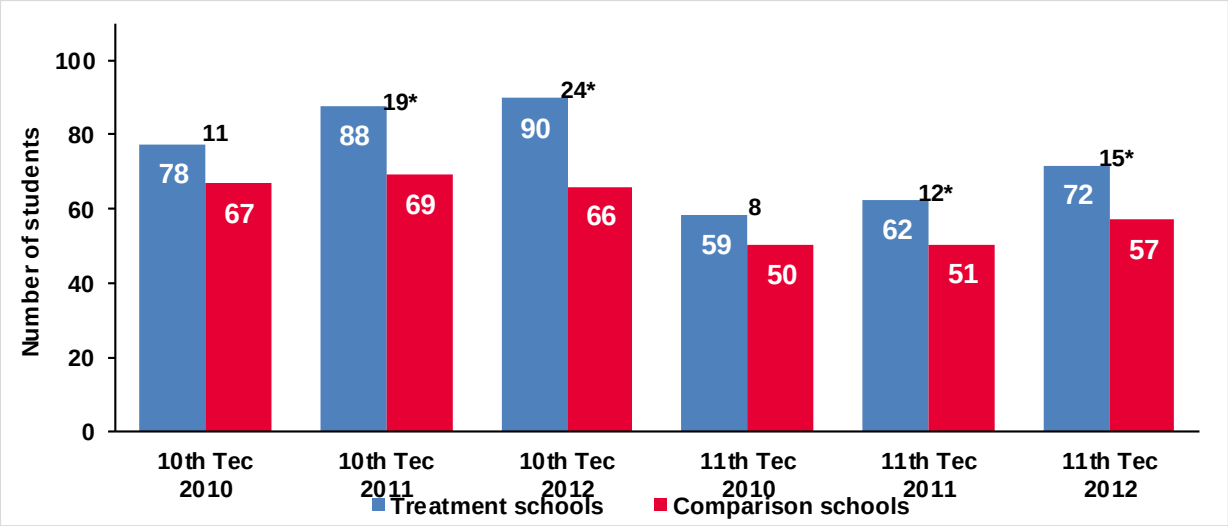
* Impact estimate is statistically significant at the .05 level.

FOMILENIO investments increased technical secondary school enrollment by more than 700 students in 2011 and more than 900 students in 2012. Using impact estimates presented above, we calculate that in 2011, in the 20 treatment schools, about 720 (720 = 36 * 20) more students enrolled in technical programs than in the 20 comparison schools; and in 2012,

a total of 920 (920 = 46 * 20) more students enrolled in technical programs in the 20 treatment schools. It is important to note that we compared only enrollment in treatment versus comparison schools. This comparison did not allow us to assess whether enrollment in the whole region increased, since it is possible that some students decided to attend treatment schools instead of comparison (or other) schools. MCC assumed in the ERR calculations that 1,560 additional students would enroll in the strengthened secondary schools annually as a result of FOMILENIO investments. But the impacts we estimated are lower. We find that on average 920 more students enrolled in technical programs at intervention schools than at comparison schools in 2012. We should note that the impacts estimated in this report compare intervention schools to comparison schools at follow-up, and the ERR is a pre-post comparison using intervention schools.

The school strengthening intervention had a positive impact on enrollment in grades 10 and 11 in 2011 and 2012. To better understand the positive impact on enrollment, we calculated impacts on enrollment by grade. Figure IV.3 shows impacts on technical program enrollment in grades 10 and 11. In 2011, treatment schools enrolled 19 more students in grade 10 technical programs and 12 more students in grade 11 technical programs than comparison schools. These impacts were even larger in 2012; treatment schools enrolled 24 more students in grade 10 technical programs and 15 more students in grade 11 technical programs than comparison schools. These findings highlight the fact that during 2011 and 2012, treatment schools experienced larger incoming classes of first-year technical program students. These annual increases created the cumulative impact of an additional 46 students in technical programs in treatment schools in 2012, discussed above and presented in Figure IV.2. As noted above, these positive impacts may be associated with the availability of FOMILENIO scholarships for technical program students in treatment schools.

Figure IV.3. Impacts of secondary school strengthening on enrollment in technical programs, by grade and year (number of students)



Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from 2006, 2007, and 2008 Final Enrollment, School Census.

Note: Treatment means are regression adjusted using ordinary least squares and include covariates to account for the average enrollment across the baseline years (2006, 2007, and 2008). Comparison means are unadjusted. Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

An analysis of implementation data and enrollment trends suggests that scholarships had a larger role in enrollment increases than additional classrooms and new degree programs. To learn more about the impact of the strengthening intervention on enrollment, we analyzed correlations between infrastructure improvements and enrollment trends from 2008 to 2012. We found that enrollment trends among the 20 strengthened schools were largely uncorrelated with the number of new classrooms built or whether schools introduced new degree or diploma programs.[27] Rather, there was a generalized increase in enrollment across all strengthened schools. In addition, there is a strong correlation between the number of FOMILENIO scholarships awarded to students and enrollment trends from 2008 to 2012.[28] These findings suggest that the construction of new classrooms and new diploma and degree programs did not play as large a role as scholarships in stimulating enrollment at the strengthened schools. This hypothesis is corroborated by interviews with principals of strengthened schools, several of whom noted that, although they believed infrastructure improvements and new degree programs played some role in motivating students to enroll in technical programs, scholarships played a larger role in this decision.

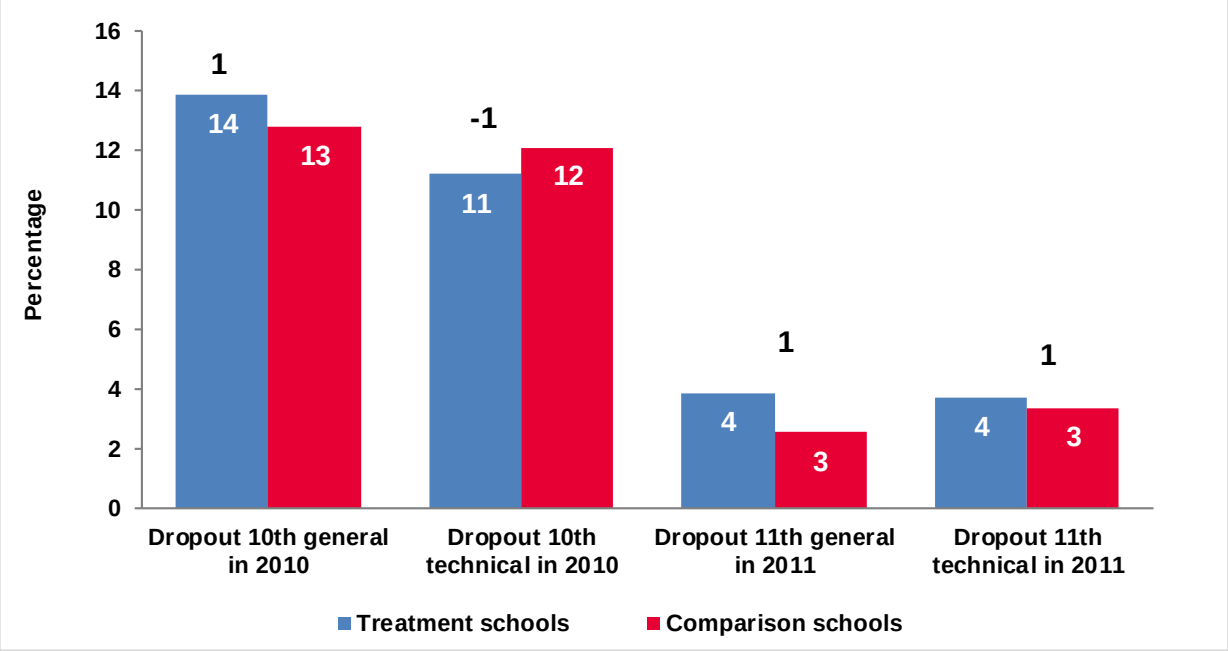
Next, we estimated impacts of the strengthening intervention on within-year dropout rates during 2010 and 2011 for grades 10, 11, and 12. (We should note that the intervention did not specifically aim to decrease dropout rates; rather it assumed that dropout rates in improved schools would remain unchanged.) In 2010, drop-out rates in grades 10, 11, and 12 were roughly 12 percent, 4 percent, and 1 percent, respectively. This trend of lower dropout as grades progress could have been due in part to a selection effect; students with lesser affinity for school tend to drop out earlier, so as grades advance, those with greater academic potential and affinity tend to stay, and these continuing students thus are less likely to drop out. (Appendix B, Table B.2 presents the estimated impact on dropout rates on cross-sections by year, grade, and type of secondary program.)

The school strengthening intervention had no impact on dropout rates for the students who enrolled in secondary schools in 2010 and 2011. We find no statistically significant differences between treatment and comparison groups on dropout rates when analyzing cross-sections of grades, year, and program (Table B.2). Similarly, using longitudinal data from the cohort of students who enrolled in grade 10 in 2010, we find no statistically significant differences between treatment and comparison groups on dropout rates (Figure IV.4). We find similar results for the 2011 cohort as well; see Appendix B, Figure B.2. Given these results, we can conclude that the secondary school strengthening intervention had no effect on dropout rates.

[27] For example, schools that received between two and five new classrooms experienced the same average increase in total enrollment as schools that received no new classrooms but received other infrastructure improvements.

[28] For example, there was a strong positive correlation (of 0.47) between the number of first-year FOMILENIO scholarships offered in 2010 and enrollment changes at strengthened schools from 2008 to 2010.

Figure IV.4. Impacts of secondary school strengthening on dropout rates for the cohort of students enrolled in grade 10 in 2010 (percentages)



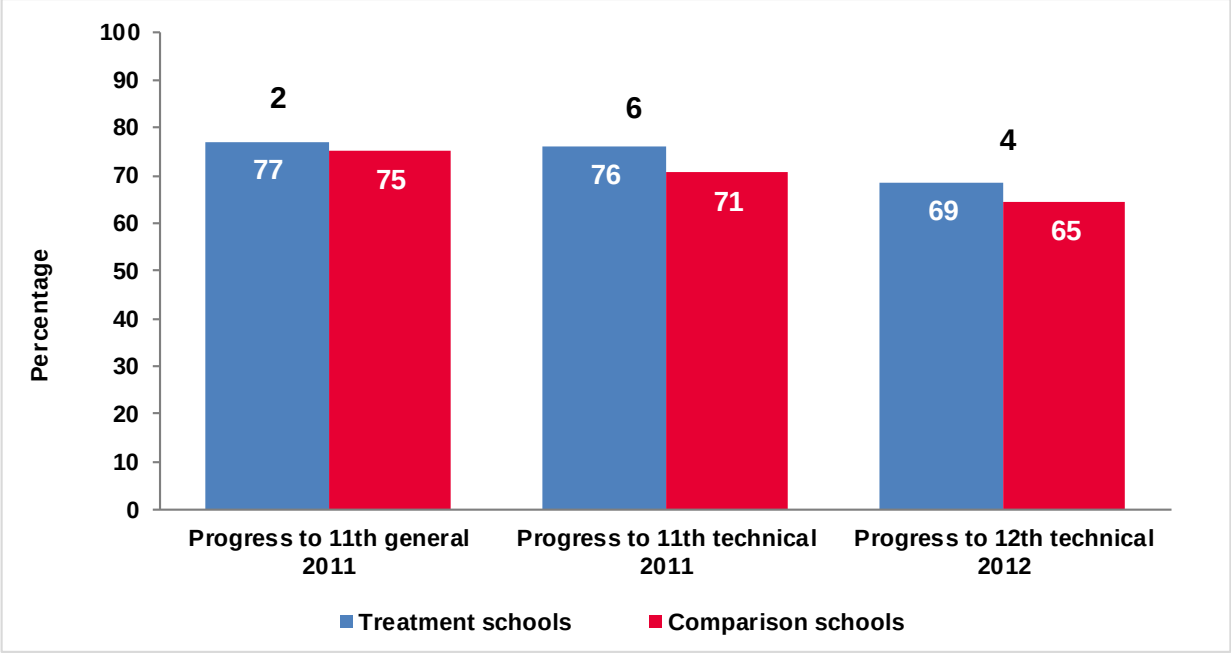
Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from 2008 Final Enrollment, School Census.

Note: Treatment means are regression adjusted using a random effects specification to account for students clustered in schools and include covariates to control for baseline dropout rates in 2008. Comparison means are unadjusted. Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

The school strengthening intervention had no impact on progressing to the next grade in the same program. Another outcome of interest is progression, or whether the students who were enrolled in one grade and program in a certain year enroll in the next grade of that program the next year. This outcome is constructed with two years of data and hence is intrinsically longitudinal. As such, we present results only for the 2010 cohort. We find that for this cohort, treatment schools had a larger percentage of students progressing on schedule than comparison schools; 76 percent of the students in the treatment schools who enrolled in grade 10 technical programs in 2010 progressed to grade 11 technical programs in 2011, compared to 71 percent of students in the comparison schools (Figure IV.5). A similar trend occurred with respect to continuation to grade 12 technical programs in 2012. However, these differences are not large enough to be considered statistically significant. We find similar results for the 2011 cohort (see Appendix B, Figure B.6).

Figure IV.5. Impacts of secondary school strengthening on progressing on schedule in the same program for the cohort that enrolled in grade 10 in 2010 (percentages)



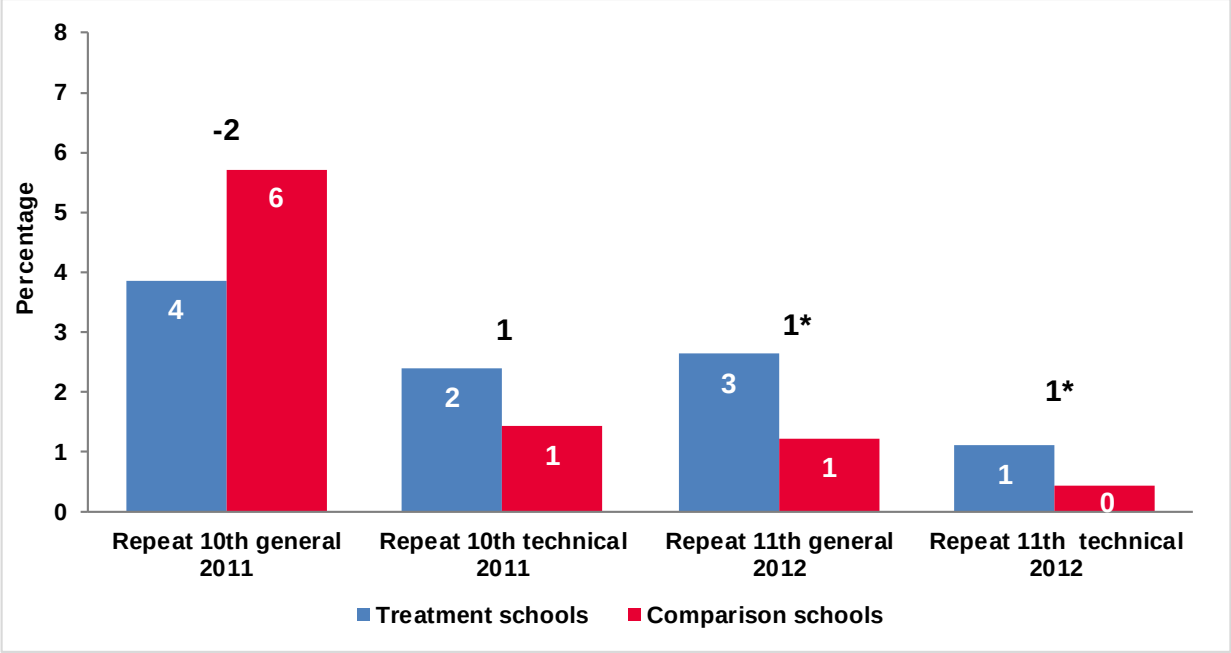
Source: School records at the student level for 2010, 2011, and 2012.

Note: No baseline covariates are used because data on progress to the next grade are not available for the baseline years. Statistical tests account for students clustered in schools. Comparison means are unadjusted. Some differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

The school strengthening intervention increased repetition rates by a small margin. Another outcome of interest is whether the students who were enrolled in one grade and program in a given year repeat the same grade and program the next year. (Figure IV.6). For students who enrolled in grade 10 in 2010, we found no statistically significant impact of the strengthening intervention on repetition rates in 2011. However, we find two statistically significant results on grade 11 repetition in 2012. Students in treatment schools were 1 percentage point more likely to repeat grade 11 in 2012 for both general and technical programs. We find no other statistically significant impact estimate for the 2011 cohort (Appendix B, Table B.3).

Figure IV.6. Impacts of secondary school strengthening on repeating a grade in the same program for the cohort that enrolled in grade 10 in 2010 (percentages)



Source: School records at the student level for 2010, 2011, and 2012.

Note: No baseline covariates are used because some baseline data are not available. Statistical tests account for students clustered in schools. Comparison means are unadjusted. Some differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Schools strengthened by FOMILENIO were less likely to have students switch from technical to general programs and more likely to have students change to a technical program and repeat the previous grade. Most schools in our sample offer both general and technical degrees, and some students start in one program and eventually change to the other. MINED's regulations allow for students who pass grade 10 in a technical program to enroll in grade 11 in a general program the next year, if they desire. However, a student must repeat grade 10 in order to transition from general to technical studies. In the 2010 cohort, students in treatment schools were 4 percentage points less likely to have changed from a technical program to a general program, a statistically significant difference (Tables B.4 and B.5 in Appendix B). In addition, in treatment schools, students were 1 percentage point more likely to change from a general to a technical program, repeating 10th grade in the process. Both findings suggest that some portion of students at strengthened schools saw technical programs as more attractive than general programs—perhaps due to the availability of scholarships for technical studies or the new technical infrastructure—and were thus less willing to transfer out of technical programs and more willing to transfer into them, even if it meant losing a year of studies.

The school strengthening intervention had no impact on academic achievement in 2010 and 2011 but a positive effect on science achievement scores in 2012. Each year, all students enrolled in 11th grade in El Salvador take the PAES test, a national exam that assesses language, mathematics, science, and social studies. In 2010 and 2011, there are no statistically significant

treatment-comparison differences in global or subset PAES scores (Table IV.3). However, in 2012, treatment school students had higher PAES science scores than comparison school students; treatment students scored 5.5 (out of 10) on average, compared to 5.0 for comparison students. The difference is statistically significant and equivalent to 0.65 standard deviations—considered to be a medium-sized effect using Cohen's standards (Cohen 1998).[29] Treatment school students also scored 0.4 points higher, overall, than comparison school students on the PAES global score in 2012, although this difference is only marginally statistically significant. This difference is equivalent to 0.43 standard deviations. These findings show that the secondary strengthening intervention had a positive effect on students' achievement, particularly in science.

Table IV.3. Impacts of secondary school strengthening on academic achievement (test scores, scale 0 to 10 points)

	Treatment group			Comparison group				
Characteristic	Adjusted mean	SD	N	Mean	SD	N	Adjusted difference	*p*-value
2010								
PAES Global	5.0	0.6	20	4.8	0.7	20	0.1	0.43
PAES Math	4.7	0.8	20	4.7	0.8	20	-0.1	0.83
PAES Language	5.1	0.7	20	4.9	0.5	20	0.3	0.06
PAES Social Science	5.6	0.6	20	5.6	0.5	20	0.0	0.92
PAES Science	5.0	0.6	20	4.8	0.6	20	0.2	0.31
2011								
PAES Global	4.6	0.7	20	4.68	0.61	20	-0.05	0.76
PAES Math	4.5	0.8	20	4.50	0.81	20	0.02	0.91
PAES Language	5.3	0.5	20	5.30	0.45	20	-0.03	0.85
PAES Social Science	5.0	0.6	20	5.17	0.68	20	-0.22	0.23
PAES Science	4.5	0.4	20	4.49	0.41	20	-0.02	0.87
2012								
PAES Global	5.3	1.1	20	4.9	0.7	20	0.4	0.06
PAES Math	4.8	1.1	20	4.7	0.9	20	0.1	0.66
PAES Language	5.1	0.9	20	4.8	0.6	20	0.3	0.14
PAES Social Science	6.0	0.7	20	5.8	0.5	20	0.2	0.20
PAES Science	5.5	0.9	20	5.0	0.6	20	0.5*	0.02

Source: Data provided by MINED in personal communication. Data available at the school level for 2006, 2007, 2008, 2010, 2011, and 2012.

Note: Treatment means are regression adjusted using ordinary least squares and include covariates to account for the average test scores across the baseline years (2006, 2007, and 2008). Comparison means are unadjusted. Some adjusted differences are not equal to the treatment mean minus the comparison mean, due to rounding.

* Impact estimate is statistically significant at the .05 level.

[29] Although this could be considered a medium effect using Cohen's standards, the What Works Clearinghouse, an initiative of the U.S. Department of Education, which reviews research in education programs and policies, does not provide guidance on classifying the magnitude of effect sizes obtained from school-level analyses due to a lack of knowledge in the field for judging the magnitude of cluster-level effects.

Contextualizing impact findings with in-person interview data

Some principals noted a connection between competency-based teaching and students' test scores. In the in-person interviews conducted in 2014 and 2015, several principals stated that as a result of implementing new technical programs, diploma programs, and competency-based teaching approaches, students scored better on the PAES achievement test at the end of 10th grade. One principal noted, "Since the [FOMILENIO] training, we evaluate students on their ability to solve problems, analyze, synthesize, and apply their knowledge…become a creative and innovating student. Since 2012, we've gotten the best scores in the department…I associate our emphasis on competencies with that [increase]…it's made our teachers open to a different way of teaching." In particular, new science labs and degree and diploma programs that featured stronger exposure to scientific concepts—including civil engineering, milk production, and hydroponic vegetable production—may have increased students' exposure to scientific theory and hands-on practice, thus helping to improving their PAES science scores relative to students in comparison schools.

E. Impacts on outcomes using data from student surveys

To construct outcome indicators, such as graduation from secondary school, enrollment in post-secondary school, employment, and income, we conducted a student survey at the end of 2013. MCC is interested in understanding the effects of the strengthened secondary schools one year after the students should have graduated. Thus, our sample frame included all students in the 40 study schools who were enrolled in their last year of secondary school in 2012. Because secondary schools can offer two types of programs, there are two types of students in their last year of secondary school: (1) those enrolled in grade 12 of technical programs and (2) those enrolled in grade 11 of general programs. Thus, in our sample, students enrolled in grade 12 technical programs began technical secondary school in 2010 and so are part of the 2010 cohort. Students enrolled in grade 11 general programs started general secondary school in 2011 and so are part of the 2011 cohort.

Sample characteristics. The overall response rate for the survey was 84 percent for the full sample: 86 percent for the treatment group and 80 percent for the comparison group. The analysis sample includes all students with completed interviews. A total of 1,196 students completed the survey: 742 in the treatment group and 454 in the control group (see Appendix B Table B.6). In the survey, we obtained information on students' characteristics, such as age, gender, the program of study, and so on that allowed us to better understand the composition of the sample. In addition, we conducted statistical tests to assess differences on those characteristics between the treatment and comparison groups; Table IV.4 presents the results.

At the time of the survey, students in the treatment and comparison groups were around 19 years old (no statistically significant difference between the two groups). However, the treatment group had a larger proportion of women than the comparison group; this difference is statistically significant. On average, students in the treatment group had families of approximately five members, similar to the comparison group (the difference is not statistically significant). In addition, the treatment group had more students in 12th grade technical programs than the comparison group (7 percentage points); this difference is not statistically significant. In the treatment group, 29 percent of the students had a FOMILENIO scholarship in 2012, compared to only 1 percent in the comparison group; this difference is statistically significant.

Table IV.4. Student characteristics in the analysis sample (percentages, unless otherwise indicated)

Characteristics	Treatment group mean	Comparison group mean	Difference	*p*-value
Age (years)	18.9	19.1	-0.2	0.25
Female	56	50	6*	0.01
Family size (members)	4.9	5.2	-0.3	0.10
Enrolled in 11th grade general program in 2012	43	50	-7	0.43
Enrolled in 12th grade technical program in 2012	55	47	7	0.33
Had FOMILENIO scholarship in 2012	29	1	28*	0.00
Sample sizes	**742**	**454**		

Source: Student follow-up survey conducted in 2013.

Note: Means are weighted to account for different probabilities of selection for the survey and nonresponse. Statistical tests account for clustering of students within schools. The difference may not equal the treatment mean minus the comparison mean due to rounding.

* Impact estimate is statistically significant at the .05 level.

Estimation model. Table IV.5 presents the regression-adjusted impact estimates of the strengthening of secondary schools on outcomes, constructed using 2013 student survey data. The regression-adjusted impact estimations discussed in the rest of this chapter include age and gender as covariates. Family size is not included as a covariate because it is a time-variant characteristic that could have been influenced by the intervention—for example, students in the treatment group could have been less likely to become pregnant as the result of attending strengthened schools. In addition, when available, we also include as a covariate the school-level baseline value of the outcome of interest obtained from the student survey conducted in 2009. For example, we used the school-level graduation rates obtained from the 2009 survey as covariates in the regression-adjusted impact on graduation rates. Furthermore, outcomes such as employment and income are also affected by local labor market conditions. To account for these effects, we included the unemployment rate at the department level reported by the National Multipurpose Household Survey (EHPM for its initials in Spanish) 2012 and the monthly household income reported in the EHPM 2012 as covariates in the regression-adjusted impacts on outcomes related to employment and income.

Table IV.5. Impact of FOMILENIO's strengthening of secondary schools (percentages, unless otherwise indicated)

Outcome	Treatment group adjusted mean	Comparison group mean	Adjusted difference	*p*-value
Graduation of secondary education				
Graduated with a general degree in 2012	43	43	0	0.96
Graduated with a technical degree in 2012	46	46	0	0.98
Graduated with a secondary school degree by 2012, independent of program	91	89	2	0.39
Academic achievement in secondary education				
Ever passed PAES[a]	79	81	-1	0.83
Global score for ever passed PAES (average)[b]	6.2	5.7	0.5*	0.01
Enrollment in post-secondary education				
Enrolled in a university in 2013	24	23	1	0.58
Enrolled in technical-vocational post-secondary education in 2013	11	8	3	0.09
Enrolled in post-secondary education in 2013 (university or vocational)	35	30	4	0.11
Employment				
Employed in 2013	34	38	-4	0.37
Employed full time in 2013	19	21	-2	0.52
Hours worked weekly in 2013	12.3	13.2	-1	0.59
Employed or enrolled in post-secondary education in 2013	65	62	4	0.45
Student income and consumption				
Income from main job in 2013 (in USD)	234	273	-39	0.52
Income from secondary work activities in 2013 (in USD)	164	199	-35	0.23
Income from other sources in 2013 (in USD)	563	650	-86	0.29
Student total annual income in 2013 (in USD)	956	1,124	-168	0.16
Student annual consumption in 2013 (in USD)	456	538	-82	0.18
Sample sizes	**742**	**454**		

Source: Student follow-up survey administered in 2013.

Note: Means are regression adjusted to account for baseline characteristics and clustering of students within schools. Data are weighted to account for different probabilities of selection for the survey and non-response. The adjusted difference may not equal the treatment adjusted mean minus the comparison mean, due to rounding.

[a] The sample sizes for this outcome were 736 and 451 for treatment and comparison groups, respectively.

[b] The sample sizes for this outcome were 528 and 314 for treatment and comparison groups, respectively.

* Impact estimate is statistically significant at the .05 level.

The school strengthening intervention had no impact on secondary school graduation rates. In El Salvador, graduating from secondary school requires that students pass their last year, pass the PAES, and complete a social service project to benefit the community. In our study sample,

we found no impact of the school strengthening intervention on graduation from secondary school in 2012: 43 percent of the students in the treatment group graduated with a general degree, the same as students in the comparison group. Also, 46 percent of students in the treatment group graduated with a technical degree, the same as students in the comparison group (Table IV.5). The treatment group's 2012 graduation rate (independent of a degree program) of 91 percent exceeds the M&E target of a 71 percent graduation rate in the 20 treatment schools. However, we should note that the 91 percent graduation rate corresponds to the sample of students who already had made it to the last year of secondary school, not all students who enrolled in secondary school; the latter is likely the population of interest in the M&E target.

We find a positive impact of school strengthening on academic achievement for the students who provided their PAES scores. In both treatment and comparison schools, about 80 percent of students passed the PAES. In addition, students in the treatment group reported higher scores than those in the comparison group (6.2 compared to 5.7); the difference of 0.5 is statistically significant. A limitation of this finding is that not all of the students who completed the survey recalled or provided their PAES scores, so the sample sizes used for this outcome are smaller than the analysis sample. However, the estimated impact is consistent with the marginally significant positive impacts we find in global PAES scores in 2012 when we used the school-level PAES scores provided by MINED and discussed in the previous section (Table IV.5).

The school strengthening intervention had no impact on enrollment in a university but had a marginal impact on enrollment in technical-vocational post-secondary education. In the treatment group, 23 percent of the students enrolled in a university in 2013; 24 percent did so in the comparison group (Table IV.5). The difference is not statistically significant. However, in the treatment group, 11 percent of the students enrolled in technical-vocational post-secondary education, compared to 8 percent of the students in the comparison group. The difference of 3 percentage points is only marginally significant (p-value = 0.09). This difference could be explained partly because four of the secondary schools in the treatment group offered degree programs linked to ITCHA. The students from these four schools were offered the chance to continue their post-secondary education in ITCHA, starting in the second year and completing a post-secondary degree in only one year. In addition, ITCHA offered several scholarships that could have also incentivized the students to enroll in technical-vocational post-secondary education. Therefore, the impact on enrollment in such education cannot be fully attributed to the strengthened intervention, since other related interventions could have also influenced this result.

The school strengthening intervention had no impact on students' employment one year after attending their last year of secondary education. In 2013, 34 percent of the students who attended the treatment schools were employed, compared to 38 percent who attended the comparison schools (Table IV.5), a difference of -4 percentage points that is not statistically significant. We also find no statistically significant differences on full-time employment (19 percent from the treatment schools and 21 from the comparison schools, respectively) and no impacts on the hours worked weekly (12.3 hours from the treatment schools and 13.2 from the comparison schools, respectively). The employment rate we find for the treatment group—34 percent—is lower than the compact's target of 50 percent employment among graduates of improved schools. We should note, however, that the target focuses on employment among graduates, whereas we focused on employment among all students who attended their last year of secondary school. The low employment rates are likely related to the fact that some students

enrolled in post-secondary education at followup, and hence were not employed. We also tabulated the percentage of students that were either employed or enrolled in post-secondary education in 2013 and found no impacts. In the treatment group, around 65 percent of students were employed or in post-secondary education, compared to almost 62 percent in the comparison group (no statistically significant difference). Note that the percent of students either employed or enrolled in post-secondary school (65 percent) is well above the compact's goal of 50 percent employment. Below we discuss the impact of the intervention on enrollment in post-secondary education.

The school strengthening intervention had no impact on students' income one year after they should have completed their secondary education. In 2013, students who attended treatment and comparison schools had comparable average incomes from their primary jobs and secondary work activities (Table IV.5). We also find no significant differences in income from other sources (such as scholarships, remittances, allowances from their parents, and income from renting properties). Students in the treatment schools made $168 less than the comparison students from all sources of income, but the difference is not statistically significant. Similarly, we find no statistically significant impact of the intervention on students' consumption. As explained at the beginning of this section, income may also be affected by local market conditions. To control for some of the labor market differences, our regressions included as covariates the average household income and unemployment rates for the nine departments in our sample, as reported by the EHPM 2012. However, our estimates did not account for variations in local market conditions within departments. It is likely that the treatment-comparison differences in income were due in part to differences in local labor markets within departments.

The secondary school strengthening intervention had no impact on the percentage of students whose work is related to their program of study or other factors related to obtaining the job, such as grades, courses, or previous experience. We find no statistically significant differences between treatment and comparison groups on whether their work was related to the program of study for secondary education, whether courses taken in their secondary education helped them get a job, whether their grades helped them get a job, or whether prior work experience during their secondary studies provided work experience (Table IV.6). Similarly, the school strengthening intervention had no impacts on the way secondary students found a job. More than 80 percent of employed respondents found their job through a friend or family member; only 7 percent in both treatment and comparison groups said they got their job through an internship done as part of a course.

Contextualizing impact findings with in-person interview data

- **Secondary school graduates often have difficulty getting work, particularly related to their area of study.** In focus groups and interviews, students, teachers, and principals agreed that secondary school graduates face serious obstacles to employment, given the lack of overall labor market demand in the region, particularly related to their field of study. Several principals noted that their graduates are often forced to search for jobs for as many as two to three years; when their graduates do find employment, they often make only the minimum wage in a job unrelated to their degree. One principal said, "It was so sad to me that one of the best engineering students, who had a grade average of 9 out of 10, was taking orders in Pollo Campero." Students and teachers noted, however, that students enrolled in some technical programs, particularly engineering and community health, often have a better chance of finding work in their field of study than other students.
- **Several principals noted the lack of strong internship programs as a barrier to employment in their graduates' field of study.** Although some technical programs—particularly accounting—have an internship component, students are often not involved in substantive work during these internships, with some even tasked with cleaning or getting coffee. A principal said, "There are no businesses that want to work with interns—they either doubt the students' capacity or don't want to be subject to any risks." Principals reasoned that stronger internship programs that allowed students to help in substantive ways could help students form personal and professional relationships on the job, thus increasing their job prospects following graduation. However, because the two new MEGATEC programs introduced in strengthened schools do not have internship program requirements, they represent a lost opportunity for students to establish relationships with potential employers.
- **A lack of professional development and placement services may also hinder graduates' employment prospects.** In focus groups, teachers also mentioned that secondary school students generally receive no assistance with respect to how to conduct a job search, apply for jobs, or prepare for an interview with prospective employers. As a result, they find themselves ill-equipped to find employment in their field. One teacher said, "Businesses don't value the [secondary] technical degree—that seal of approval. But it also depends on how the [students] sell themselves. If they just show up and say they want to help with 'whatever,' the businesses won't want them."

The school strengthening intervention had no impact on the type of occupation of employed people; the most common occupations were in sales and retail. In the treatment group, 21 percent of employed people worked as sales persons and 7 percent in retail; in the comparison group, the percentages were 23 and 9 percent, respectively. In the treatment group, 4 percent of employed people worked in agriculture, as opposed to 2 percent in the comparison group; the difference is not statistically significant. Similar percentages worked in domestic services—that is, 6 percent in the treatment group and 5 percent in the comparison group.

Table IV.6. Impact of secondary school strengthening on students' job search and the relationship between secondary education and students' jobs (percentages, unless otherwise indicated)

Outcome	Treatment group adjusted mean	Comparison group mean	Adjusted difference	*p*-value
Factors related to job/work				
Work is related to secondary program studied	22	19	3	0.60
Courses in secondary school helped to obtain the job	30	38	-7	0.29
Grades helped to obtain the job	20	19	1	0.82
Work during secondary studies provided work experience	46	51	-5	0.51
Received job orientation in school	27	30	-3	0.73
How student found work[a]				
Through a friend/family member	82	84	-3	0.58
Job internship done as part of a course	7	7	0	0.89
Newspaper advertisement	1	1	1	0.51
Job fair	1	0	1	0.15
Through PILAS	0	0	0	N/A
Occupations				
Sales person	21	23	-2	0.70
Retail	7	9	-2	0.60
Agriculture	4	2	3	0.11
Domestic services	6	5	2	0.53
Secretary	3	1	1	0.57
Accountant	2	2	0	0.82
Mechanic	2	1	1	0.57
Cook	2	1	1	0.55
Informatics	0	2	-1	0.19
Sample sizes	**253**	**174**		

Source: Student follow-up surveys administered in July 2012 and July 2013.

Note: Means are regression adjusted using a regression to account for baseline characteristics and clustering of students within schools. Data are weighted to account for different probabilities of selection for the survey and non-response. Some numbers may not add up, due to rounding.

[a] Sample sizes were 193 and 121 for the treatment and comparison groups, respectively.

F. Subgroup analyses

MCC is interested in assessing whether the secondary school strengthening intervention had a differential impact on girls versus boys; we therefore conducted a subgroup analysis of impacts by gender. We also conducted a subgroup analysis by program of study because FOMILENIO and other stakeholders in El Salvador are interested in assessing whether the secondary school strengthening intervention had a different impact on general programs than technical programs.

1. Gender subgroup results for outcomes from school records

The school strengthening intervention had a positive impact on enrollment in technical programs for both girls and boys in 2011 and 2012, but no impact on enrollment in general programs for either boys or girls. More girls enrolled in technical programs in the treatment schools than in the comparison schools—that is, 15 more in 2010, 18 more in 2011, and 22 more in 2012 (Figure IV.7). Of these three estimates, the last two are significant at the 5 percent level; the 2010 and 2011 differences are only marginally significant (10 percent level). Impacts for boys were slightly larger. On average, 19 more boys enrolled in technical programs in 2011 in treatment schools than in comparison schools, and 24 more boys enrolled in 2012. Both of these differences are statistically significant. We find no differences in enrollment in general programs for boys or girls. (Figure B.1 provides additional impacts on enrollment, by gender.)

The school strengthening intervention had a negative impact on boys' dropout rates. Examining dropout rates for the 2010 cohort, we find one statistically significant impact for boys but not for girls. In 2011, male students in treatment schools dropped out of grade 11 technical programs at higher rates than boys in comparison schools—a 4 percentage point difference (see Figure B.4 in the appendix). We find no statistically significant impacts on girls' dropout rates.

2. Gender subgroup results for outcomes from student survey

Table IV.7 presents the estimated impacts for girls and boys on outcomes constructed with the 2013 student survey.

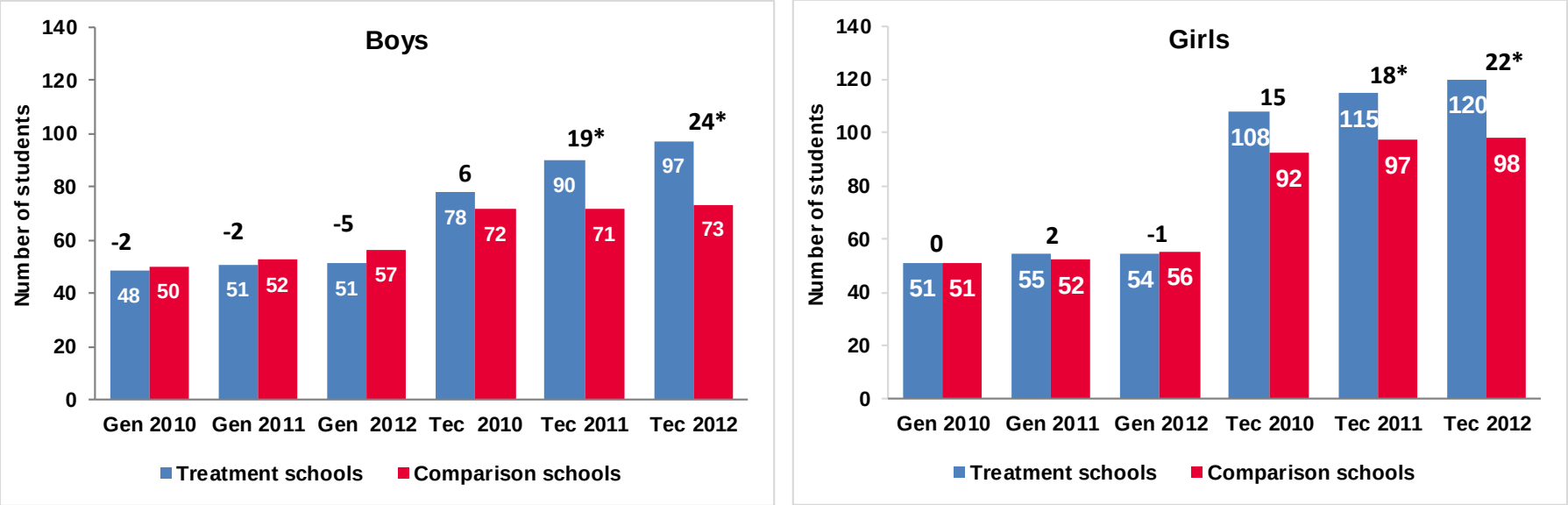
The school strengthening intervention had similar impacts for girls and boys on graduation from secondary school. The intervention had a positive impact on girls' academic achievement. We find no impacts on graduation rates for general or technical programs for girls and boys. However, we find a positive impact of the intervention on girls' global PAES scores but not boys' scores. The positive impact on girls is driven by the fact that girls in the comparison group have lower scores than boys, but in the treatment group the scores are similar between genders.

The intervention did not have an impact on enrollment in a university or technical post-secondary education for either girls or boys. For both girls and boys, treatment and comparison students tended to attend a university at similar rates. In 2013, 8 percent of girls in the treatment group enrolled in post-secondary education; 7 percent in the comparison group did so. The difference is larger for boys but not statistically significant—that is, 14 percent of boys in the treatment group enrolled in technical post-secondary education, whereas only 8 percent of the boys in the comparison group did so.

The intervention had no detectible impact on employment, full-time employment, or hours worked weekly for either girls or boys. However, boys' employment rates are almost double that of girls. For both girls and boys, treatment and comparison students tended to be employed at similar rates, and had similar rates of full-time employment. Interestingly, boys had much higher employment rates and more hours worked than girls, on average (Table IV.7). For example, male employment rates in the treatment and comparison groups were 44 and 50 percent, respectively. In contrast, the employment rates were 25 and 27 percent among girls in the treatment and comparison groups, respectively.

The intervention had a negative impact on secondary income for boys, but no impact on income for girls. The intervention had no impact on consumption for either gender. Boys in the treatment group made $71 less on average from secondary work activities than boys in the comparison group; this difference is statistically significant. This could be related to our previous finding that a larger (but not statistically significant) percentage of boys were enrolled in post-secondary education in the treatment group compared to the control group. However, there are no statistically significant impacts of the strengthening intervention on boys' or girls' total income. Similarly, we find no impacts of the school strengthening intervention on boys' or girls' consumption.

Figure IV.7. Impacts of secondary school strengthening on enrollment, by gender (number of students)



Source: School records at the student level for 2010, 2011, and 2012. Baseline controls are from 2006, 2007, and 2008 Final Enrollment Census.

Note: Treatment means are regression adjusted using ordinary least squares; we included as a covariate the average enrollment across the years 2006, 2007, and 2008 to account for baseline differences in enrollment. Comparison means are unadjusted. Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level

Table IV.7. Impacts of FOMILENIO secondary school strengthening intervention, by gender (percentages, unless otherwise indicated)

Outcome	Girls				Boys			
	Adjusted mean treatment group	Mean comparison group	Adjusted difference	*p*-value	Adjusted mean treatment group	Mean comparison group	Adjusted difference	*p*-value
All education programs								
Graduated general	37	41	-4	0.63	37	45	-9	0.41
Graduated technical	55	51	5	0.47	53	41	12	0.16
Passed PAES	85	80	5	0.45	74	81	-7	0.42
Global PAES Score	6.2	5.5	0.8*	0.01	6.3	5.9	0.4	0.11
Post-secondary education								
Enrolled in university	23	24	-1	0.79	24	22	3	0.52
Enrolled in vocational post-secondary	8	7	0	0.91	14	8	6	0.11
Enrolled in any post-secondary	31	31	0	0.65	37	29	8	0.10
Employment								
Employed in 2013	25	27	-1	0.78	44	50	-6	0.25
Employed full time	16	17	-1	0.79	22	25	-3	0.61
Hours worked weekly (average)	10	11	-1	0.59	16	16	0	0.91
Annual income and consumption								
Income from main job in 2013 (USD)	180	254	-74	0.39	256	293	37	0.67
Income from secondary activities in 2013 (USD)	166	163	2	0.96	164	235	-71	0.04
Income from other sources in 2013 (USD)	527	663	-135	0.12	603	637	-34	0.76
Student annual total income (USD) in 2013	890	1,082	-193	0.18	1,038	1,167	-129	0.32
Annual consumption (USD) in 2013	435	548	-113	0.12	480	528	-48	0.43
Sample sizes	**420**	**255**			**322**	**199**		

Source: Student follow-up surveys administered in July 2013.

Note: Means are regression adjusted to account for baseline characteristics and clustering of students within schools. We weighted data to account for different probabilities of selection for the survey and non-response. Some numbers may not add up, due to rounding.

* Impact estimate is statistically significant at the .05 level.

3. Other subgroup results for outcomes from student survey

Table IV.8 presents the estimated impacts for general and technical programs on outcomes constructed with the 2013 student survey.

The school strengthening intervention had a positive impact on the academic achievement of students enrolled in general programs. For students enrolled in general programs, global PAES score in the treatment and comparison group were 6.5 and 5.8, respectively—the difference of 0.7 is statistically significant. Students in the treatment group enrolled in technical programs also performed better, on average, than their counterparts in the comparison group (difference of 0.5 points on the global PAES score), but this difference is only marginally statistically significant. We should note that the students enrolled in general programs took the PAES in 2012 and the students enrolled in technical programs took the PAES in 2011. Consistent with our previous findings (Table IV.3) the positive impact on PAES scores for students in general programs pertains to the 2012 school year.

The intervention had no impact on secondary school graduation or enrollment in post-secondary education for either general or technical programs. Secondary school graduation rates were comparable across treatment and comparison groups, both for general and technical programs. For students in general secondary education, treatment and comparison students had similar enrollment rates in post-secondary education. For students in technical secondary education, enrollment rates in post-secondary education, especially technical-vocational, were larger for treatment students than comparison students, but none is statistically significant. Overall, 34 percent of students in technical programs in the treatment group were enrolled in any post-secondary education (university or technical-vocational), compared to 27 percent in the comparison group; the difference of 7 percentage points is not statistically significant.

The intervention had a negative impact on employment and hours worked weekly for technical students, but no impact on employment or hours worked for general students. For general programs, treatment and comparison students were employed at similar rates, and treatment students worked more hours than comparison students; the difference is not statistically significant. For technical program students, the average employment rate in the treatment group was 33 percent, compared to 45 percent in the comparison group; the -12 percentage point difference is statistically significant. Technical students in the treatment group also worked 5 fewer hours on average than comparison students—12 hours compared to 17. It is likely that the lower employment rates for technical students in the treatment group were due in part to the finding discussed above: more students in the treatment group enrolled in post-secondary education than in the comparison group.

The intervention had a negative impact on total income for students in technical programs but no impact on income for students in general programs. For general programs, treatment and comparison students had similar incomes from all sources. For the technical programs, however, treatment students had a lower total income than comparison students, on the order of $273 for the year. It is likely that the negative differences in total income were due in part to lower employment in the treatment group, linked to higher post-secondary enrollment. In addition, although we included covariates to account for differences in labor market outcomes at the department level, such differences within departments could be driving part of the income differences.

Table IV.8. Impacts of FOMILENIO secondary school strengthening intervention, by program (percentages, unless otherwise indicated)

	Grade 11 general				Grade 12 technical			
Outcome	Adjusted mean treatment group	Mean comparison group	Adjusted difference	*p*-value	Adjusted mean treatment group	Mean control group	Adjusted difference	*p*-value
All education programs								
Graduated general	88	86	2	0.65	NA	NA	NA	NA
Graduated technical	NA	NA	NA	NA	97	97	0	0.94
Passed PAES	86	78	8	0.15	77	84	-7	0.44
Global PAES Score	6.5	5.8	0.7*	0.00	6.0	5.6	0.5	0.08
Post-secondary education								
Enrolled in university	28	29	-1	0.82	20	17	3	0.54
Enrolled in vocational post-secondary	6	5	0	0.91	14	10	4	0.16
Enrolled in any post-secondary	33	34	-1	0.84	34	27	7	0.16
Employment								
Employed in 2013	36	33	3	0.56	33	45	-12*	0.05
Employed full time	16	15	1	0.77	22	27	-6	0.09
Hours worked weekly (average)	13	10	3	0.14	12	17	-5*	0.04
Annual income and consumption								
Income from main job in 2013 (USD)	203	174	29	0.69	255	387	-132	0.15
Income from secondary activities in 2013 (USD)	116	120	-5	0.91	78	281	-203	0.15
Income from other sources in 2013 (USD)	602	778	-176	0.14	585	496	89	0.29
Student annual total income (USD) in 2013	926	1,066	-140	0.26	902	1,175	-273*	0.03
Annual consumption (USD) in 2013								
Sample sizes	**203**	**191**			**532**	**254**		

Source: Student follow-up surveys administered in July 2013.

Note: Means are regression adjusted to account for baseline characteristics and clustering of students within schools. Data are weighted to account for different probabilities of selection for the survey and non-response. Some numbers may not add up, due to rounding.

NA = Not available.

* Impact estimate is statistically significant at the .05 level.

The intervention had no impact on consumption for students in either general or technical programs. Despite the negative impact of the intervention on income for technical students, we find no significant differences in annual consumption between treatment and comparison groups for students in technical (or general) programs.

G. Summary of findings

From 2009 to 2011, 20 needy schools received large-scale capital improvements, teacher training, and new degree and diploma programs. 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 bathroom stalls. Principals and students were satisfied with infrastructure improvements, with some exceptions. In addition, four secondary schools introduced MEGATEC degree programs in 2010 in alternative tourism and civil engineering, and ten of the 20 strengthened schools introduced certificate programs. Stakeholders expressed appreciation for the new degree and certificate programs, although some had reservations about the alternative tourism curriculum. CIDE designed and conducted teacher and stakeholder training focused on competency-based education at all 20 strengthened schools. Overall, CIDE trained 540 school staff, thus surpassing the compact target of 500 trained educators under the sub-activity. FOMILENIO representatives and school staff reported high satisfaction with the training offered by CIDE.

In combination with scholarships, secondary school improvements had a positive effect on enrollment in technical programs. After taking into account differences in enrollment at baseline, we find statistically significant impacts of school strengthening on enrollment in technical programs in 2011 and 2012. Treatment schools had about 36 more students enrolled in technical programs than comparison schools in 2011 and 46 more students in 2012. This trend likely reflects the impact of secondary school improvements—including new technical degree programs and infrastructure at strengthened schools—on students' motivation to enroll as well as schools' capacity to serve additional students. However, it also likely reflects some impact of FOMILENIO scholarships on enrollment, as these scholarships were offered in 17 of the 20 treatment schools, but not in any of the 20 comparison schools. Thus, the finding of increased enrollment is a response to an intervention focusing on enhancing students' demand for technical education (primarily through scholarships) while enhancing the supply of high quality technical education (through new programs, additional classrooms, and infrastructure).

School improvements motivated both girls and boys to enroll in technical programs. The school strengthening intervention had a positive impact on boys' enrollment in technical programs in 2011 and 2012 and girls' enrollment in technical programs in 2012. The impacts on enrollment were larger for boys than for girls, however.

Strengthening efforts had a positive effect on student achievement. Administrative and survey data illustrate that in 2012 (the third year of the interventions), treatment school students had significantly higher PAES global and science scores than comparison school students, after controlling for baseline differences in student achievement. These findings suggest that the secondary strengthening intervention had a positive effect on students' achievement, particularly in science. Interviewed stakeholders related these positive impacts on test scores to better laboratories, more practice, and the technical degree and diploma programs introduced as part of

the intervention—particularly the competency-based approach to learning, which reinforced problem-solving and analytical skills. Furthermore, it appears that these positive impacts on achievement are driven by girls' PAES scores. In the strengthened schools, academic achievement is similar for boys and girls but in the comparison group, girls' performance is lower than boys.

Strengthening efforts had effects on enrollment and academic achievement but not on other educational outcomes. Based on this analysis, secondary school strengthening investments had no impact on progression and graduation rates. As such, it appears that the primary effect of scholarships, infrastructure investments, and new degree and certificate programs was to attract a larger number of students into technical programs than would have enrolled otherwise. Once these students were enrolled, however, scholarships, new infrastructure, and degree and certificate programs played no detectible role in motivating or allowing students to progress in, and graduate from secondary school. However, these investments did strengthen the quality of education, to the extent that students in strengthened schools experienced higher test scores than their counterparts in comparison schools.

Strengthening secondary schools had no effect on employment and income one year after students were scheduled to complete general or technical degrees, but had a marginal effect on enrollment in technical vocational post-secondary education. We find that about one third of the students in our sample reported being employed one year after they were scheduled to complete a general or technical degree for both strengthened and comparison schools. However, a larger percent of students from strengthened schools reported being enrolled in a technical vocational institution than in the comparison schools. This is likely related to the four strengthened schools linked to the ITCHA/MEGATEC. These students were able to transfer to this vocational post-secondary institution and complete their post-secondary degree within only one year, often with partial or full scholarships.

The intervention had a negative impact on labor market outcomes for technical students, likely related to higher enrollment in post-secondary education. Technical program students in treatment schools were less likely to be employed, worked few hours, and had lower total income, on average, than technical program students in comparison schools. However, this should not be interpreted as an entirely negative finding, as there is suggestive evidence that lower employment rates for technical students in the treatment group were due in part to more students in this group enrolling in post-secondary education than in the comparison group. Presumably, enrollment in post-secondary education could pay dividends in future years if students obtain more specialized and higher paying jobs as a result of their advanced studies.

The intervention had no detectible impact on employment rates for either girls or boys. However, boys' employment rates are almost double that of girls. For both girls and boys, treatment and comparison students tended to report similar employment rates, and had similar rates of full-time employment. Interestingly, boys had much higher employment rates and more hours worked than girls, on average. For example, male employment rates in the treatment and comparison groups were 44 and 50 percent, respectively. In contrast, the employment rates were 25 and 27 percent among girls in the treatment and comparison groups, respectively. Stakeholders noted that this finding reflected persistent cultural values and gender stereotypes in

El Salvador: in general, boys are expected to find jobs and girls are expected to remain at home—even after competing secondary school.

H. Limitations

As in the case of any evaluation, these impact estimates reflect the characteristics of the study population and the assistance provided. Because the study population comprised secondary school-age students who attended 40 secondary schools, these results cannot be generalized to the entire population of secondary school-age students in El Salvador's Northern Zone. The impact of strengthening all secondary schools in the Northern Zone could be similar, smaller, or larger than the impact detected among the study population.

In addition, the strengthening intervention was implemented at the same time as other FOMILENIO program interventions, particularly the scholarship program. Under the scholarship intervention, 17 of the 20 schools that received infrastructure improvements and teacher training also received FOMILENIO scholarships. Scholarships most likely would affect students' educational outcomes independently of the effect of the strengthening intervention. However, the impacts presented in this chapter cannot be separated statistically from the effects of the scholarships. In addition, new MEGATEC technical degree programs were introduced in 4 of the 20 strengthened schools. Because these programs were linked to the newly established MEGATEC programs at ITCHA, students who completed the programs could register directly in their second year of post-secondary education following secondary school and thus access ITCHA scholarships. As a result, students in the 4 linked secondary schools could have had enhanced incentives to complete secondary school. Unfortunately, we cannot separate the impacts of secondary school strengthening from the possible effects of these new linked MEGATEC programs on students' educational outcomes.

In addition, this evaluation's follow-up period of one year is a relatively short time period, particularly given the tendency of a portion of students to continue on to post-secondary studies. In future studies of technical education interventions of this kind, it may be desirable to assess employment at least two years after post-secondary graduation to allow students in the treatment and comparison schools to finish their post-secondary studies.

V. FINDINGS FOR SCHOLARSHIPS IN STRENGTHENED SCHOOLS

In this chapter, we discuss the final results regarding the impact of FOMILENIO's secondary school scholarships in strengthened schools on applicants' educational and labor market outcomes. In Section A, we provide general program implementation findings; in Section B, we describe the sample of students in the scholarship impact analysis; in Section C, we summarize the impact results. We conclude the chapter with a summary of findings and a discussion of limitations (Sections D and E).

A. Implementation findings

The FOMILENIO scholarships program in strengthened schools provided scholarships to students having an economic need. FOMILENIO secondary scholarships targeted 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 education, and, ultimately, to improve students' labor market outcomes. CIDE was responsible for the initial design of the scholarship program, including determining the appropriate scholarship amount and eligibility criteria. The full set of eligibility requirements for secondary school scholarships were as follows: 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 9th grade with a minimum of a 6th grade point average (out of 10 points); be interested in studying in one of the educational programs selected to be included in the scholarship program; and meet the requirements set by the school in which they plan to enroll.

Scholarships for secondary education were for $400 awarded for the first year and could be renewed up to two years. After some deliberation, MINED and FOMILENIO approved a scholarship amount of $400 per year per student enrolled in secondary school.[30] If the scholarship was awarded, students received $30 monthly payments, as well as a larger initial payment and school supplies at the start of each school year. Scholarship money was to be used to defray the costs of materials (including textbooks and calculators), transportation, and food. 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 and technical secondary school students could renew their scholarships for one or two more years, respectively.

FOMILENIO offered scholarships in 17 of the 20 schools it strengthened. According to the original plans, scholarships would be offered to students at all 20 secondary schools scheduled to be strengthened under the sub-activity. FOMILENIO and MINED formed a scholarship committee to manage the scholarship allocation across those schools. The committee included staff from MINED, FOMILENIO, CIDE, FEPADE and school principals. In deciding how these scholarships would be distributed, the committee first determined that they would be

[30]To provide some context for the scholarship amount, we should note that the EHPM conducted by DIGESTYC in 2009 reported that the monthly household income in the Northern Zone was almost $400.

offered to students in 17 of the 20 secondary schools strengthened by FOMILENIO.[31] For the selected schools, the committee also selected the educational programs in which the scholarships would be offered and the number of scholarships for each program. According to a FOMILENIO representative, programs selected for scholarships were largely new MEGATEC degree programs and certificate programs in which FOMILENIO and MINED staff wanted to stimulate student interest, and the number of scholarships designated for each program reflected stakeholders' estimates regarding the size of the incoming grade 10 class, as well as their aspirations to fill degree and certificate programs to capacity. Although the committee set a tentative number of scholarships for each school, it adjusted that number if some schools had a higher or lower number of eligible scholarship applicants than originally projected.[32]

FEPADE administered first- and second-year scholarships, and MINED administered second- and third-year scholarships. In 2009, FOMILENIO contracted with the Business Foundation for Educational Development (known as FEPADE for its initials in Spanish) to conduct outreach to potential applicants, process applications, disburse funds, and monitor students' grades. From 2009 to 2012, FEPADE staff administered all first-year and half of the second-year FOMILENIO scholarships; this administration included promoting the scholarships and assisting in student selection. As a counterpart contribution, MINED financed and administered scholarships for the remaining half of the second-year scholarship recipients (those not covered by FOMILENIO funds) and all third-year recipients from 2010 to 2014.

FOMILENIO awarded the majority of new scholarships from 2010 to 2012. In the first year of the scholarship program (2009), modest promotion efforts and limited funding in just three schools yielded a relatively low demand for scholarships; FOMILENIO awarded only 150 first-year scholarships (Table V.1). To promote scholarships for the 2010 academic year, FEPADE staff visited all 162 primary schools that feed into the selected 17 secondary schools and explained the scholarship program and the application process to students. These promotional efforts resulted in more than 1,500 eligible applications, from which 921 students were awarded a scholarship in 2010. Due to the growing awareness of the scholarship program in participating schools, FOMILENIO awarded more than 1,100 first-year scholarships in each of the two following years (2011 and 2012). A FOMILENIO representative noted that in these two last years of the program, principals played a larger role in applicant recruitment and selection, including accepting scholarship applications directly and helping to identify low-income students who likely met scholarship requirements.[33]

[31] The three schools not selected for scholarships by the committee were the three "Centros Educativos" in our sample, which offer grades 1 to 11 in the same school, as opposed to grades 10 to 12. These schools did not offer a technical option or a certificate program, therefore the committee did not select them for the scholarship program.

[32] The interim report for the secondary scholarships program offers a more detailed description of the program's implementation (Campuzano et al. 2013b).

[33] In 2009 and 2010, FEPADE staff accepted scholarship applications. Stakeholders noted that students' direct application to schools in 2011 and 2012 was a positive development, as it gave them an incentive to learn more about the degree programs available at their school and make more informed enrollment decisions.

Table V.1. Scholarships awarded 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 participating schools	3	17	17	17	17

Source: FOMILENIO administrative data for 2009–2012.

FOMILENIO exceeded the targets for awarded scholarships. From 2009 to 2012, FOMILENIO financed a total of 4,330 secondary school scholarships. This total of 4,330 scholarships includes 3,409 secondary school scholarships, 586 post-secondary scholarships for ITCHA students, and 335 post-secondary scholarships for non-ITCHA students. Subtracting the compact goal of 3,600 from 4,330 yields a surplus of 730 scholarships for the period 2009 to 2012. According to a FOMILENIO source, it was able to finance additional secondary scholarships for two reasons. First, scholarship administration costs were lower than anticipated at the beginning of the compact. Second, FOMILENIO entered a cost-sharing arrangement with the Fundación Krete near the end of the implementation period. In this agreement, the latter would finance a portion of the post-secondary scholarships FOMILENIO was originally slated to finance. As a result of this agreement, FOMILENIO was able to offer a higher number of secondary scholarships than initially budgeted. At the time of compact close-out, FOMILENIO had administered approximately 150 more secondary school scholarships than originally planned.

Scholarship recipients tended to be poorer than other students in the schools, according to principals. In follow-up interviews, the majority of principals of the 17 schools reported that overall, scholarship recipients at their schools were poorer than non-recipients. One principal said, **"**The kids with scholarships are different—they are living in extreme poverty, and the scholarship was a huge help in financing their studies." This finding is in line with the scholarship eligibility criteria, which required that applicants have a household income of less than three times the minimum wage of $6 a day, roughly equivalent to $378 per month. Other principals noted that scholarship recipients were more motivated to excel, more committed to their studies, and more disciplined in class as a result of the scholarship. One said, "To a certain extent, [the scholarship recipients] looked more enthusiastic, looking toward the future." However, there was no general consensus on this point, as at least one principal noted that scholarship recipients were no different from the rest of the students with respect to discipline and motivation.

1. Constraints and facilitators to implementation

Students expressed strong satisfaction with FOMILENIO scholarships, but some noted that scholarships did not cover their education expenses. Students expressed satisfaction with the scholarships, but reported that at $30 a month, scholarships did not cover their educational costs—particularly related to transportation and food. One secondary school student said, "The scholarship covers less than half of expenses for those who live far away." According to survey data that DIGESTYC collected, students who were offered the scholarship and whose commute was less than 25 minutes reported spending $13 on food and $6 on transportation per month, on

average. In contrast, scholarship recipients who traveled more than 25 minutes to school reported spending $24 on food and $21 in transportation per month, on average. The FOMILENIO scholarship thus defrayed only a portion of the average costs incurred by scholarship recipients who lived more than 25 minutes from school. These findings are corroborated by a qualitative study that MCC conducted, which found that most students reported that the scholarship amount was not enough to cover their school expenses (Zanin 2010). According to the study, interviewed scholarship recipients said they needed $76 a month on average—of which the scholarship would pay $30—to cover all school-related expenses.

First-year scholarships were distributed in a timely manner, but second- and third-year scholarships were not. Some students reported that scholarship disbursements had not been paid in a timely manner. As noted above, FEPADE administered all FOMILENIO-financed first-year (and half of all second-year) scholarships; these scholarships were distributed in a timely manner, according to most accounts. However, MINED financed and administered half of all second-year secondary school scholarships (and all third-year scholarships). Payment of the MINED-financed scholarships was delayed because MINED's annual budget approval took longer than anticipated and so delayed payments. When received by students, the payments were retroactive and covered several months in one lump sum. For example, in 2011, some students reported receiving their first scholarship disbursement in July, and in some cases as late as August, to cover expenses dating back to January of the same calendar year. Reflecting on this difficulty, a FOMILENIO representative noted that FEPADE-administered scholarships had higher administrative costs than those MINED administered, but working with FEPADE "guaranteed that the money got there on time and that the kids would get more follow-up."

Principals' greater involvement in promoting and awarding scholarships in the 2011 school year was viewed as positive by interviewed stakeholders. Principals from strengthened schools coordinated with FOMILENIO and CIDE staff prior to the 2009 and 2010 school years to set scholarship targets and disseminate news of the scholarship to graduating 8th grades at nearby schools. However, 2011 marked the first year in which principals played a central role in promoting the scholarships in their communities and helping FOMILENIO and FEPADE staff select students for scholarships. In a follow-up interview**,** a FOMILENIO representative noted that this increased principal involvement was a positive development, particularly because principals clarified the application process and selection criteria for students, and helped generate unprecedented demand. The representative said, "In the second year we involved the principals a lot more in promoting the scholarship and identifying the kids—so in the second year we got a lot more interested students."

2. Post-compact scholarships

MINED fulfilled its commitment to fund second- and third-year FOMILENIO scholarships during the post-compact period, but did not fund new first-year scholarships in 2013 or 2014. After the compact ended in 2012, MINED fulfilled its commitment to fund second- and third-year secondary school scholarships until the last cohort of FOMILENIO scholarship recipients finished secondary school in 2014. Under this arrangement, the annual secondary school scholarship amount remained at $400 per year. A FOMILENIO representative noted, "Yes, [MINED] fulfilled their end of the bargain." However, the FOMILENIO representative expressed disappointment that during 2013 and 2014, MINED did not devote

funds to new scholarships for students entering their first year of secondary school. According to the representative, MINED had committed to financing additional scholarships in the post-compact period. However, this agreement did not specify the exact number of scholarships, the scholarship amount, the total budget that MINED would devote to scholarships, the exact years the scholarships would be offered, or their terms and conditions. According to the FOMILENIO representative, the lack of detail in this commitment represented a lost opportunity for FOMILENIO to secure a strong counterpart contribution from MINED for additional scholarships in the region.

In 2015, MINED funded a new round of secondary school scholarships in the Northern Zone. In 2015, MINED introduced 458 need-based scholarships (valued at $183,200) to first-year students at the 17 technical schools that received FOMILENIO scholarships. The amount of the new scholarships is the same as the FOMILENIO scholarship—$400 per year—and they primarily fund technical programs. If students continue to be eligible, they can renew their scholarship for two more years—2016 and 2017. However, because MINED has limited resources for scholarships in the Northern Zone, the next round of first-year scholarships will not be available until 2018; in other words, no first-year students will get scholarships in 2016 or 2017, similar to 2013 and 2014. MINED's continued investment in scholarships to support technical education in the region is a positive development, but its total number of first-year scholarships from 2015 to 2017 (458) falls far below the number of first-year FOMILENIO scholarships awarded from 2010 to 2012 (3,259).

3. Lessons learned from implementation

To increase acceptance rates and better cover education expenses, scholarship amounts could vary according to students' education expenses. As noted previously, MCC's qualitative study in 2010 found students generally reporting that the scholarship amount was not enough to cover their school expenses (Zanin 2010). In light of this finding, future scholarship interventions could determine scholarship amounts according to students' actual travel expenses, so those who live farther from schools would receive larger monthly scholarship payments. Such an approach could potentially increase acceptance rates among applicants who face sizable constraints to education—particularly rural students. Perhaps more important, it would constitute a fairer allocation of scholarship payments, using to students' actual costs of education.

In future education investments, Millennium Challenge Accounts (MCAs) could negotiate more detailed post-compact commitments. In the interest of continuing scholarships in the Northern Zone following the compact, FOMILENIO and MINED representatives signed an agreement in which MINED committed to continuing to fund new technical scholarships in FOMILENIO-strengthened secondary schools after the compact expired in late 2012. However, a FOMILENIO source was disappointed with the lack of new MINED scholarships during these years, suggesting that MINED should have been held to stronger and more specific commitments regarding the number of scholarships it would administer, the scholarship amount, and the years of administration. In future post-compact negotiations, MCAs could attempt to achieve more definitive commitments from government counterparts regarding their continued investments in scholarships, infrastructure, or teacher training. Such commitments are particularly important with scholarships, which have been shown to have a positive impact on secondary school enrollment in the region.

B. Study sample

For the impact analysis, the sample used for the evaluation of scholarships is a sub-sample of students who applied for a first-year FOMILENIO secondary school scholarship for the 2010–2011 school year. These students had to be eligible for a scholarship according to the criteria described in Chapter I, had to apply to the schools or programs that had more demand than available scholarships, and had to have been assigned to either the treatment group (scholarships) or control group (no scholarships). The evaluation sample consists of 751 students: 515 who were randomly assigned to the treatment group and offered a scholarship and 236 who were assigned to the control group and were not offered a FOMILENIO scholarship. All 751 students applied to 12 educational programs in 10 of the 17 schools selected for scholarships. All schools selected for scholarships were also strengthened with FOMILENIO funds.

The final analysis, presented in this report, focuses on the impact of the scholarships on students' outcomes at two points in time: in mid-2012, approximately two and a half years after the first cohort of students applied for a scholarships, and at the end of 2013, approximately four years after students in that cohort applied for the scholarship. Data from the scholarship application form completed in 2009 were used to control for potential differences in student and household characteristics between the treatment and control students (this approach allowed us to attain higher statistical power), whereas data from two student follow-up surveys conducted in July 2012 and October 2013 provided key outcome measures. We summarize the number of randomized students and survey respondents in Table V.2. As shown, 80 percent of the research sample completed both surveys, and there was no major treatment-control difference in response rates: almost 82 percent of the treatment group completed both surveys, compared to almost 78 percent of the control group. The analysis sample for this final analysis included all respondents with data for the two follow-up surveys.

Table V.2. Number of randomized students and response rates for first follow-up survey

	Research sample	Treatment group	Control group
Number of students randomized	751	515	236
Number of completed interviews in 2012 and 2013	604	421	183
Response rate (%)	80.0	81.7	77.5

Source: Mathematica administrative data and follow-up surveys conducted in 2012 and 2013.

Note: In 2009, 751 students were randomized into the treatment or control groups. Completed interview data indicate the number of those students responding to both the 2012 and 2013 surveys.

We considered a student to be a scholarship participant only if he or she actually received at least the first scholarship payment in 2010; for the purposes of the evaluation, we still viewed a student who received the first payment and later dropped out from the program as a participant. Students in the treatment group who did not receive the first payment (not participants) reported many reasons for not receiving the first payment of the scholarship, the most frequent being that FOMILENIO did not approve the scholarship. It is unclear why students gave this answer

because FEPADE staff repeatedly reported that they contacted all the students in the treatment group to inform then that they had been granted a scholarship. Almost 77 percent of the students in the treatment group (and only one student in the control group) received at least the first scholarship payment (Table V.3). The fact that one control student got a scholarship was probably due to an administrative error when scholarships were awarded.

We conducted this report's main analysis using the sample of students who completed both surveys, regardless of whether treatment group members actually received a scholarship or not. This is called an *intent-to-treat* (ITT) impact estimation approach; it is often used to test the "real-world" impact of programs that may not achieve perfect adherence—in this case, a scholarship program in which not all students accepted their scholarship offer. However, we also conducted a *treatment-on-the-treated* (TOT) analysis, which estimates impacts only among those students who actually received at least the first payment of the scholarship. The impact obtained from this analysis can be interpreted as the effect of receiving a FOMILENIO scholarship, as opposed to the effect of receiving a scholarship offer (under our primary ITT approach).

Table V.3. Students in the analysis sample who participated in the scholarship program

	Treatment group	Control group
Number of students in the analysis sample	421	183
Number of students who received at least one scholarship payment	325	1
Participation rate (%)	77.2	0.5

Source: FEPADE administrative records.

Note: For the purpose of this evaluation, participation in the scholarship intervention is defined as receiving at least one scholarship payment in 2011. Students who received the first scholarship payment but dropped from the program at a later date are still considered to be participants.

Baseline equivalence. Information from the application forms was available for the full research sample of 751 students. However, we were interested in verifying that treatment and control groups were equivalent at baseline in the analysis sample that includes only students who responded to the follow-up surveys (604 students). If the groups were unbalanced, a difference in outcomes could be due to the initial differences, not the treatment.[34] Table V.4 presents the characteristics of students in our analysis sample at the time they applied for the scholarship. We find no statistical differences between the treatment and control groups on the characteristics for which data were available. We should note that household income measures may be underreported because students generally did not have strong knowledge of their parents' full income. Even if they underreported household income, however, the measure could convey true

[34]We present data with the characteristics of the respondents and non-respondents in Table A.3.

income differences across treatment and control groups as long as these groups did not have systematic differences in the way they underreported this income.[35]

The majority of the scholarships that FOMILENIO offered were for technical programs. Of the 12 programs in our study sample, FOMILENIO offered scholarships for 2 general secondary and 10 technical secondary programs. Of the 421 students in the treatment group, 84 percent applied for scholarships in technical programs and 16 percent for scholarships in general programs. Of the 183 students in the control group, 88 percent applied for scholarships in technical programs and 12 percent for scholarships in general programs.

Table V.4. Baseline characteristics of students in the analysis sample (averages, unless otherwise indicated)

Characteristics	Treatment group	Control group	Difference	*p*-value
Age (years)	16.0	16.0	0.0	0.79
Female (%)	60	59	1	0.76
Annual household income (in USD)	1,892	1,865	26	0.79
Household size	5.7	5.6	0.1	0.39
Grade average	7.8	7.9	0.0	0.61
Annual expenditures (in USD)	1,857	1,800	58	0.57
Urban (%)	17	15	2	0.56
Sample sizes	**421**	**183**		

Source: Data from 2009 scholarship application form (FEPADE's records).

Note: Means are regression adjusted using ordinary least squares; indicator variables of each program where randomization was conducted were included as covariates to account for random assignment within programs. Means are weighted to account for the different probabilities of assignment to the treatment across programs and for non-response (see equation 3 in Chapter II). Some numbers may not add up, due to rounding.

* Impact estimate is statistically significant at the .05 level.

C. Impact on student outcomes

In this section, we first present the impact of the offer of FOMILENIO scholarships on educational outcomes, such as enrollment in secondary school, grade completion, secondary school graduation, and continuation to post-secondary education. It is important to note that the scholarships were offered only in schools that were also strengthened by FOMILENIO. Thus, we cannot separate the effects of the scholarships from the effects of the school strengthening, and the impacts discussed in this chapter reflect the effect of offering a scholarship in strengthened schools. Next, we present the impact of the offer of scholarships on students' employment and

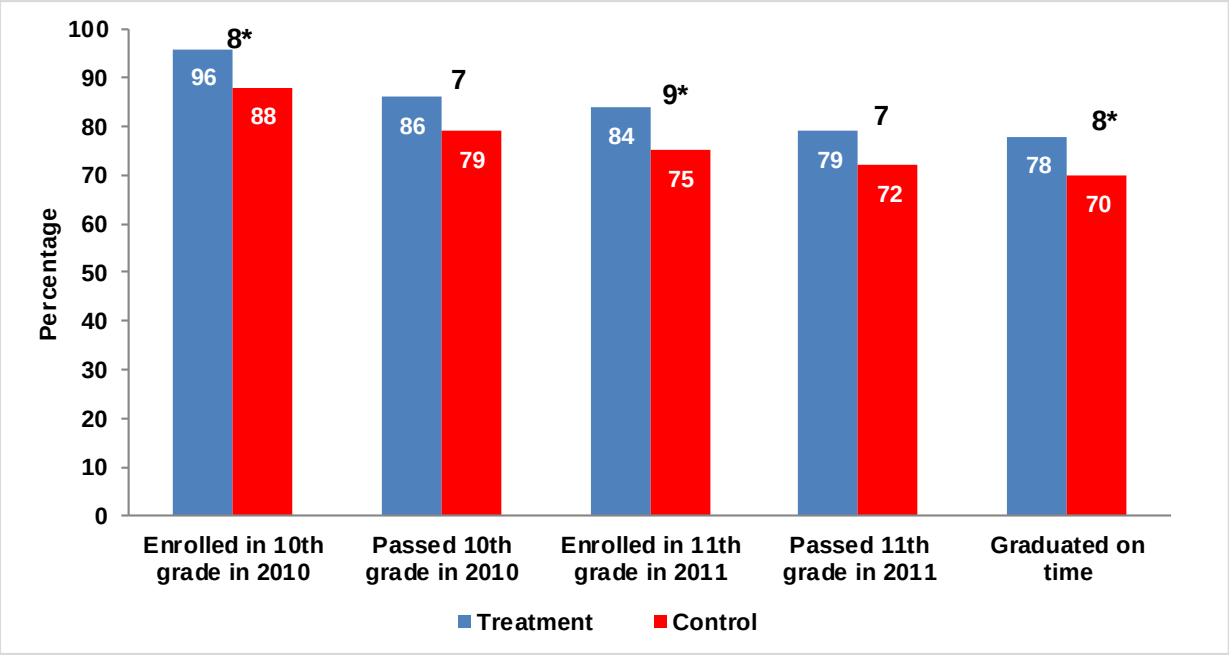
[35]Based on additional statistical tests, we have no reason to suspect that there were systematic treatment-control differences in underreporting household income. Furthermore, students appeared to underreport household income in a consistent way across data sources. Estimates of household income from our follow-up survey were very similar to household income estimates constructed with data from FEPADE's application form.

income. In addition, we present ITT versus TOT impacts on these outcomes, impacts by gender, and additional subgroup analyses.

1. Impacts on educational outcomes

Scholarships in strengthened schools increased enrollment and graduation rates by between 8 and 9 percentage points. Students who received the scholarship offer were 8 percentage points more likely to enroll in 10th grade in 2010, 9 percentage points more likely to enroll in 11th grade in 2011, and 8 percentage points more likely to graduate on time—either in 2011 for general programs or 2012 for technical programs—than their counterparts who were not offered the scholarship (Figure V.1). This finding illustrates that a sizable portion of students enrolled in secondary school as a direct result of the scholarship and progressed in their studies to graduate on schedule. It is important to mention that FOMILENIO scholarships were renewed each year if students passed the grade. The impact estimates reflect the continued assistance of the scholarship throughout 10th, 11th and, in the case of technical programs, 12th grade.

Figure V.1. Impact of scholarships on enrollment, completion, and graduation, by study group



Source: Student follow-up surveys administered in July 2012 and July 2013.

Notes: Graduation on time means graduation from a general program in 2011 or from a technical program in 2012.

Means are regression adjusted using ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income); indicator variables of each program where randomization was conducted were included as covariates to account for random assignment within programs. Means are weighted to account for the different probabilities of assignment to the treatment across programs and for non-response. Some numbers may not add up, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Contextualizing impact findings with in-person interview findings

Principals noted a direct increase in enrollment as a result of FOMILENIO scholarships. In telephone interviews during the post-compact period, the majority of principals at the 17 secondary schools where scholarships were granted said that of all the FOMILENIO investments from 2009 to 2012—including scholarships, improved facilities, and new degree programs—scholarships had the largest direct impact on enrollment rates. Many principals described how the financial support allowed students to start their studies in their institutions, as it offset the costs of transportation, meals, and materials. One principal said, "I can say with certainty that the scholarship motivated kids to continue studying. Before the scholarship, we'd have around 10 to 15 graduates a year. After that, we had more demand. In 2014, we graduated 36 third-year students. [The scholarship] generated much of that increase in enrollment." Another principal said simply, "Without that scholarship several of those kids would not have finished their studies."

Scholarships in strengthened schools increased enrollment, grade completion, and graduation from technical but not general programs. Students who were offered the scholarship were more likely to enroll in technical programs, pass each academic year, and graduate with a technical secondary degree, compared to students not offered one (Table V.6). These sizable impacts—ranging from 10 to 12 percent—are largely responsible for the positive findings discussed above, which are independent of whether students pursued general or technical degree programs. This finding is not surprising, given that the majority of first-year scholarships in 2010 were granted for technical educational programs. In addition, there is suggestive evidence that scholarships disincentivized enrollment, grade completion, and graduation from general programs, although those effects (negative impacts of 3 and 4 percent) are not statistically significant. Overall, these findings confirm an important expectation of the FOMILENIO scholarship program: that offering scholarships (largely) for technical education in the Northern Zone can bolster students' enrollment in, and completion of, technical academic degrees.

Students' actual enrollment behavior compared to their expectations in scholarship applications provides further evidence of the influence of scholarships on students' choice of academic programs. To better understand how the scholarships affected the choice of program, we calculated the percentage of students who enrolled in technical (or general) programs according to which type of program they actually specified when they applied for scholarships. We find that a larger percentage of treatment group students enrolled in the degree program they specified in their scholarship applications than control students. This finding is logical, as we would expect that students awarded a scholarship to pursue a specific degree program would be more likely to enroll in that program, whereas those who did not get the scholarship offer would be more likely to change their mind or decide to enroll in the degree program they prefer. Synthesizing these results, it seems that the offer of the scholarship made students more likely to enroll in technical (or general) programs if they had requested that type of program in their scholarship applications. This finding is a meaningful finding, as it offers further evidence that scholarships for specific degree programs can induce students to enroll in those programs.

Table V.5. Degree program enrollment versus program indicated in scholarship application (percentages)

Characteristics	Treatment group	Control group	Difference
Among students who applied for a scholarship in a technical program			
Enrolled in a technical program	86	66	20
Enrolled in a general program	13	31	-18
Among students who applied for a scholarship in a general program			
Enrolled in a general program	90	68	22
Enrolled in a technical program	10	32	-22
Sample sizes	**421**	**183**	

Source: Application data and follow-up survey.

Note: Unadjusted means and difference are used. No statistical tests were conducted.

Contextualizing impact findings with interview data

According to stakeholders, scholarships incentivized students to enroll in technical programs. In focus groups and interviews, students and teachers noted that the scholarships had a positive impact on enrollment in technical programs. In interviews during 2011, students in technical programs—particularly those enrolled in the alternative tourism program—reported that they selected their program based solely on the availability of FOMILENIO scholarships. One tourism student said, "We were hoping to study something else, but due to the scholarship, we signed up." One principal expressed concern about the large role that scholarships played in students' decisions to enroll in technical programs. The principal said, "We make students aware they should not study for the scholarship money only. They need to actually like the program."

Scholarships in strengthened schools had no effect on test scores. Students who received the scholarship offer were just as likely to pass the PAES and have similar PAES scores as students who did not get a scholarship offer (Table V.6). This finding is unsurprising, given that scholarships are need based as opposed to merit based.

Scholarships in strengthened schools helped incentivize students to enroll in technical or vocational post-secondary education but not in university studies. Students offered scholarships were less likely to be enrolled in a university in 2013 than those not offered scholarships (Table V.7). However, students offered a secondary scholarship were 12 percentage points more likely to be enrolled in a technical or vocational post-secondary institution than those in the control group (19 percent versus 6 percent, respectively; Table V.7). This finding likely reflects the role of secondary scholarships in motivating students to pursue technical studies (discussed above) but also likely reflects the influence of the MEGATEC program in Chalatenango (see Chapter III), which incentivized students with technical secondary degrees in alternative tourism and civil engineering to earn a post-secondary degree at ITCHA with only one additional year of study. In addition, ITCHA offers several scholarships for post-secondary education, which also helped incentivize students to enroll in vocational or technical post-secondary programs.

Table V.6. Impact of FOMILENIO scholarships on students' educational outcomes (percentages, unless otherwise indicated)

Outcome	Treatment group adjusted mean	Control group mean	Adjusted difference	*p*-value
All programs				
Enrolled in 10th grade in 2010	96	88	8*	<0.01
Passed 10th grade in 2010	86	79	7	0.05
Enrolled in 11th grade in 2011	84	75	9*	0.02
Passed 11th grade in 2011	79	72	7	0.07
Graduated on time	78	70	8*	0.05
Graduated by 2012	81	76	4	0.26
Ever passed PAES	55	52	4	0.43
Global score for ever passed PAES (average)	559	563	-4.4	0.78
General programs				
Enrolled in 10th grade in 2010	21	25	-4	0.22
Passed 10th grade in 2010	18	22	-3	0.37
Enrolled in 11th grade in 2011	21	25	-3	0.34
Passed 11th grade in 2011	21	24	-3	0.39
Graduated in 2011	20	24	-3	0.37
Graduated in 2012	2	6	-4	0.08
Technical programs				
Enrolled in 10th grade in 2010	75	63	12*	<0.01
Passed 10th grade in 2010	67	57	10*	0.02
Enrolled in 11th grade in 2011	62	50	12*	0.01
Passed 11th grade in 2011	59	49	10*	0.03
Enrolled in 12th grade in 2012	58	48	10*	0.03
Passed 12th grade in 2012	58	48	10*	0.03
Graduated in 2012	58	47	11*	0.02
Sample sizes	**421**	**183**		

Source: Student follow-up surveys administered in July 2012 and July 2013.

Note: Means are regression adjusted using ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income) and for the programs of study in which randomization was conducted. Data are weighted to account for differential assignment ratio and non-response across programs of study. Some numbers may not add up, due to rounding.

PAES = MINED's Learning and Skills Test for Secondary Education Graduates.

* Impact estimate is statistically significant at the .05 level.

2. Impacts on employment, income, and personal consumption

FOMILENIO scholarships in strengthened schools decreased employment rates and the number of hours worked likely due to attending vocational post-secondary education. In 2013, when most students in the study had completed their secondary education, those who had been offered the scholarships were 9 percentage points less likely to be employed than

students in the control group. Furthermore, they reported working an average of 4.3 fewer hours than students in the control group (Table V.7). Although we find that students offered the scholarship were employed at lower rates than control students, we also find that the former were more likely to attend vocational post-secondary education. Thus, it is likely that the students were not employed because they were in school. When we compare the percent of students that are either employed or enrolled in any post-secondary education in 2013, we do not find statistically significant differences between the treatment group (61 percent) and the control group (63 percent).

Table V.7. Impact of FOMILENIO scholarships on students' employment and income (percentages, unless otherwise indicated)

Outcome	Treatment	Control	Difference	*p*-value
Post-secondary education				
Enrolled in university in 2013	12	17	-5	0.10
Enrolled in vocational or higher technical education in 2013	19	6	12*	<0.01
Employment				
Employed in 2012	27	27	0	0.95
Employed full time in 2012	11	14	-3	0.28
Hours worked weekly in 2012 (hours)	7.2	8.8	-1.7	0.26
Employed in 2013	34	43	-9*	0.04
Employed full time in 2013	19	26	-7	0.08
Hours worked weekly in 2013 (hours)	12.5	16.8	-4.3*	0.03
Employed or enrolled in any post-secondary in 2013	61	63	2	0.62
Income and personal consumption				
Income from main job in 2013 (in USD)	306.9	421.7	-114.7	0.14
Income from secondary work activities in 2013 (in USD)	78.9	92.8	-13.9	0.60
Income from other sources in 2013 (in USD)	644.4	619.3	25.1	0.78
Student total annual income in 2013 (in USD)	1,032	1,132	-100	0.36
Student annual consumption in 2013 (in USD)	510	532	-22	0.67
Sample sizes	**421**	**183**		

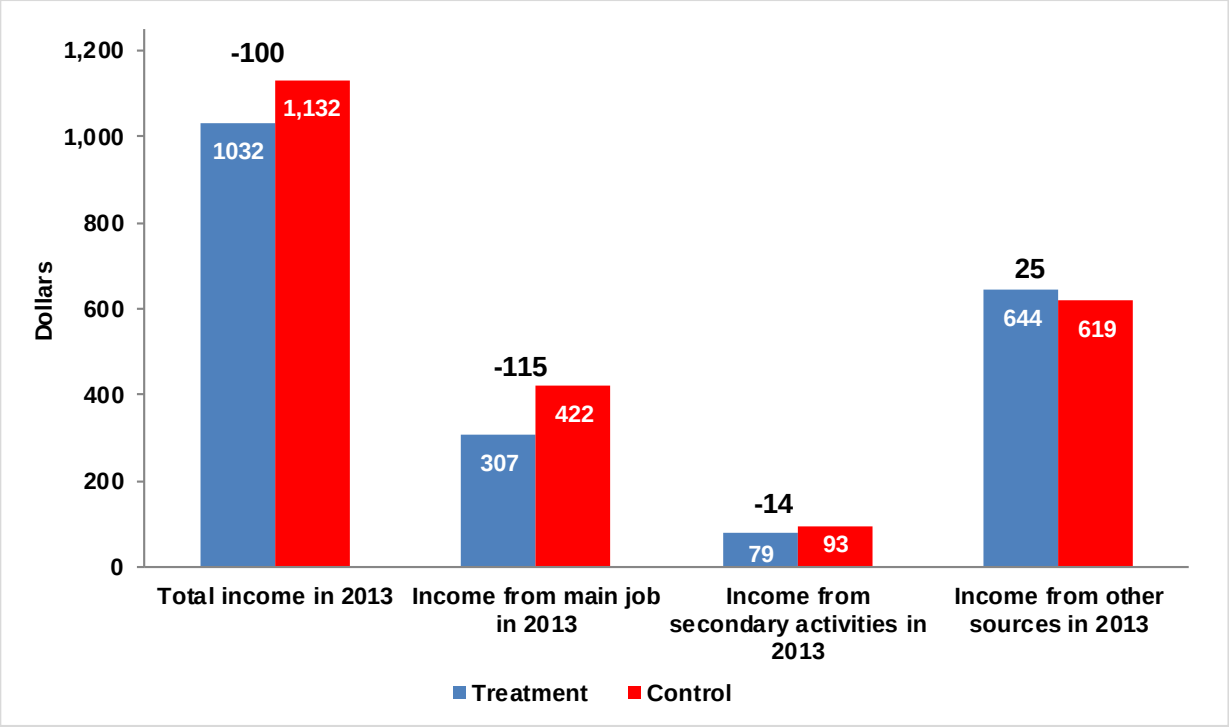
Source: Student follow-up surveys administered in July 2012 and July 2013.

Note: Means are regression adjusted using ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income) and the study design. Data are weighted to account for differential assignment ratio and non-response across strata. Some numbers may not add up, due to rounding. Income from secondary work activities includes labor income from second and supplemental jobs; income from other sources includes scholarships, remittances, allowances, and other income unrelated to work.

* Impact estimate is statistically significant at the .05 level.

We find no impact of FOMILENIO scholarships in strengthened schools on income and personal consumption. Despite the negative impact of scholarships on employment rates and hours worked, we find no statistically significant effects of the offer of a scholarship on income and consumption (Table V.7 and Figure V.2). Treatment group members' annual average incomes from their main jobs were lower than those of the comparison group, which is consistent with the lower employment rates discussed above. However, because these differences are not statistically significant, we cannot conclude that the scholarship offer had a negative impact on students' income.

Figure V.2. Impact of FOMILENIO scholarship on income



Source: Student follow-up surveys administered in July 2012 and July 2013.

Note: Means are regression adjusted using ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income) and to account for random assignment within program of study. Data are weighted to account for differential assignment ratio and non-response across programs of study. Some numbers may not add up, due to rounding. Income from secondary work activities includes labor income from second and supplemental jobs; income from other sources includes scholarships, remittances, allowances, and other income unrelated to work.

*Treatment-control difference statistically different from zero at the .05 level.

3. Comparison of intent-to-treat and treatment-on-the-treated impact estimates

The impact estimates discussed in the previous section compared treatment and control groups regardless of whether students actually received FOMILENIO scholarships—that is, that section presents an ITT analysis. However, in our analysis sample, 77 percent of the students who were offered scholarships accepted them and received the first payment (and thus are classified as participants; Table V.3). Because MCC, MINED, and FOMILENIO are also interested in understanding the effect of scholarships on students who actually participated in the

program, we present TOT results in this section. First, we compare the baseline characteristics of participants and non-participants in the treatment group (Table V.8). This comparison is important because participants already differed from non-participants in their decision to accept a scholarship. Thus, it is important to understand if participants and non-participants also differed on other observable characteristics.

On average, scholarship participants were younger, had higher incomes, and were more likely to live in urban areas than students who were offered a scholarship but did not accept it (non-participants). On average, participants were about half a year younger than non-participants; this difference is statistically significant. In addition, participants had higher average baseline annual household incomes than non-participants (a difference of $367) and higher annual expenses (a difference of $346); both differences are statistically significant. Finally, a higher percentage of participants than non-participants reported living in urban areas; this difference is statistically significant at the 5 percent level. Non-participants' lower household incomes and lower likelihood of living in urban areas relative to scholarship recipients suggest that non-participants might have had more difficulty in covering school expenses—particularly travel expenses—than scholarship recipients. If so, these findings suggest an unintended consequence of the scholarship offer: a proportion of very poor applicants may have rejected a scholarship because it did not fully fund their studies and they may have had no alternative funding sources. This finding was first documented in a 2010 follow-up survey of 27 treatment group members who rejected the scholarship; respondents cited the small scholarship amounts as insufficient to fully cover education costs as the most common reason for rejection (Zanin 2010).

Table V.8. Baseline characteristics of participants and non-participants in the treatment group (averages, unless otherwise indicated)

	Participant group	Non-participant group	Difference	*p*-value
Age (years)	15.9	16.4	-0.5*	0.01
Female (%)	59	66	-7	0.22
Annual household income (in USD)	1,916	1,548	367*	0.00
Household size	5.5	5.9	-0.3	0.21
Grades	7.8	7.7	0.2	0.16
Annual expenditures (in USD)	1,941	1,595	346*	0.00
Urban (%)	19	7	12*	0.00
Sample sizes	**325**	**96**		

Source: Data from scholarship application form (FEPADE's records).

Note: Means are regression adjusted using ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income) and for random assignment within program of study. Data are weighted to account for differential assignment ratio and non-response across programs of study.

FEPADE = Business Foundation for Educational Development or Fundación Empresarial para el Desarrollo Educativo.

* Impact estimate is statistically significant at the .05 level.

We obtained a similar impact of the scholarships in strengthened schools on education outcomes for both the ITT and TOT impact estimates and, as expected, impacts for the TOT estimates were larger. As mentioned before, ITT estimates can be interpreted as the effect of the offer of the scholarship, regardless of whether the scholarship was accepted; TOT estimates can be interpreted as the effect of scholarships on those who accepted them. Using either approach, we find positive and significant effects of the scholarships on most educational outcomes, including enrollment, grade completion, and graduation (Table V.9). Under a TOT approach, however, impacts were larger than under an ITT approach because they are based on the outcomes of only those students who accepted FOMILENIO scholarships. For example, scholarship recipients were 10 percentage points more likely to graduate on time compared to students who did not receive the scholarship (TOT). This estimate is larger than the 8 percentage point impact estimate for all students in the treatment group (ITT). Similarly, positive impacts on secondary technical enrollment, grade completion, and graduation were larger with a TOT approach, ranging from 13 to 16 percentage points, as opposed to between 10 and 12 percentage points under an ITT approach.

Table V.9. Comparison of ITT and TOT impact estimates of FOMILENIO-funded scholarships (percentages, unless otherwise indicated)

Outcome	ITT impact	TOT impact
All programs		
Enrolled in 10th grade in 2010	8*	10*
Passed 10th grade in 2010	7	9*
Enrolled in 11th grade in 2011	9*	11*
Passed 11th grade in 2011	7	9
Graduated on time	8*	10*
Graduated by 2012	4	6
General programs		
Enrolled in 10th grade in 2010	-4	-6
Passed 10th grade in 2010	-3	-4
Enrolled in 11th grade in 2011	-3	-4
Passed 11th grade in 2011	-3	-4
Graduated in 2011	-3	-4
Graduated in 2012	-4	-5
Technical programs		
Enrolled in 10th grade in 2010	12*	16*
Passed 10th grade in 2010	10*	13*
Enrolled in 11th grade in 2011	12*	16*
Passed 11th grade in 2011	10*	13*
Enrolled in 12th grade in 2012	10*	13*
Passed 12th grade in 2012	10*	13*
Graduated in 2012	11*	14*

Source: Student follow-up surveys administered in July 2012 and July 2013.

Note: ITT impacts use ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income) and the study design. TOT impacts use an instrumental variable specification where treatment is used as an instrument for participation and we account for the same baseline characteristics as the ITT model. In both estimations, results are weighted to account for differential assignment ratio and non-response across programs of study (strata).

*Treatment-control difference statistically different from zero at the 0.05 level.

Positive impacts on post-secondary technical enrollment and negative impacts on employment likely due to enrollment in vocation post-secondary education were in the same direction but were larger with a TOT approach. In 2013, students who received scholarships were 16 percentage points more likely to be enrolled in a post-secondary technical school and 12 percentage points less likely to be employed than students who did not get scholarships; these impacts were larger than the ITT impacts for the same outcomes (that is, 12 and 9 percent, respectively). This finding further corroborates the sizable effect of scholarships and linked MEGATEC programs on students' decisions to pursue a post-secondary technical degree.

Table V.10. Comparison of ITT and TOT impact estimates of FOMILENIO-funded scholarships (percentages, unless otherwise indicated)

Outcome	ITT impact	TOT impact
Post-secondary programs		
Enrolled in university in 2013	-5	-7
Enrolled in vocational school in 2013	12*	16*
Employment		
Employed in 2012	0	0
Employed full time in 2012	-3	-4
Hours worked weekly (average) in 2012	-1.7	-2.2
Employed in 2013	-9*	-12*
Employed full time in 2013	-7	-9
Hours worked weekly (average) in 2013	-4.3*	-5.7*
Income and consumption		
Income from main job in 2012 (in USD)	-51.7	-68.3
Income from secondary activities in 2012 (in USD)	2.6	3.4
Income from other sources in 2012 (in USD)	159.5*	211.0*
Student total annual income in 2012 (in USD)	110	146*
Annual consumption in 2012 (in USD)	21	28
Income from main job in 2013 (in USD)	-114.7	-151.4
Income from secondary activities in 2013 (in USD)	-13.9	-18.4
Income from other sources in 2013 (in USD)	25.1	33.3
Student total annual income (in USD) in 2013	-100	-132
Annual consumption (in USD) in 2013	-22	-29

Source: Student follow-up surveys administered in July 2012 and July 2013.

Note: ITT impacts use ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income) and the study design. TOT impacts use an instrumental variable specification where treatment is used as an instrument for participation and we account for the same baseline characteristics as the ITT model. In both estimations results are weighted to account for differential assignment ratio and non-response across programs of study. Income from secondary work activities includes labor income from second and supplemental jobs; income from other sources includes scholarships, remittances, allowances, and other income unrelated to work.

*Treatment-control difference statistically different from zero at the 0.05 level.

The TOT impact estimates showed a positive effect of the scholarships on students' total incomes of around $150 per year. In 2012, students who received scholarships reported a higher total income, on average, than those who did not receive scholarships. This difference is likely linked to scholarship recipients' income from the scholarship, reflected in income from other sources. However, by 2013, there were no statistically significant differences in income or consumption between scholarship recipients and non-recipients.

4. Gender subgroup analysis

In this section, we assess whether the offer of the scholarship had a different impact on girls than boys. Figure V.3 and Tables V.11 and V.12 present a summary of these results, which we describe below.

The scholarships' impact on enrollment, grade completion, and graduation was larger among boys. As illustrated in Figure V.3, boys offered scholarships in the strengthened schools were 17 percentage points more likely to enroll in secondary school and graduate on time, whereas girls who were offered the scholarship in the strengthened schools had very similar education outcomes to girls who did not receive a scholarship offer. The offer of the scholarship seems to have motivated a substantial portion of boys to enroll in secondary school who otherwise would not have done so. In contrast, girls in the study sample appeared to enroll in secondary school at relatively high rates, regardless of the scholarship offer. It is worth noting that the scholarship offer helped boost boys' enrollment and graduation rates to levels that were comparable with girls' rates. In other words, FOMILENIO scholarships closed a substantial gender gap in secondary school enrollment, at least among students in the study. This gender gap is present in the 40 schools in the Northern Zone included in the evaluation of secondary school improvements. More girls than boys enrolled in secondary education from 2006 to 2010.[36]

Interpreting impact findings with qualitative data

Scholarships may reduce boys' propensity to migrate or find a job. Several stakeholders noted that scholarships serve as a stronger motivator for boys than girls because they reduce boys' strong incentives to emigrate or find low-skilled work to provide for their families. A FOMILENIO representative said, "Scholarships were a lot better for the boys—they are the ones who have to work. A family isn't going to send their son to school unless they get something in return—like a scholarship." One principal corroborated this account, saying, "The scholarships motivated boys more … with the scholarship, boys started to move back into traditional sectors like engineering and agroindustry." Another principal suggested that girls do not face similar pressures to drop out before or during secondary school, noting, "The girls have their parents' support to keep studying … boys tend to leave for the U.S."

There is no conclusive evidence that the scholarships in strengthened schools dissuaded some portion of girls from dropping out or incentivized them to study in technical programs over general programs. Nearly identical rates of enrollment, grade completion, and graduation among girls in treatment and control groups suggest no real effect of the scholarship offer on girls' decision to enroll in, remain in, or graduate from secondary school. However, there is suggestive evidence that the scholarship motivated girls to enroll in technical programs

[36] See Figure A.1 in "Interim Results of the Impact Evaluation for the Secondary School Strengthening Program." Submitted to MCC by Larissa Campuzano, Seth Morgan, and Randall Blair on July 8, 2012.

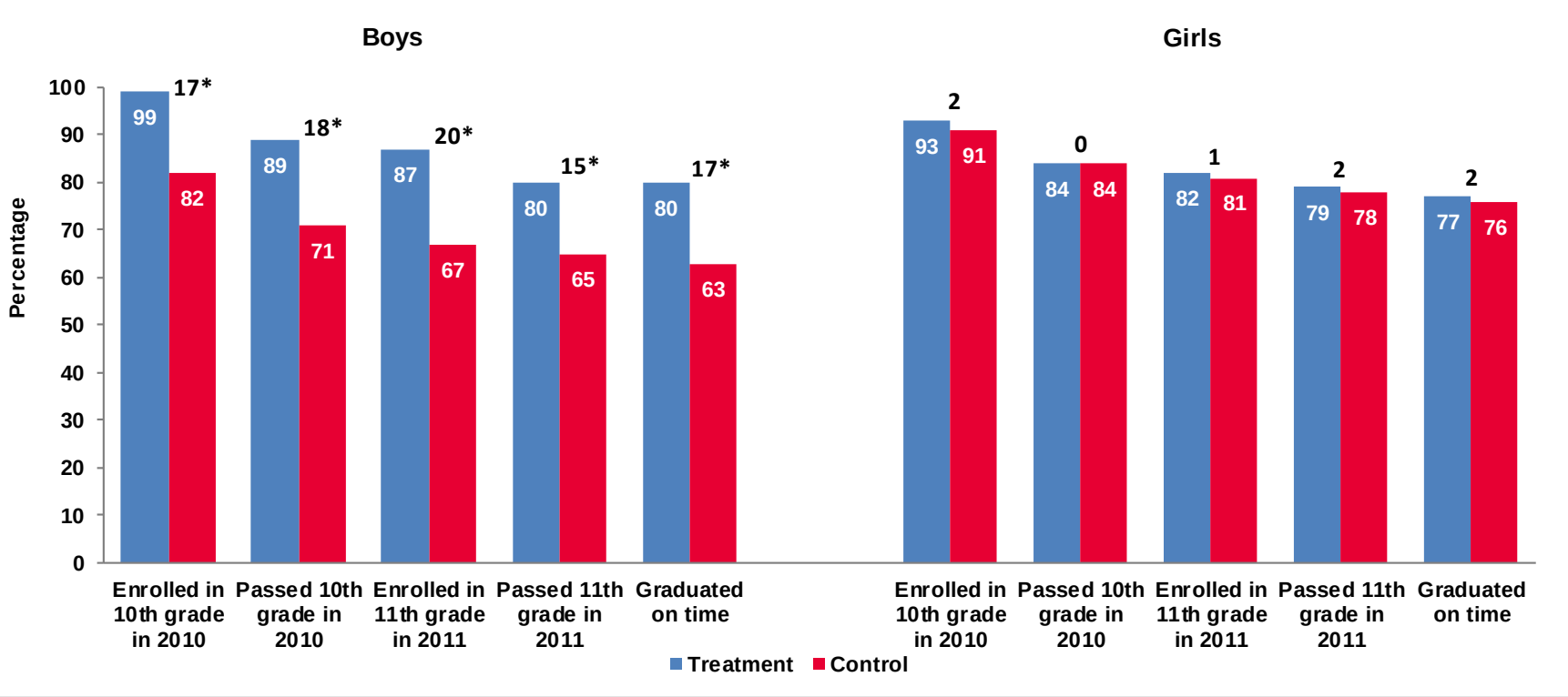
over general programs, as illustrated by negative impacts in educational outcomes for general programs and positive impacts in the same outcomes for technical programs among girls. Because none of these impacts is statistically significant, we cannot conclude that scholarships primarily for technical education in fact incentivized girls to enroll in technical programs, including accounting, alternative tourism, business administration, and civil engineering.

Scholarships in strengthened schools enabled boys to pursue secondary technical programs. Boys who got the scholarship offer were 19 percentage points more likely to enroll in—and 14 percentage points more likely to graduate from—technical programs than boys not offered scholarships. However, boys who got the scholarship offer were no more likely to pursue general programs than boys who did not get the offer. In part, this finding likely reflects boys' preference for technical programs in El Salvador. The scholarship motivated a nontrivial portion of boys to study secondary school that likely would not have continued studying otherwise, and the majority of these boys selected technical education programs.

Boys' higher relative income in 2012 likely reflects the fact that they were still receiving scholarship payments during their last year of technical secondary education. We do not find gender-related differences in the scholarships' impact on employment. However, we find that in 2012, scholarships had a positive and statistically significant impact on boys' total income ($266), whereas we find no impact for girls. This difference could be related to the positive impact we found on 12th grade enrollment for boys (but not for girls) shown in Table IV.11. More boys in the treatment group enrolled in the 12th grade—combined with the fact that 12th graders in the treatment group were still receiving FOMILENIO scholarship payments at followup—could explain the positive impact on income. However, scholarships had no impact on income for boys or girls in 2013, after their scheduled secondary school graduation date.

Scholarships helped boys to continue on to technical post-secondary education. For both genders, the impact of scholarships on enrollment in technical post-secondary programs was sizable and statistically significant. This supports the conclusion that both boys and girls were incentivized to continue their technical education to the post-secondary level as a result of a scholarship offer in the strengthened schools that were also linked to degree programs at ITCHA (and likely the prospect of a post-secondary scholarship as well). However, this impact was larger for boys than girls by a sizable margin of 12 percentage points (Table V.12). This finding implies that secondary scholarships can play an important role in boys' post-secondary education, as their positive effects on secondary education outcomes continue into post-secondary school.

Figure V.3. Scholarship impact on education outcomes, by gender



Source: Student follow-up surveys administered in July 2012 and July 2013.

Note: "Graduated on time" is defined as graduated from a technical program in 2012 or from a general program in 2011. Means are regression adjusted using ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income) and for random assignment within the program of study. Data are weighted to account for differential assignment ratio and non-response across programs of study.

*Treatment-control difference statistically different from zero at the 0.05 level.

Table V.11. Impacts of FOMILENIO scholarships on secondary educational outcomes, by gender (percentages, unless otherwise indicated)

Outcome	Impact for boys	Impact for girls	Difference
All programs			
Enrolled in 10th grade in 2010	17*	2	15*
Passed 10th grade in 2010	18*	0	18*
Enrolled in 11th grade in 2011	20*	1	18*
Passed 11th grade in 2011	15*	2	13
Graduated on time	17	2	15
Graduated by 2012	9	1	-9
General programs			
Enrolled in 10th grade in 2010	-2	-6	3
Passed 10th grade in 2010	1	-6	7
Enrolled in 11th grade in 2011	2	-7	10
Passed 11th grade in 2011	2	-6	8
Graduated in 2011	2	-7	8
Graduated in 2012	-7	-1	-6
Technical programs			
Enrolled in 10th grade in 2010	19*	8	11
Passed 10th grade in 2010	17*	5	11
Enrolled in 11th grade in 2011	17*	9	9
Passed 11th grade in 2011	13*	7	6
Enrolled in 12th grade in 2012	14*	6	8
Passed 12th grade in 2012	14*	6	8
Graduated in 2012	14*	8	6

Source: Student follow-up surveys administered in July 2012 and July 2013.

Note: Impacts use ordinary least squares to account for the stratification that was part of the study design; means are weighted to account for differential assignment ratio and non-response across strata. Some numbers may not add up, due to rounding.

*Treatment-control difference statistically different from zero at the 0.05 level.

Table V.12. Impacts of FOMILENIO scholarships on post-secondary outcomes, by gender (percentages, unless otherwise indicated)

Outcome	Impact for boys	Impact for girls	Difference
Post-secondary education			
Enrolled in a university in 2013	-7	-4	-3
Enrolled in vocational post-secondary in 2013	20*	7*	12*
Employment			
Employed in 2012	0	0	0
Employed full time in 2012	0	-5	5
Hours worked weekly (average) in 2012	-0.5	-2.5	2.0
Employed in 2013	-12	-7	-5
Employed full time in 2013	-7	-7	0
Hours worked weekly (average) in 2013	-5.6	-3.4	-2.2
Income and personal consumption			
Income from main job in 2012 (in USD)	-9.9	-80.1	70.2
Income from secondary work activities in 2012 (in USD)	-17.6	16.3	-33.8
Income from other sources in 2012 (in USD)	293.9*	68.2	225.7*
Student annual total income in 2012 (in USD)	266*	4	262*
Annual personal consumption in 2012 (in USD)	65	-9	74
Income from main job in 2013 (in USD)	-2.4	-190.8	188.5
Income from secondary work activities in 2013 (in USD)	-2.8	-21.5	18.7
Income from other sources in 2013 (in USD)	14.6	32.3	-17.7
Student annual total income (in USD) in 2013	17	-179	197
Annual personal consumption (in USD) in 2013	106	-109	214*

Source: Student follow-up surveys administered in July 2012 and July 2013.

Note: Means are regression adjusted using ordinary least squares to account for baseline characteristics (age, female, grades, urban, and household income) and to account for random assignment within the program of study. Data are weighted to account for differential assignment ratio and non-response across programs of study. Some numbers may not add up, due to rounding. Income from secondary work activities includes labor income from second and supplemental jobs; income from other sources includes scholarships, remittances, allowances, and other income unrelated to work.

*Treatment-control difference statistically different from zero at the 0.05 level.

D. Summary of findings

The FOMILENIO scholarships program in strengthened schools provided scholarships to students with economic need. FOMILENIO offered scholarships in 17 of the 20 schools it strengthened. Scholarships for secondary education were for $400 awarded for the first year and could be renewed up to two years. From 2009 to 2012, FOMILENIO financed a total of 3,409 secondary school scholarships; this number exceeded initial compact targets. FEPADE administered first- and second-year scholarships, and MINED administered second- and third-year scholarships. Students expressed strong satisfaction with FOMILENIO scholarships, but some noted that scholarships did not cover their education expenses. *In addition,* disbursement delays hampered second- and third-year students' receipt of scholarships.

FOMILENIO scholarships in the FOMILENIO strengthened schools had a positive impact on enrollment, continuation, and graduation from secondary school. Students offered scholarships for the strengthened schools were 8 percentage points more likely both to enroll in secondary school and to earn a secondary degree than students not offered scholarships. Another important finding is that because they were awarded primarily for technical programs, scholarships influenced students to choose technical over general degree programs. These findings validate the fundamental logic of the scholarship program, in which modest scholarships can incentivize needy students to enroll in and complete technical degree programs. However, because the scholarships were offered only in schools that also were strengthened with infrastructure and curriculum improvements, the effects we find reflect both the offer of the scholarship and strengthening of the schools.

Scholarships' positive effects were concentrated among boys. Scholarships played a large role in motivating boys to enroll in and complete secondary school but no clear role in girls' education outcomes (statistically significant impacts of between 14 and 20 percentage points for boys' key educational outcomes versus no statistically significant impacts for girls). This effect was not foreseen in the program's initial logic model, which envisioned comparable effects of scholarships for both boys and girls.

Scholarships had a negative effect on students' employment but a positive effect on post-secondary technical education in 2013. Students offered scholarships were less likely to be employed than those not offered scholarships (34 percent versus 43 percent; statistically significant at the 5 percent level). Furthermore, students offered the scholarship worked fewer hours per week than those not offered scholarships. This negative effect on employment is likely related to the scholarships' positive and statistically significant effect on enrollment in post-secondary technical education (19 percent versus 6 percent among students not offered scholarships; statistically significant at the 5 percent level). Thus, we can conclude that the scholarships played some role in motivating students to forego immediate entry into the labor force in favor of pursuing a post-secondary degree. In part, this fulfils the program's objective of increased enrollment in post-secondary technical education. However, one year following students' projected graduation from secondary school, it does not appear that student outcomes have fulfilled the program's goals of increased employment and income among graduates. Perhaps, however, these goals could be realized in a longer time-frame—for example three or four years following secondary school graduation.

When we analyze the effects of FOMILENIO scholarships on students who actually received at least one scholarship payment, we find similar but larger effects than in our analysis of students who simply received the scholarship offer. Students who received (but did not necessarily accept) the offer of a scholarships were 11 percentage points more likely to enroll in 11th grade; 10 percentage points more likely to complete 11th grade; and 13 percentage points more likely to enroll in, complete, and pass 12th grade than those students who did not receive a FOMILENIO scholarship. In contrast, students who accepted scholarships were 14 percentage points more likely to graduate with a technical degree than those who did not receive one and 16 percentage points more likely to enroll in a post-secondary technical-vocational education institution. However, we also find that scholarship recipients were 12 percentage points less likely to be employed than non-recipients and worked about 5.7 fewer hours per week. In sum, we find that the scholarships' positive effects on secondary enrollment and

graduation, positive effects on post-secondary technical enrollment, and negative effects on employment are larger among scholarship recipients—to the extent that one in 10 scholarship recipients likely attended and completed secondary school as a direct result of the scholarship.

E. Limitations

As in the case of any evaluation, these impact estimates reflect the characteristics of the study population and the assistance provided. Because the study population comprised secondary school-age students residing in specific municipalities who expressed an interest in scholarships in late 2009 (and met needs-based and academic requirements for these scholarships), these results cannot be generalized to the entire population of secondary school-age students in El Salvador's Northern Zone, or even the entire population of FOMILENIO scholarship recipients from 2009 to 2012. The impact of offering a scholarship similar to the FOMILENIO scholarship to all secondary school-age students in the Northern Zone—or even all secondary school-age students in the Northern Zone who received scholarships—could be similar, smaller, or larger than the impact detected among the study population.

In addition, the scholarship intervention was implemented at the same time as other FOMILENIO program interventions, particularly the secondary school strengthening program. Under this strengthening intervention, all 17 schools participating in the scholarship intervention received infrastructure improvements, and most secondary school teachers and administrators at these schools received teacher training. These improvements most likely would affect students' educational outcomes independently of the effect of the scholarship intervention. However, the impacts presented in this report cannot be separated statistically from the effects of secondary school improvements.

In addition, this evaluation's follow-up period of one year is a relatively short time period, particularly given the tendency of a portion of students to continue on to post-secondary studies. In future studies of technical education interventions of this kind, it may be desirable to assess employment at least two years after post-secondary graduation to allow students sufficient time to finish their post-secondary studies and find gainful employment.

VI. FINDINGS FOR THE ITCHA/MEGATEC INTERVENTION

This chapter describes the results of our evaluation of the ITCHA/MEGATEC component of the Formal Technical Education Subactivity. Section A presents our findings on the implementation of the ITCHA/MEGATEC intervention, based largely on stakeholder interviews. Section B describes our findings on trends in ITCHA enrollment during the intervention and postcompact period, based largely on a review of administrative data. The remaining sections present results from follow-up surveys with former ITCHA students: Section C provides a description of ITCHA students; Section D presents students' education and labor market outcomes; Section E presents our subgroup analyses; and Section F discusses students' satisfaction with the quality of ITCHA instruction and recommendations to improve the institute.

A. Implementation findings

There were four major aspects of the ITCHA/MEGATEC intervention: (1) designing and implementing MEGATEC degree programs, (2) contracting and training MEGATEC teachers, (3) constructing a new ITCHA facility, and (4) administering scholarships to ITCHA post-secondary students and secondary students in linked MEGATEC programs. The implementation of each aspect is discussed below.

1. Designing and implementing the MEGATEC degree programs

FOMILENIO and CIDE staff collaborated to design the new degree programs. In 2008, FOMILENIO contracted CIDE to analyze the labor market demands in the Northern Zone and develop new MEGATEC degree programs to meet these demands. As instructed by FOMILENIO, CIDE staff focused this analysis on potential job markets related to interventions financed under the MCC-El Salvador compact, including the Productive Development Project and the Connectivity Project. Based on this analysis, CIDE recommended six programs with strong employment potential, either in the form of self-employment or wage labor. After discussions between MINED, CIDE, and FOMILENIO, MINED chose two new degrees—civil engineering and alternative tourism—to be developed as MEGATEC programs in ITCHA. According to MINED and FOMILENIO, the civil engineering program was chosen due to the proximity of road construction related to the Connectivity Project, and the alternative tourism program was chosen because the Northern Zone—particularly the department of Chalatenango—had several natural and historical locales that were conducive to national and international tourism.

CIDE led curriculum development for the new MEGATEC degrees. In 2009, CIDE held three-day workshops with key stakeholders—including representatives from the private sector—to determine which competencies were needed in each program. Next, CIDE analyzed and proposed curricula for these competencies and held additional workshops with participants with all levels of expertise to develop and evaluate teaching and training plans. Key players in this process were ITCHA's education council[37] (known

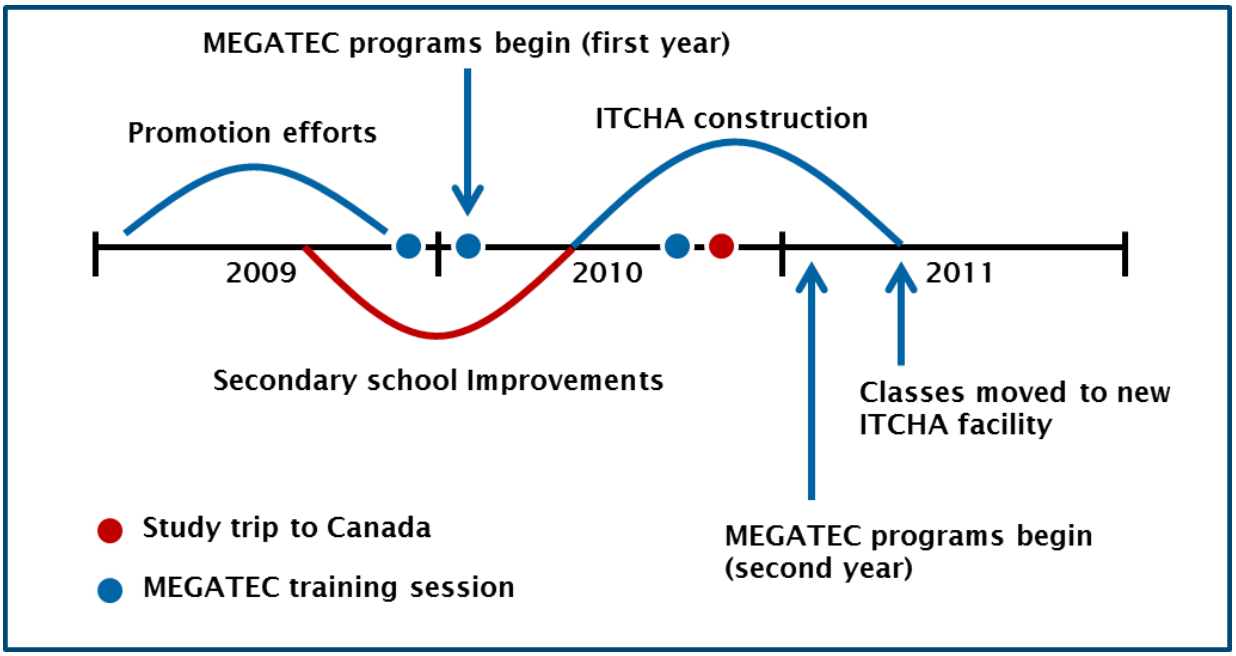
[37] Composed of teachers and parents, each school's education council (CDE) designates the use of the school's resources, including investments in teaching materials, computers, and other technologies. The CDE is analogous to parent-teacher organizations (PTOs) in the United States.

as CDE for its initials in Spanish), as well as teachers and MINED representatives. The final MEGATEC curriculum, finished in 2009, included a full set of modules for secondary and post-secondary technical degrees in civil engineering and alternative tourism.

Stakeholders selected four secondary schools in Chalatenango to serve as linked MEGATEC schools. A key factor for incorporating ITCHA into the MEGATEC model was the linkage with nearby secondary schools. Under the MEGATEC model, four secondary schools near ITCHA would offer a technical secondary school degree in alternative tourism or civil engineering. These "linked" schools would provide ITCHA with trained students who could forego the first year of post-secondary technical education and enroll directly in the second year of ITCHA's MEGATEC programs. MINED, CIDE, and FOMILENIO determined that two secondary schools, the La Palma National Institute and the San Ignacio National Institute, would offer the MEGATEC alternative tourism degree. Similarly, two secondary schools, the Benjamín Estrada Valiente National Institute and the Aguilares National Institute, would offer the civil engineering MEGATEC degree. These schools were selected due to their geographic proximity to ITCHA and their potential for employment related to the two new degree programs. For example, the technical schools chosen for the alternative tourism program—La Palma and San Ignacio—were located in one of the areas in the Northern Zone with the most potential for eco-tourism.

Stakeholders widely promoted the MEGATEC degrees. In 2009, FEPADE staff visited primary schools in the region to promote the FOMILENIO scholarship program and the new MEGATEC degree options (Figure VI.1). ITCHA personnel also promoted the new programs through existing parent and student networks, and FOMILENIO financed radio ads and promotional materials to increase student interest in the two new technical programs available at ITCHA and its linked secondary schools. Owing in part to this outreach, 2010 enrollment in engineering and tourism programs exceeded 150 students in linked secondary schools and reached nearly 100 students at ITCHA.

Figure VI.1. Time line for ITCHA construction and MEGATEC training



New MEGATEC programs blended theory and practice. Starting in early 2010, newly trained teachers began using the new alternative tourism and engineering curricula at ITCHA and its linked schools (Figure VI.1). Similar to other technical degree programs implemented by MINED, the new degree programs featured discrete modules designed to impart the curricula's core competencies. Each module could last from one to nine weeks, depending on the number and content of the lessons and activities. Modules featured didactic components, which students would cover in class, as well as hands-on practice, which students would often complete in in-school labs or off school grounds, alone or in groups. Following the practice, students would often complete a final presentation or project that synthesized what they had learned. For example, for the Land Surveying with Digital Equipment module in the civil engineering curriculum, students would first learn about land surveying techniques and equipment in class and then practice using surveying equipment in groups. For their final grade on the module, students would develop a manual with step-by-step instructions on how to use surveying equipment. Modules were scheduled according to the academic year, and students would progress through the modules one by one, only starting the next module after completing the previous one.

Introducing the MEGATEC programs included adopting a new approach to student assessment. CIDE provided ITCHA and secondary school teachers with standardized guidance to assess students' achievement on each competency. The new competency-based technical curriculum had three evaluation components: formative, summative, and synthesis. Formative evaluation is preliminary: students would receive early feedback on their execution of key activities, but no grades. In their feedback, teachers would diagnose the student's knowledge and attempt to fill knowledge gaps. Next, teachers would give students summative grades based on their performance on a series of discrete activities, including quizzes and group projects. At the end of each module, students would complete a final project (or a synthesis activity) to tie together all

the module's material—often an activity, presentation, or group project with a tangible set of deliverables. Competencies would be graded based on a 10-point scale.

Teachers and students expressed some difficulties with grading under the competency-based approach. In follow-up interviews, secondary school teachers noted that their biggest difficulty transitioning to the new competency-based system was evaluating students' final projects in an objective way. In the past, teachers could simply assign students a grade based on an exam, and they had to practice evaluating projects, presentations and activities before they grew confident in their grading scheme. Even after several years of implementation in 2015, MEGATEC students complained about what they called a lack of objectivity in the grades teachers assigned to their presentations and projects. One student said, "Teachers owe grades on a certain date, so they use their own creativity to figure out what grades to give each student."

Challenges to implementing the new degree programs included dealing with crowded classrooms, resolving discrepancies in academic standards, and assuring students about the new programs' legitimacy. According to teachers and administrators, introducing the MEGATEC curriculum in ITCHA and the secondary schools in 2010 and subsequent years presented additional challenges. Owing in part to successful recruitment efforts, some secondary school classes had over 50 students, which precluded one-on-one instruction. With four trained MEGATEC teachers, ITCHA had sufficient human resources to place around 20 students in each class. However, this seemingly manageable number of students per class posed a challenge for some modules that required hands-on practice and instruction.

In addition, during focus groups in 2015, teachers at one secondary school mentioned a discrepancy in academic standards: students could earn a secondary technical degree with a 6.0 GPA, but they would not be allowed to enroll in a linked program at ITCHA unless they had a 7.0 GPA during their third year of study. This caused some confusion until ITCHA staff communicated its 7.0 admission requirement to linked schools, and schools adopted this standard for MEGATEC programs. A teacher at one secondary school also noted that teaching staff continually had to assure students that new MEGATEC degree programs were "real" and that students would receive a technical secondary degree if they completed the full three years of study. The principal reasoned that these doubts were due to rumors—likely unfounded—that MINED had not yet approved the new MEGATEC curriculum during its first two years of implementation.

A factor that facilitated the introduction of the new degree programs was that all trained ITCHA and secondary school teachers had a rapport from their shared training experience. This shared training experience allowed for better communication between teachers and created an informal link between secondary schools and ITCHA. Often, ITCHA and secondary school teachers communicated online, requested help from each other when needed, and shared relevant information about lesson plans and curricula. This communication was particularly useful in ensuring that secondary schools with the same MEGATEC programs were using similar methods to teach each competency. Another factor in the successful introduction of the two new degrees was the ITCHA administrative staff, who coordinated class schedules and resource allocation among

teachers and programs in an efficient manner, particularly when classrooms were overcrowded during construction of the new facility in 2010.[38] Said one MCC interviewee, "[ITCHA staff] does a lot with very little. They are very innovative."

Teachers noted improvements in the quality of education but would have liked more guidance, less redundancy in modules, and more realistic goals. According to some ITCHA teachers, the school's new MEGATEC degrees actually improved education in the traditional programs, as non-MEGATEC teachers found more opportunities to provide their students with practical, hands-on application of key concepts. The MEGATEC approach also generated interest among students of the traditional programs—particularly marketing students—for more hands-on practice. But despite the overall positive reception of the competency-based model, some MEGATEC teachers reported they would have liked additional guidance in making a transition to the MEGATEC model. One secondary school teacher said, "We learned by trial and error…. Sometimes we feel we were thrown in the water to learn." In addition, some teachers reported that they would have liked to help design the competency-based modules, as they viewed some of the modules as repetitive, felt some modules were missing, and thought some of the subjects could have been improved with teacher input. Also, teachers at two secondary schools noted that some of the objectives of core competencies were unrealistic, given time constraints and limited opportunities to practice in a real-world setting. For example, following a project management module, students were expected to be able to "design, manage, and supervise a construction project" after just six weeks of study.

Internship arrangements for MEGATEC programs were weaker than originally planned. A critical component of secondary and post-secondary MEGATEC programs is the internship, which enables students to learn practical skills and build relationships in their field of study. However, as of 2015, at least two of the four linked secondary schools did not have an internship component for alternative tourism and civil engineering students. Principals reported that it was difficult to form relationships with businesses in the area, which were unlikely to believe that students had the skills to assist them.

Starting in 2010, ITCHA began implementing one-month internships for second-year students in the MEGATEC programs. In a 2015 interview, an ITCHA representative noted that the internship program had been somewhat successful in recent years, as they had collaborated with several good companies. However, interviewed teachers questioned whether participating businesses would have an incentive to invest in students if they spend a maximum of one month on the job. One teacher said, "This is what I'd call an institutional failure—[we] are not connecting students directly with businesses." The teacher proposed a more formal internship structure, in which students alternate between full-time internships and full-time instruction during the course of the entire school year, starting their first year with ITCHA. Such arrangements would be more likely to result in job offers upon graduation, reasoned the teacher. MINED representatives made a similar statement regarding the need to improve technical internship opportunities in the region. However, a MINED representative said that just as important as expanding the internship

[38] ITCHA is run by AGAPE, a Catholic social organization with a long history of education and workforce development projects throughout El Salvador.

period is forming meaningful relationships with mayors and businesses that can lead to substantive internships. The representative said, "The businesses really have to feel that they are benefiting, that the kids have good potential—so it may be more of an issue of public relations and generating trust."

2. Contracting and training MEGATEC teachers

Stakeholders surmounted some bureaucratic challenges with respect to contracting technical teachers. In preparation for the 2010 school year, CIDE and MINED recruited and contracted four ITCHA teachers (two civil engineering teachers and two tourism teachers) and five technical secondary school teachers (three civil engineering teachers and two tourism teachers) in late 2009. In particular, contracting the secondary school teachers presented a key challenge. Existing MINED regulations permitted secondary schools to hire only teachers with a formal teaching certification, which most of these individuals did not have due to their technical background. To allow these new technical secondary school teachers to be contracted for the 2010 school year, MINED passed a decree that allowed teachers with technical training to be hired without an official teaching certification; such teachers would be required to obtain this certification within a year. During training and before the decree was passed, however, CIDE assumed responsibility for hiring and paying the teachers. Because these teachers were contracted and paid by CIDE, all actors avoided violating MINED policy.

Technical teachers had extensive training and follow-up in late 2009 and 2010. Once qualified MEGATEC teachers were selected and contracted, school principals and teachers participated in a series of trainings (Figure VI.1). These trainings were designed to help teachers develop competency-based course materials for the 2010 school year, to review and formalize course plans and materials, to develop evaluation tools to assess students' achievement, and to plan students' internships. CIDE staff also provided educational support for teachers from January to September 2010, conducting classroom observations and giving teachers feedback on their performance. In total, training included seven workshops, 136 hours of instruction, and 9 months of follow-up and support. Thirteen teachers were trained, and 11 teachers participated in nearly all workshops and sessions (4 ITCHA teachers and 7 secondary school teachers).

Throughout the school year, teachers could request additional training on technical aspects of the MEGATEC curricula that they had not yet mastered. For example, civil engineering teachers requested training in topography, and alternative tourism teachers requested training in basic first aid. In addition, teachers and administrators of MEGATEC programs as well as FOMILENIO, MINED, CIDE, and INSAFORP staff (totaling 22 people) participated in a one-week study trip to Canada in September 2010 to learn about competency-based approaches. According to participants, the trip was very educational, as it provided an opportunity to observe competency-based instruction firsthand.

According to stakeholders, MEGATEC trainings were well-implemented and useful. Stakeholders credited the CIDE teachers' professionalism, capability, enthusiasm, and strong communication skills as the major facilitators of the productive experience. One middle school principal said, "The training by CIDE was excellent. Improvement is clear; we used to see uncertainty [among teachers] at the beginning. Now it's not there.

What a radical change!" In particular, teachers found units on student evaluation tools to be particularly useful. However, training sessions did have some limitations. First, because pedagogy was the primary focus, technical deficiencies were not fully addressed in the sessions. One ITCHA administrator remarked that one engineering module related to soil analysis needed follow-up instruction. The administrator said, "Some teachers have experience, but soil analysis is a very specific area of studies, and the teachers…need to learn more [on the subject] to speak with authority and impart it to students." ITCHA teachers of non-MEGATEC programs also mentioned that they would have liked to participate in intensive training, as they saw that their colleagues greatly benefited from the sessions.

Interviews with MEGATEC students in 2011 suggest that training workshops sufficiently trained teachers to administer the new degree programs. ITCHA civil engineering students reported that teachers had improved the quality of their instruction, were flexible in their teaching approach, and could explain key concepts until students understood them. In focus groups, ITCHA students also noted that teachers had improved their teaching techniques over the course of each academic year and from one year to the next. Secondary school tourism students remarked that alternative tourism classes were well-taught. In contrast, the students noted that instruction in other related areas, especially English, needed improvement.

3. Construction and the new facility

Construction of a new facility deviated from initial plans outlined in the compact. As the Formal Technical Education Sub-Activity was originally designed, the existing ITCHA site in Chalatenango would undergo a series of infrastructure improvements, including large improvements to existing buildings. However, this plan was abandoned during 2008 due to three main considerations. First, it became apparent that the ITCHA's existing lot size was not large enough to accommodate all the planned infrastructure improvements or the school's projected enrollment of 650 students in future years. Second, students' access to the institute was also a factor. FOMILENIO and MINED identified an alternate location for the ITCHA (already owned by MINED) at the entrance of the city of Chalatenango and near an established bus stop. Stakeholders agreed that this location would have better student access than the existing ITCHA site, especially among students who traveled from distant locations. Third, the alternate location had access to farmland, which could be used in future years for a new program in agriculture that ITCHA administrative staff was planning.

Given these considerations, FOMILENIO, MINED, and MCC staff considered building a new structure at the alternate location. This decision had additional costs, given that construction costs of a new facility would be higher than modifying an existing facility (and blueprints had already been developed to enhance the existing ITCHA's infrastructure). To inform the decision, FOMILENIO reviewed the projected economic rates of return (ERRs) related to rehabilitating the old building versus constructing a new facility.[39] Although the ERR of rehabilitating the old

[39] The economic rate of return (ERR) is defined as the interest rate at which the cost and benefits of a project, discounted over its life, are equal. In general, MCC selects and finances investments with an ERR above 10 percent. However, ERR thresholds differ across sectors and projects.

building was substantially higher than constructing a new facility, FOMILENIO leadership chose to construct the new building.[40] FOMILENIO, MCC, and MINED staff believed that moving to a new location was the best decision in the long-term, as a larger facility would better accommodate future enrollment increases and the alternate location provided an opportunity to establish an agricultural program.

Construction of the new facility was completed in April 2011, after some delays. After some delays related to the project's architectural plans, construction on the new ITCHA facility started in April 2010 (Figure VI.1). AGAPE staff expected to start teaching classes in the new ITCHA facility in January 2011, the start of the 2011 school year. However, the building was not yet operational at that date due to significant rainstorms and some initial leaks in the building's foundation. From January to April 2011, temporary classrooms were created at the existing ITCHA to house the school's four pre-existing academic programs and the two new MEGATEC programs. By all accounts, the old ITCHA institute in Chalatenango was overcrowded during these months, as enrollment practically doubled between 2009 and 2011. These months were challenging for ITCHA staff, teachers, and students. However, an MCC representative stated that all parties involved, particularly ITCHA administrators, managed the transition well. Construction was completed in April 2011, and ITCHA classes began at the new facility shortly thereafter.

Although construction was more expensive than originally planned, total ITCHA investments did not exceed the original budget. Following improvements, the new ITCHA facility had nine functioning classrooms, a multiple-use auditorium, and an outdoor cafeteria. In addition, it had 4 computer labs and 10 technical labs as well as 170 new computers (Table VI.1). As reported by FOMILENIO in March 2012, the construction costs of these new installations totaled around $5.1 million. This was well above the $1.6 million originally budgeted for construction, as the original budget figures were based on plans to remodel the existing ITCHA. However, according to FOMILENIO sources, all ITCHA expenses—including construction, instructional equipment, learning resources, program design, and training—did not exceed the original budget of $7 million by a substantial amount. This is largely because the actual expenses for equipment, resources, and training were far lower than originally budgeted.

[40] According to analysis conducted by a FOMILENIO employee in 2009, remodeling the existing ITCHA had a projected ERR of 51 percent, whereas the projected ERR associated with building a new facility was between 9 and 11 percent, depending on whether an auditorium and other additions were included in program costs. However, MCC staff did not verify the validity of these estimates.

Table VI.1. ITCHA improvements

	ITCHA
Infrastructure	9 classrooms, a multiple-use auditorium, and an outdoor cafeteria
Laboratories	4 computer labs and 10 technical labs
Computers	170 new computers; as of August 2011, ITCHA had 6 classrooms with 24 computers each (for use in MEGATEC and non-MEGATEC programs)

Source: CIDE/FOMILENIO administrative data on ITCHA improvements.

Overall, stakeholders expressed satisfaction with the new facility, with some caveats. During in-person interviews in 2011, ITCHA administrators, teachers, and students reported being very satisfied with the new facility. Following ITCHA improvements, civil engineering students reported having advanced digital equipment and a well-equipped computer center. Students also reported that new classrooms were large, and each student had a desk, in contrast to the previous facility. Students said these improvements were more conducive to learning than previous arrangements. ITCHA teachers made similar statements, reporting that new, larger classrooms made teaching easier. In addition, teachers stated that ITCHA's new offices met their needs and the school's administrative area had greatly improved.

However, teachers and students noted some areas for improvement. Notably, some software licenses were still not available or were too expensive to purchase, and institute staff were attempting to obtain alternative software at the time of interviews. Students also noted that classrooms often reached very high temperatures, and ventilation could be improved. In addition, some ITCHA teachers reported that the configuration of the new non-MEGATEC labs was not optimal. One teacher remarked, "The old labs had been designed to meet our needs, but the new design is not functional." The teachers reasoned that if they had been consulted, they could have helped design labs that were more conducive to high quality instruction.

4. ITCHA and secondary school scholarships

FOMILENIO financed nearly 600 ITCHA scholarships during the compact period. From 2009 to 2011, FOMILENIO financed 586 ITCHA scholarships of $1,500 per school year to students in MEGATEC and non-MEGATEC programs (61 in 2009, 200 in 2010, and 325 in 2011). Administered by AGAPE, the ITCHA scholarship covered enrollment, learning materials and books, food, and transportation. Around 80 percent of first-year students who were enrolled at ITCHA in 2011 received a FOMILENIO scholarship, and similar proportions of students in MEGATEC and non-MEGATEC programs received this scholarship. The consensus among students and teachers in 2011 was that ITCHA scholarships were generous and served as a primary motivation for students' enrollment. One ITCHA student said, "The scholarship is very important; it covers the cost of books, registration, transportation, and more. It is a determining factor for students. Some had quit [studying] and came back due to the scholarship." However, by 2012, FOMILENIO scholarships for first-year ITCHA students were unavailable.

Secondary students in engineering and tourism programs were favored for FOMILENIO scholarships. To incentivize student enrollment in MEGATEC programs at the secondary level, FOMILENIO staff offered scholarships to a large proportion of secondary students in linked MEGATEC programs. For example, in 2011, about 80 percent of first-year secondary school students who were studying alternative tourism and civil engineering in linked MEGATEC programs received a scholarship, whereas only 36 percent of first-year secondary school students enrolled in other programs in participating schools received a FOMILENIO scholarship. As such, students had a strong incentive to enroll in secondary MEGATEC programs and potentially to continue on to ITCHA with some form of post-secondary scholarship.

MINED increased the number of ITCHA scholarships in the post-compact period. In 2012 and 2013, MINED funded fewer than 100 first-year scholarships at ITCHA. However, these numbers increased to 250 scholarships starting in 2014 and 350 scholarships in 2015. (Also in 2015, MINED scholarships included an additional stipend for transportation and food, whereas before they covered only tuition, fees, and materials). Overall, MINED's ITCHA scholarships were around $1,300 per year, but most of this money was distributed directly to ITCHA staff to cover tuition, fees, and other materials. In a follow-up interview, ITCHA staff noted that MINED scholarships had helped fill the void left by the discontinuation of new FOMILENIO scholarships in 2012. However, one official noted that relatively few MINED-funded ITCHA scholarships in 2012 and 2013 contributed to dwindling enrollment rates in those years.

MINED also increased secondary technical scholarships in the post-compact period. In 2015, MINED also increased its number of scholarships to secondary school students in the Northern Zone. According to MINED staff and secondary school principals, these scholarships are awarded exclusively to students enrolled in technical programs—including civil engineering and alternative tourism—in the interest of encouraging technical studies in secondary school. However, at least one school principal noted that MINED scholarships were awarded after students had enrolled for the 2015 school year. As such, they likely had little effect on school enrollment in 2015.

B. ITCHA enrollment trends

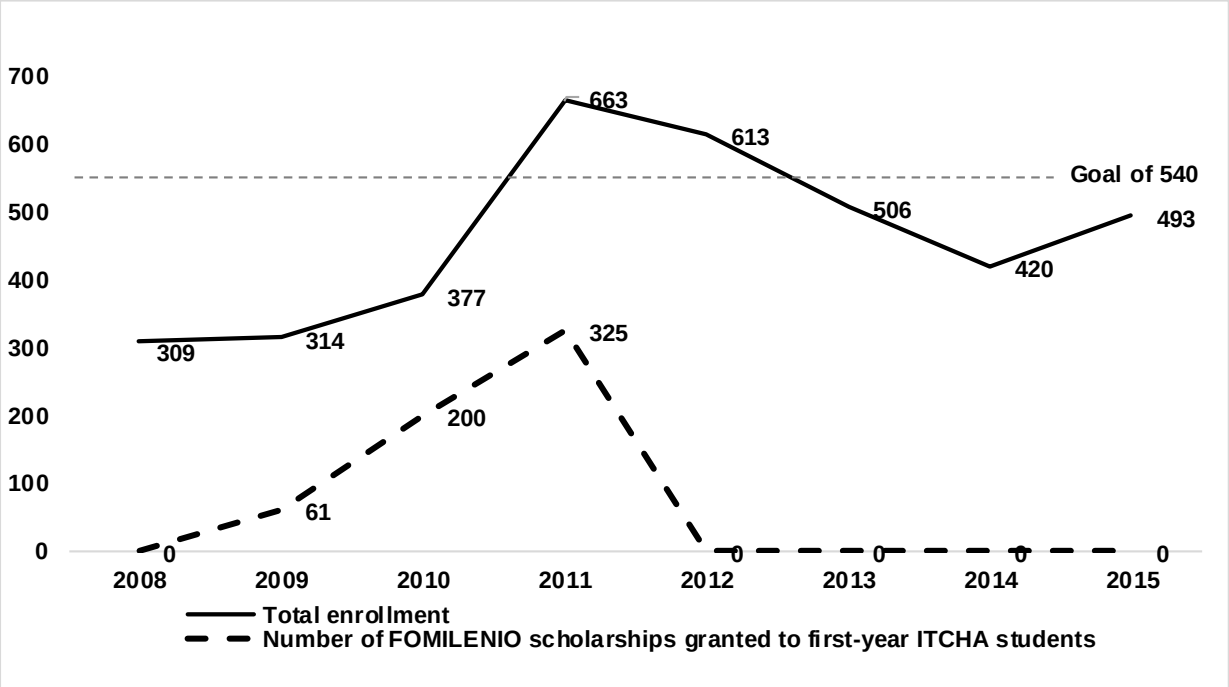
Enrollment grew dramatically in 2011 but dipped from 2012 to 2014. Enrollment at ITCHA more than doubled from just over 300 students in 2008 to over 650 students in 2011 (Figure VI.2). Stakeholders attributed this dramatic growth to three factors: (1) the availability of FOMILENIO scholarships starting in 2010; (2) the two new MEGATEC degree programs that commenced in 2010 (as well as the software development program that commenced in 2011); and (3) ITCHA's attractive new facilities, which opened in early 2011.

However, ITCHA enrollment dipped substantially from 2012 to 2014. Remarkably, ITCHA enrollment trends from 2009 to 2014—including the dramatic increase and subsequent decrease in just a few years—mirror the number of available FOMILENIO scholarships awarded to first-year students during these years (Figure VI.2). This suggests that scholarships played a large role in students' enrollment decisions: generous FOMILENIO scholarships likely motivated students to enroll in ITCHA rather than pursue other studies or employment. In follow-up interviews,

ITCHA and FOMILENIO representatives supported this assessment: of all the factors that affected ITCHA enrollment during this period, stakeholders believed FOMILENIO scholarships played the largest role.

ITCHA enrollment met the monitoring and evaluation goal of 540 students in 2012. However, total enrollment fell short of the original compact goal of 1,100 students by 2012. This initial goal reflected stakeholder plans for ITCHA to serve as a regional technological hub for teachers and students. But stakeholders lowered the goal to 540 after assessing the capacity of the newly constructed ITCHA facility and ITCHA staff capabilities. Also relevant to this goal is that ITCHA enrollment decreased in 2012 and never again reached 540 (Figure VI.2). However, enrollment rose to nearly 500 students in 2015, potentially in response to 100 additional first-year scholarships provided by MINED that year.

Figure VI.2. ITCHA total enrollment, 2008 to 2015 (number of students and first-year scholarships)



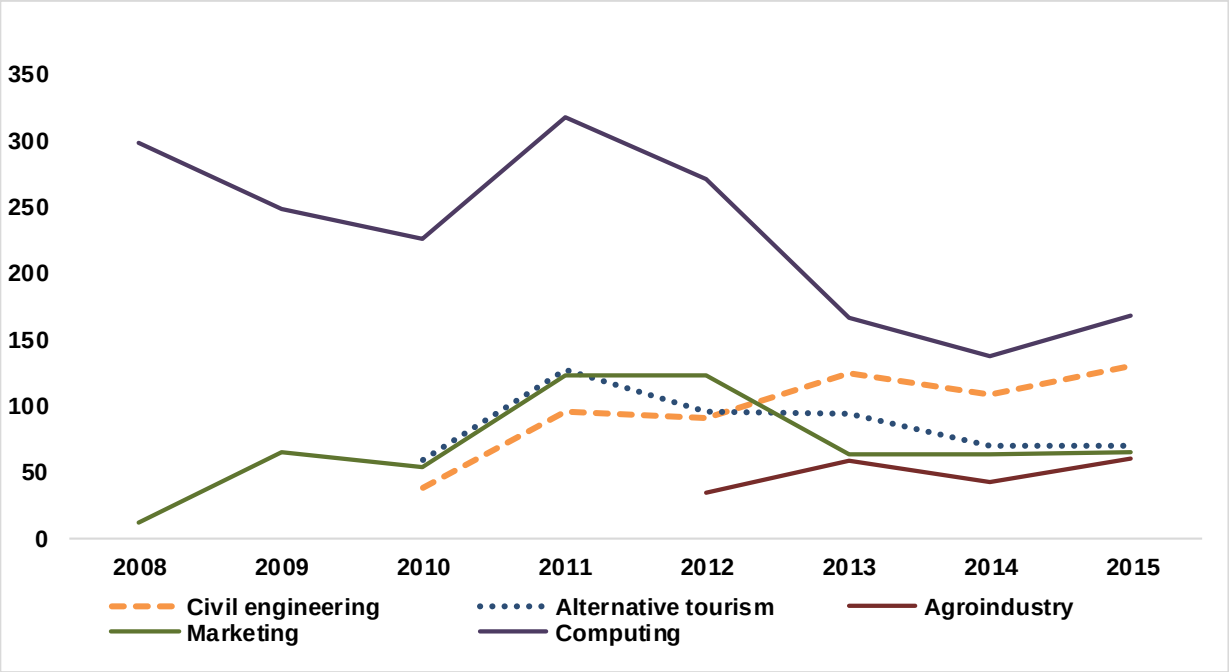
Source: Administrative data supplied by ITCHA administrators and FOMILENIO.

Enrollment in the engineering program has increased since 2010, whereas enrollment in alternative tourism has decreased since 2011. Enrollment in civil engineering at ITCHA has increased over time, due in part to sizable cohorts of students from linked secondary schools, who began enrolling directly in their second year of studies at ITCHA in 2013 (Figure VI.3). In contrast, enrollment in alternative tourism peaked in 2011 and has declined steadily in recent years. In 2013, a cohort of students from linked secondary schools helped maintain tourism enrollment numbers, but enrollment dwindled in 2014 and 2015 as the size of subsequent cohorts decreased. One ITCHA administrator said, "Our enrollment is highly related to enrollment in the feeder schools—if they run out of students, so does ITCHA." A principal at a linked school that offered the alternative tourism degree verified that enrollment in tourism had flagged in recent

years—dropping to as few as four first-year students in 2014—due to security concerns in the area and perceptions that the program would not offer graduates a credential or skills that could enable them to get a good job.

Enrollment in non-MEGATEC ITCHA programs saw a dramatic increase and a subsequent decrease from 2010 to 2014. ITCHA's computing and marketing programs are not MEGATEC programs in that they are not competency-based programs linked with nearby secondary schools. These non-MEGATEC programs saw a dramatic increase followed by a decrease in enrollment from 2010 to 2014, similar to overall ITCHA enrollment (Figure VI.3). The availability of FOMILENIO scholarships in 2010 and 2011, and their discontinuation in 2012, likely played a large role in these enrollment trends. In contrast, enrollment in the agroindustry program has been relatively steady, albeit modest, since it was introduced in 2012.[41]

Figure VI.3. Degree program enrollment, 2008 to 2015 (total number of students)



Source: Administrative data supplied by ITCHA administrators and FOMILENIO.

C. Characteristics of ITCHA students

Data collectors surveyed two cohorts of ITCHA students for the ITCHA evaluation: (1) those expected to finish ITCHA courses in late 2012 and graduate in early 2013 (the 2011–2012 cohort) and (2) those expected to finish ITCHA courses in late 2013 and graduate in early 2014 (the 2012–2013 cohort). The 2011–2012 cohort was surveyed in late 2013, approximately one year after they completed their studies at ITCHA. The

[41] Agroindustry is a MEGATEC program linked to the Instituto Nacional Francisco Martínez Suárez in Chalatenango.

second cohort was surveyed in mid-2015, approximately 1.5 years after they finished their studies at ITCHA. This second cohort was unique because it included the first class of students who graduated from linked secondary schools with MEGATEC degrees in late 2012 and continued directly to their second year of studies at ITCHA in 2013.

Most interviewed students completed two years at ITCHA, except for students from linked MEGATEC programs in the 2012–2013 cohort. In the 2011–2012 cohort, most students (60 percent) entered ITCHA in early 2011 directly after receiving their secondary school degree in late 2010 (Table VI.2). No students from this cohort were graduates of linked MEGATEC secondary school programs, and thus they were all scheduled to complete two full years at ITCHA from 2011 to 2012. In contrast, around one-third of the 2012–2013 cohort graduated from linked technical high schools in late 2012 with MEGATEC civil engineering and alternative tourism degrees, and they entered directly into their second year of studies at ITCHA in 2013. Reflecting the presence of these linked MEGATEC graduates, the percentage of surveyed ITCHA students who held a technical high school degree was higher in the 2012–2013 cohort compared with the 2011–2012 cohort (61 percent versus 46 percent).

Marketing and tourism programs attract female students, and engineering and computing programs attract male students. Across the two surveyed cohorts, female students made up the majority of alternative tourism and marketing students, whereas they were the minority of students in civil engineering (and to a lesser extent, computing; Table VI.2). However, the gender balance for the tourism program changed substantially from the 2011–2012 cohort to the following year, as the portion of male students grew from 25 percent to nearly half of all students enrolled in the program. This improved gender balance is largely due to good gender balance among alternative tourism students who graduated from linked secondary schools and enrolled in ITCHA in early 2013. The gender balance also improved for civil engineering and marketing during these two years, but not for computing programs.

Most ITCHA students in the 2011–2012 cohort received FOMILENIO scholarships, whereas 2012–2013 students reported a mix of post-secondary scholarships. Eighty-five percent of students from the 2011–2012 cohort reported receiving FOMILENIO post-secondary scholarships, which they noted were valued at around $1,500 per year. Although students in the 2012-2013 cohort did not receive FOMILENIO scholarships, 60 percent reported receiving other post-secondary scholarships, either from MINED, foundations, or other sources. These scholarships were valued at between $550 and $650 per year, on average. As such, the majority of students in both cohorts received at least one scholarship for their ITCHA studies, but students in the 2011–2012 cohort received much higher scholarship amounts, on average.

Table VI.2. Characteristics of surveyed ITCHA students

Characteristic		All students	Civil engineering	Alternative tourism	All computing	Marketing
2011–2012 cohort						
Age		22.0	22.6	21.8	21.7	22.2
Gender (% female)		55	18	75	47	83
Family size (# in household)		5.1	4.9	5.3	5	5.2
High school degree (%)	Technical	46	37	39	45	61
	General	54	63	61	55	39
Year of secondary graduation	2009	22	25	16	24	18
	2010	60	55	61	59	64
	Other year	19	20	23	18	18
Total students		319	51	57	145	66
% of all students		100	16	18	45	21
2012–2013 cohort						
Age		21.9	21.5	21.9	22.1	22.5
Gender (% female)		40	22	52	34	74
Family size (# in household)		4.8	4.6	5.3	4.6	4.7
High school degree (%)	Technical	61	79	72	35	68
	General	39	21	28	65	32
Year of secondary graduation	2010	14	6	7	15	38
	2011	43	26	23	71	47
	2012	32	60	62	0	0
	Other year	11	7	8	14	15
Number of students from a linked secondary school		76	41	35	0	0
Total students		242	68	60	80	34
% of all students		100	28	25	33	14

Source: 2013 and 2015 ITCHA follow-up surveys.

Most former ITCHA students reported that scholarships enabled them to enroll in post-secondary school. Approximately three-fourths of interviewed ITCHA students across both cohorts who had scholarships to attend ITCHA reported that they wouldn't have been able to study at ITCHA without a scholarship. In contrast, one-fourth of students reported that they would have studied at ITCHA regardless of the scholarship, either with support from their family or by working. According to focus groups with ITCHA students, sizable scholarships are necessary to cover students' substantial transportation and food costs, school fees and materials, and in some cases, the cost of students' rent while they study.

Most ITCHA students expressed a strong desire to work following their studies at ITCHA, but a minority of students planned to continue studying. Over 70 percent of 2011–

2012 cohort students interviewed in 2013 said that they expected to work in the upcoming year, compared with only 15 percent who wanted to keep studying. In focus groups in 2015, several current ITCHA students mentioned that they planned to work and study concurrently in order to finance their education. Other students said they planned to work for one or two years to save for university studies. Current students noted that a major factor in whether they would pursue university studies was the feasibility of earning transfer credits at local and national universities for their time at ITCHA. As of mid-2015, ITCHA had secured these transfer arrangements with several universities in the Northern Zone and was pursuing similar arrangements with universities in San Salvador and elsewhere in the country.

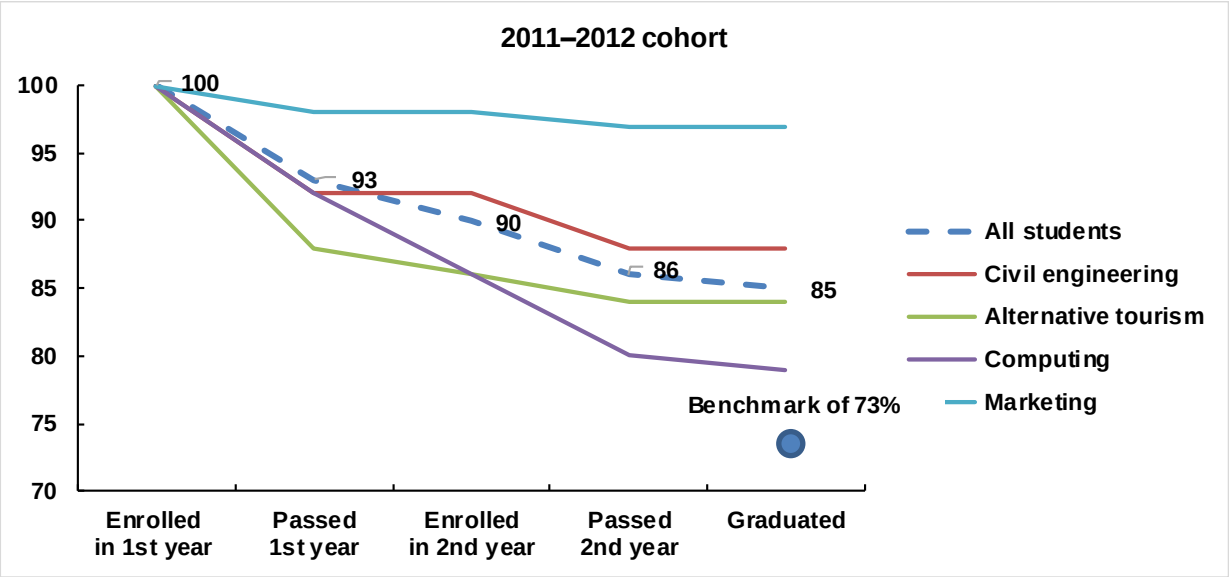
At follow-up, most former ITCHA students reported living with their parents. At least one year after attending ITCHA, 68 percent of interviewed students across both cohorts were still living with their parents (often in addition to other family members), compared with 12 percent who reported living with a spouse or partner and their own kids, in some cases (average family size was around five people; see Table VI.2). Another 10 percent reported living with family members who weren't their parents, and 5 percent reported living with friends.

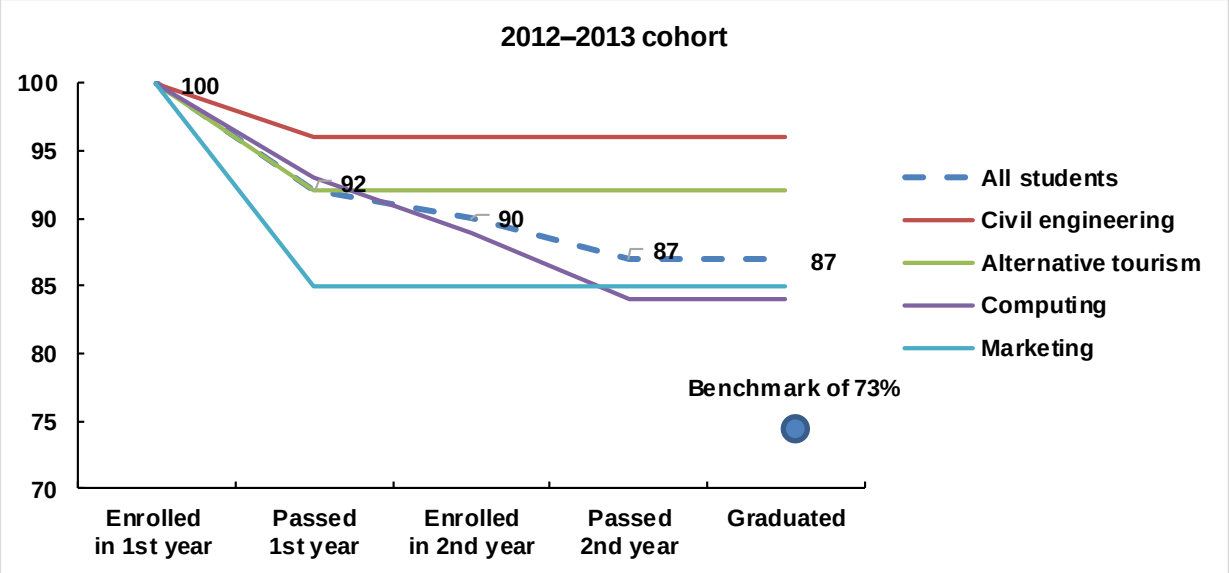
ITCHA students' education and labor market outcomes

D. Post-secondary education outcomes and university enrollment

ITCHA students had high continuation and pass rates. Across both cohorts, over 90 percent of surveyed ITCHA students passed their first year and continued to their secondary year on schedule, and at least 85 percent passed their second year on schedule (Figure VI.4). However, there was some variation in these rates, with relatively high second-year continuation and pass rates among civil engineering students and relatively low continuation and pass rates among computing students. Interestingly, marketing students from the 2011–2012 cohort had a relatively high second-year pass rate (97 percent), but marketing students from the 2012–2013 cohort had one of the lowest (85 percent). Also notable in the 2012–2013 cohort is that in most degree programs, students who passed their first year at ITCHA went on to complete their second year as well; this was not the case in the 2011–2012 cohort, which experienced some desertion in students' second year across all degree programs.

Figure VI.4. ITCHA pass and continuation rates (percentages)





Source: 2013 and 2015 ITCHA follow-up surveys.

Notes: Total sample size at enrollment in first year is 319 former students in the 2011–2012 cohort and 242 former students in the 2012–2013 cohort.

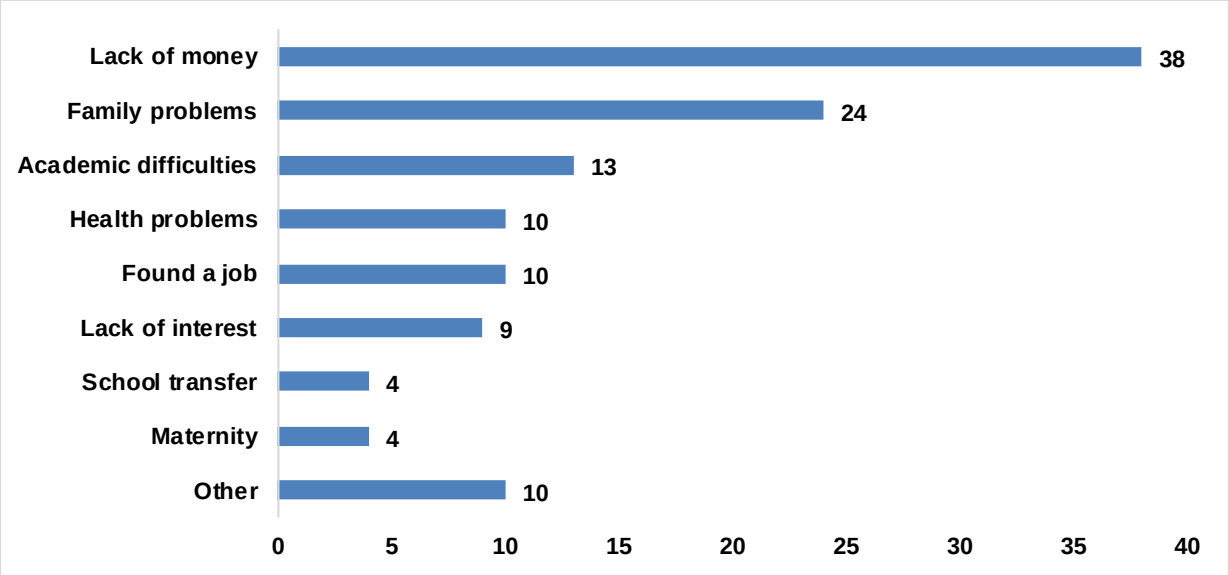
Reported rates for the 2012–2013 cohort exclude students from linked schools who skipped their first year at ITCHA.

At 85 percent and above, ITCHA students' graduation rates surpassed the benchmark of a 73 percent graduation rate used for the ERR calculation. Initial ERR calculations assumed that the ITCHA graduation rate during the compact period would remain unchanged from the baseline (2006–2007) level of 73 percent. However, the overall graduation rates among surveyed students were 85 and 87 percent for the 2011–2012 and 2012–2013 cohorts, respectively (Figure VI.4). In followup interviews, ITCHA administrators affirmed that

graduation rates of around 85 percent were typical for ITCHA students, and that the initial benchmark of 73 percent was artificially low.

Lack of funds was an important constraint to students' continued studies and graduation. Several surveyed students reported not finishing their ITCHA studies by their expected graduation date, either due to necessity or choice. Of the 68 interviewed students in both cohorts who did not finish their studies, the most common causes were a lack of money, family problems, and academic difficulties (Figure VI.5).

Figure VI.5. Reasons students dropped out of ITCHA (percentage)



Source: 2013 and 2015 ITCHA follow-up surveys.

Note: Sample size is 68 students across 2011–2012 and 2012–2013 cohorts.

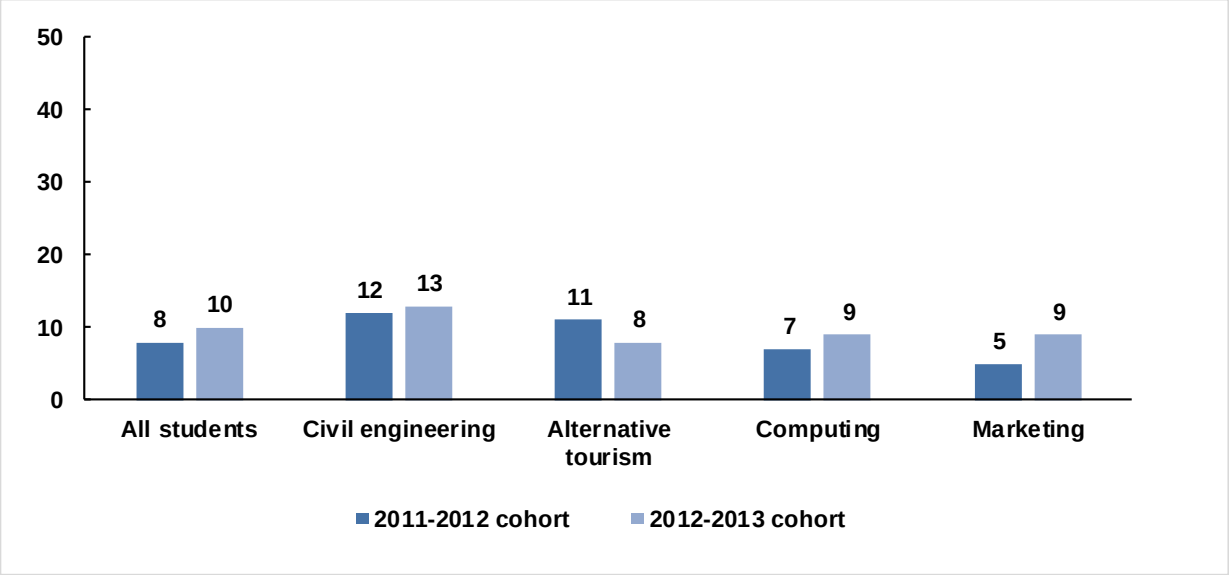
Academic achievement was slightly better in the 2012–2013 cohort than in the previous cohort. According to self-reports, students' average final GPA was 8.0 and 8.1 (out of 10) for the 2011–2012 and 2012–2013 cohorts, respectively (not shown). There was also variability in GPAs among degree programs; marketing students had average GPAs of over 8.3 in both cohorts, and computing students had average GPAs lower than 8.0 in both cohorts. However, different grades across degree programs and cohorts do not necessarily signify different achievement levels, given the variation in the curricula and grading schemes between programs and across years.

ITCHA administrators noted that students acquire technical expertise during their time at ITCHA, but they also mature as individuals. In follow-up interviews, ITCHA staff emphasized that students' GPAs may reflect their academic achievement, but they do not capture students' full range of development at the institute. An administrator said, "These kids come in very timid, from the countryside. The two-year process is dramatic—the socialization process—through interacting with people and working in different settings—it really pays dividends." Administrators noted that the maturity and personal demeanor that students acquire over the

course of their education help them to perform well in job interviews and to secure jobs following graduation.

Around 10 percent of ITCHA graduates reported being enrolled in university at follow-up. A portion of former ITCHA students—graduates and dropouts alike—reported being enrolled in university studies at follow-up. Civil engineering students from both cohorts were slightly more likely to report this, but at least 5 percent of students from each degree program in both cohorts also reported being enrolled in a university at follow-up (Figure VI.6). (It should be noted that 2011–2012 cohort students had a one-year follow-up period, whereas 2012–2013 cohort students had a 1.5-year follow-up period.) Overall, students who studied engineering, computing, and marketing at ITCHA tended to enroll in university programs that were related to their ITCHA studies.

Figure VI.6. ITCHA students' university enrollment (percentages)



Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size is 319 former students in the 2011–2012 cohort and 242 former students in the 2012–2013 cohort.

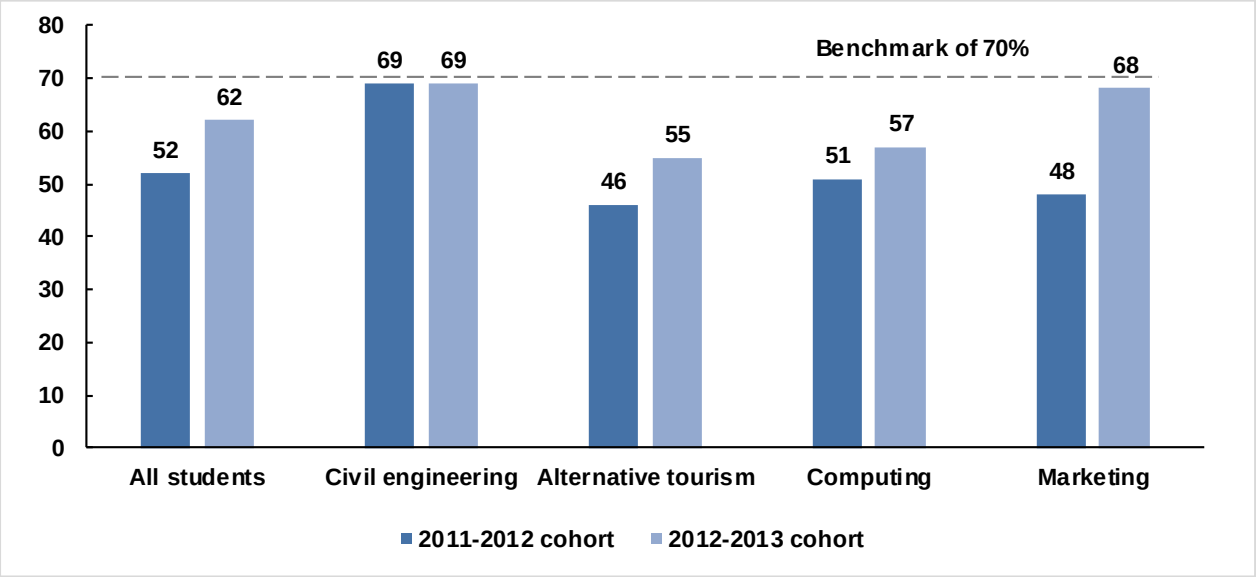
1. Employment rates and students' reported professions

Among all students, employment rates at follow-up were 52 to 62 percent—below the benchmark of 70 percent. On average, the employment rate of the 2011–2012 cohort was 52 percent one year after completing classes at ITCHA and 62 percent for the 2012–2013 cohort about 1.5 years after completing classes (Figure VI.7). Employment of ITCHA graduates (as opposed to all enrolled students) was similar at 53 and 62 percent for the 2011–2012 and 2012–2013 cohorts, respectively.[42] This is lower than the 70 percent benchmark that was used for the ERR estimates. However, this benchmark did not anticipate that as many as 10 percent of

[42] The M&E benchmark of 70 percent actually applies to ITCHA graduates, not to enrolled students. As such, this benchmark is best compared to employment rates of 53 and 62 percent for the 2011–2012 and 2012–2013 cohorts, respectively.

ITCHA students would enroll in additional post-secondary education. If the benchmark had been 70 percent employment or enrollment in advanced studies, it would have been met for the 2012–2013 cohort (71 percent of students reported being employed or studying at followup, compared with 59 percent of the 2011–2012 cohort).

Figure VI.7. Employment of ITCHA students at follow-up (percentages)



Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size is 319 former students in the 2011–2012 cohort and 242 former students in the 2012–2013 cohort.

Employment among engineering and marketing students was the highest across all programs. Employment rates were higher for civil engineering students (69 percent in both cohorts) than for students in other programs (less than 58 percent in both cohorts, except for a 68 percent employment rate among marketing students in the 2012–2013 cohort). According to ITCHA administrators, civil engineering graduates had more internship opportunities while at ITCHA, largely related to the construction of the new institute and nearby road construction. Due in part to these internships, engineering students secured high quality construction jobs upon graduation, both in the Northern Zone and in San Salvador. In addition, the employment rate of marketing students from the 2012–2013 cohort was relatively high at 68 percent. According to ITCHA staff, this likely reflects recent economic growth in the city of Chalatenango, located just minutes from ITCHA. Starting in 2015, newly established retail businesses in the city may have hired several recent marketing graduates, attracted by the business and marketing skills they acquired at ITCHA.

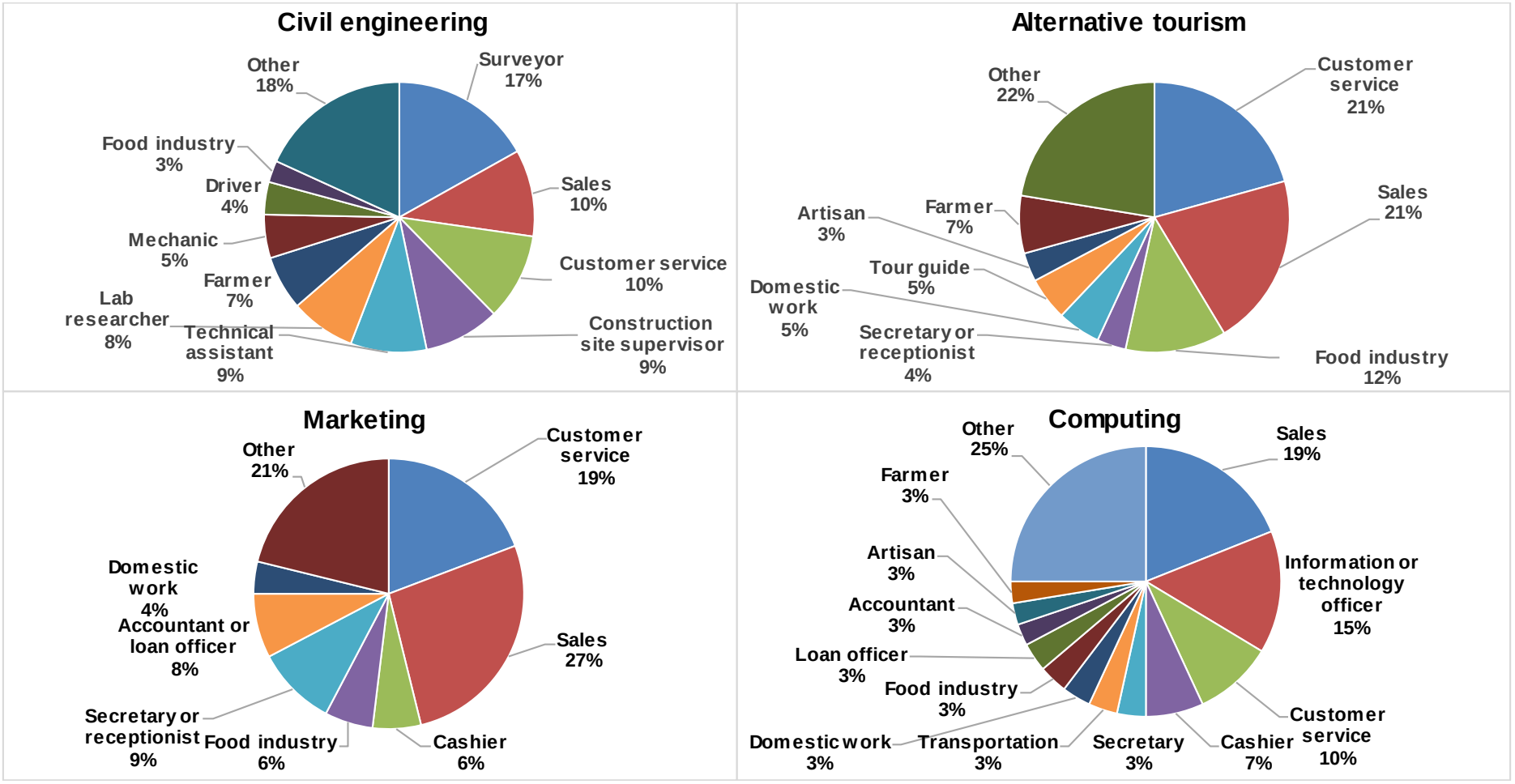
Employment among tourism and computing students was the lowest across all programs. The employment rate for alternative tourism and computing programs was below 60 percent for both cohorts, even with the 2012–2013 cohort's longer follow-up period (Figure VI.8). In follow-up interviews, ITCHA staff were unsurprised by these results. According to the ITCHA representatives, tourism in the country is linked to Salvadoran nationals' disposable income and sense of security in the country, both of which had deteriorated in recent years.

ITCHA staff also noted that a lack of public investment in tourism in recent years—particularly mountain tourism in the Northern Zone—had hurt tourism students' employment prospects. With respect to relatively low employment among computing students, one ITCHA teacher noted that the degree programs were of high quality, but companies and municipal authorities in the area did not prioritize investing in computer networks and information technology.

Most students said their classes and grades helped them find a job, as opposed to experience acquired while studying. For the 2011–2012 and 2012–2013 cohorts, respectively, 52 and 59 percent of employed students said that their classes at ITCHA helped them to get a job, and 45 and 39 percent said that their (relatively good) grades helped them find an occupation. For the 2011–2012 and 2012–2013 cohorts, respectively, 32 and 36 percent of employed students said the experience and skills they got while studying helped them get a job. However, most employed students (66 percent) stated that they found their current job through family members or friends, as opposed to the 4 percent who reported that they got a job through a school-related internship.

ITCHA students' most commonly reported occupations were customer service and sales representative. Among employed former students in both cohorts, students' most common occupations at followup were salesperson, customer service representative, cashier, and cook. In particular, a large portion of marketing and tourism students worked in sales and customer service. However, at least some students in each degree program appeared to be working in the field they chose for their studies. For example, over 40 percent of engineering students with jobs were surveyors, construction site supervisors, lab researchers, or technical assistants; 15 percent of employed computing students were technology or information officers; and 5 percent of employed tourism students were tour guides (Figure VI.8).

Figure VI.8. ITCHA students' employment at follow-up (percentage)

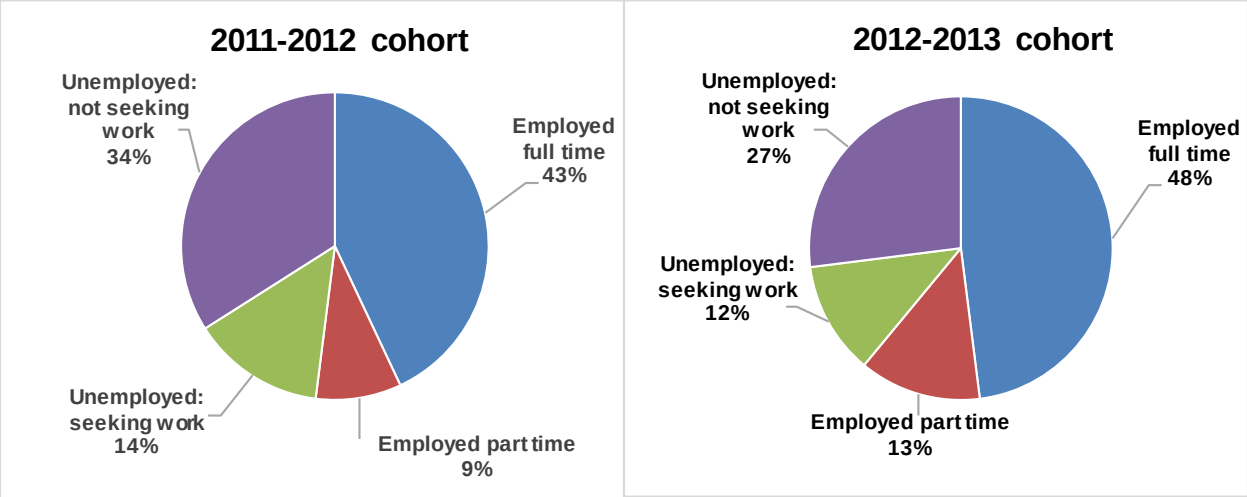


Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size is 119, 117, 100, and 225 employed students in the engineering, tourism, marketing, and computing programs, respectively, across both student cohorts.

Part-time employment rates were less than 15 percent. Over 40 percent of students in both cohorts reported full-time employment at followup, and at least 9 percent reported part-time employment (Figure VI.9). Computing students in both cohorts were more likely to report part-time employment than students from other programs (not shown).

Figure VI.9. Employment status of ITCHA students at follow-up (percentages)



Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size is 319 former students in the 2011–2012 cohort and 242 former students in the 2012–2013 cohort.

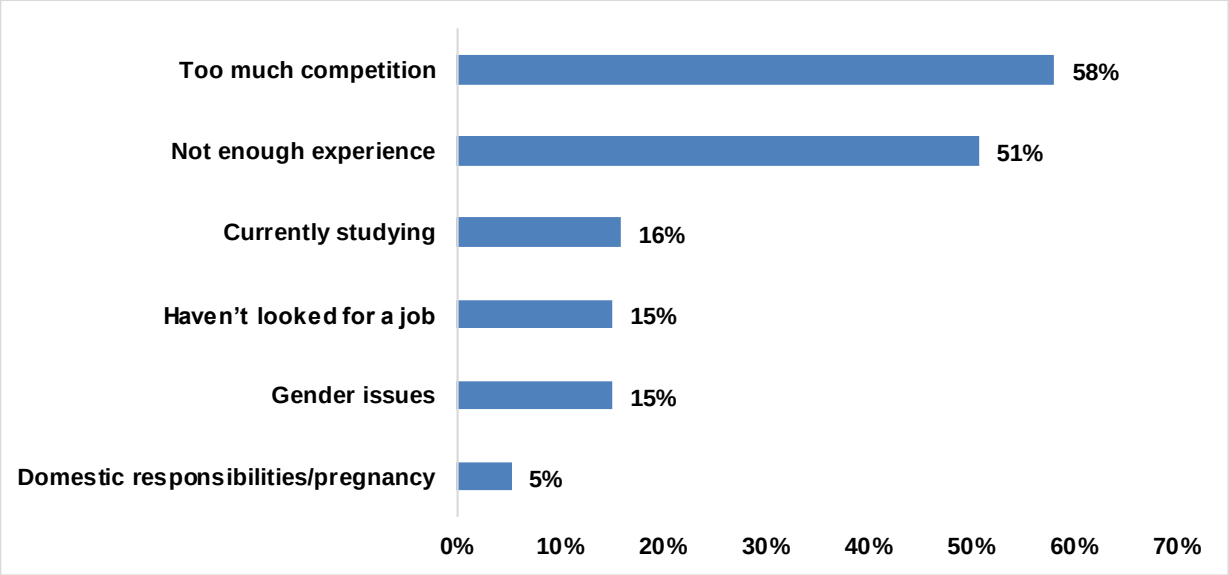
In both cohorts, around one-third of former students were unemployed and not seeking work. Over 30 percent of students in the 2011-2012 cohort and nearly 30 percent of students in the 2012-2013 cohort reported not having a job at followup, and not seeking one in the past two weeks (Figure VI.9). The most frequent reasons they cited for not looking for a job was not needing a job or having a seasonal job (reported by 38 percent of these students); not having enough experience (35 percent); the offered salary is too low (28 percent); current studies (19 percent) and transportation difficulties (15 percent); and domestic responsibilities and pregnancy (15 percent).[43]

Unemployed graduates blamed their situation, in part, on strong competition for jobs and a lack of professional experience. Forty-eight percent of interviewed former students in the 2011–2012 cohort and 39 percent in the subsequent cohort reported being unemployed at follow-up. The reasons they cited most were the strong competition for a job, their lack of professional experience, current studies, the fact that they were not looking for a job, and gender issues (Figure VI.10). The majority of the students citing gender issues were females who studied a range of degree programs, including civil engineering, tourism, computing, and marketing.

[43] These percentages total to more than 100 because students could cite more than one reason for not looking for a job.

In follow-up interviews, ITCHA teachers mentioned a lack of formal linkages with potential employers as a factor in students' poor employment outcomes. In focus groups conducted in 2015, teachers attributed students' relatively low employment to a lack of a robust, formal internship program. One teacher suggested implementing a more ingrained ITCHA internship program, in which students spend several weeks during their last year at ITCHA on site with businesses, building tangible skills and key relationships with potential employers. These findings from interviews with teachers appear in line with student reports of a lack of experience being a large factor in their inability to secure a job.

Figure VI.10. ITCHA students' reasons for unemployment (percentage)



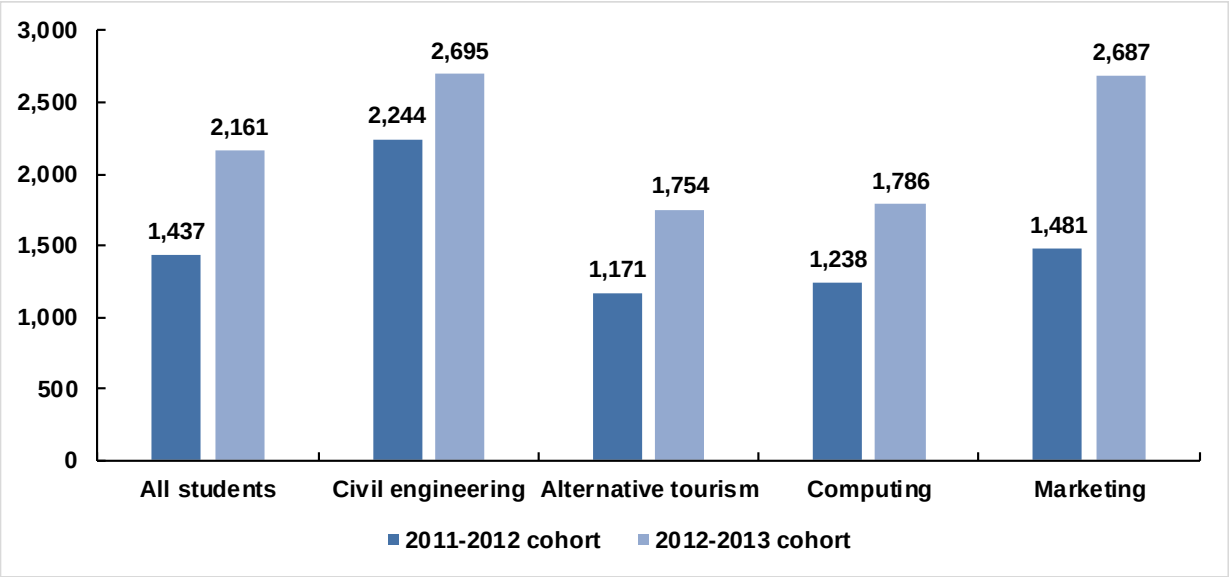
Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size is 244 former students across both cohorts. Students could provide more than one reason for unemployment.

2. Income, salaries, and time employed

Civil engineering graduates had the highest total income of all ITCHA degree programs. In both cohorts, engineering graduates had the highest annual income at follow-up (Figure VI.11). Also notable is that the income of marketing students in the 2012–2013 cohort was relatively high, and similar to that of civil engineering students from the same cohort. In both cohorts, annual income was lowest among tourism and computing students. (Income figures are unconditional on reporting employment, meaning that respondents who were unemployed during the entire followup period were given a labor income of zero).

Figure VI.11. ITCHA students' average annual income at follow-up (US$)



Source: 2013 and 2015 ITCHA follow-up surveys.

Notes: The sample size is 319 former students in the 2011–2012 cohort and 242 former students in the 2012–2013 cohort.

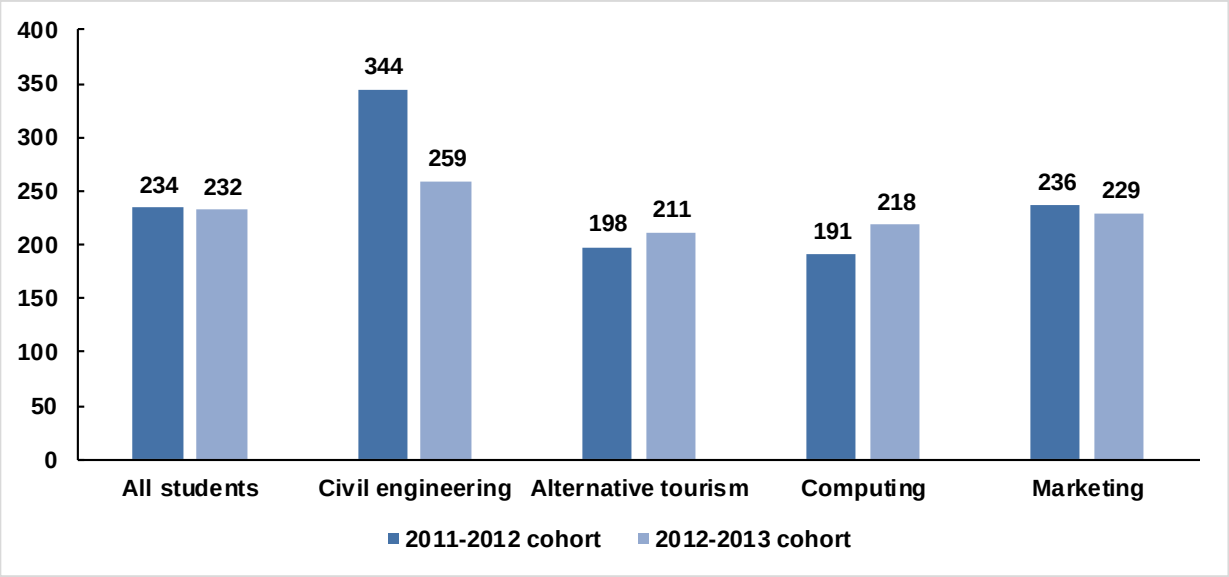
The data shown include labor market income as well as other income, including remittances and scholarships.

Civil engineering and marketing students' relatively high incomes are linked to their relatively high monthly salaries and number of months on the job. Particularly in the 2011–2012 cohort, civil engineering students who were employed at follow-up reported higher monthly salaries than other students—over $100 more per month (Figure VI.12). Civil engineering students also reported holding their current job for more months in the past year, on average, than students from other degree programs. For example, engineering students in the 2011–2012 cohort reported holding their job for over four months at follow-up, compared with two to three months for other students (Figure VI.13). (These figures include students who were unemployed during the follow-up period; they were treated as having held a job for zero months). Marketing students in the 2012–2013 cohort also reported relatively strong employment outcomes: at follow-up, they had worked at their current job as many months in the last year as engineering students (around 5.5 months, on average). This finding helps explain marketing students' relatively high annual income in the 2012–2013 cohort.

Reported total income was higher for the 2012–2013 cohort than for the previous cohort. Total income in the past year was reported to be over $500 higher in the 2012–2013 cohort than the 2011–2012 cohort (Figure VI.11). This likely reflects the fact that the 2012–2013 cohort survey was conducted 1.5 years after students finished classes at ITCHA, whereas the 2011–2012 cohort survey took place one year after students finished classes. As such, 2012–2013 cohort students had more time to find jobs and earn income prior to the survey date; as a result, they had a higher number of months on the job than 2011-2012 cohort students (Figure VI.13). (It's also possible that systematic differences in students' skills and motivation are responsible for some measured differences in income between the two cohorts.) Reported monthly wages, however, were very similar between the cohorts (Figure VI.12). One exception

is the reported monthly salary for civil engineering graduates, which fell from $344 in the 2011–2012 cohort to $259 in the next cohort. This drop is explained by the fact that well-paying surveyor jobs reported by 2011–2012 cohort students were not reported by 2012–2013 cohort students.

Figure VI.12. ITCHA students' average monthly wage at follow-up (US$)

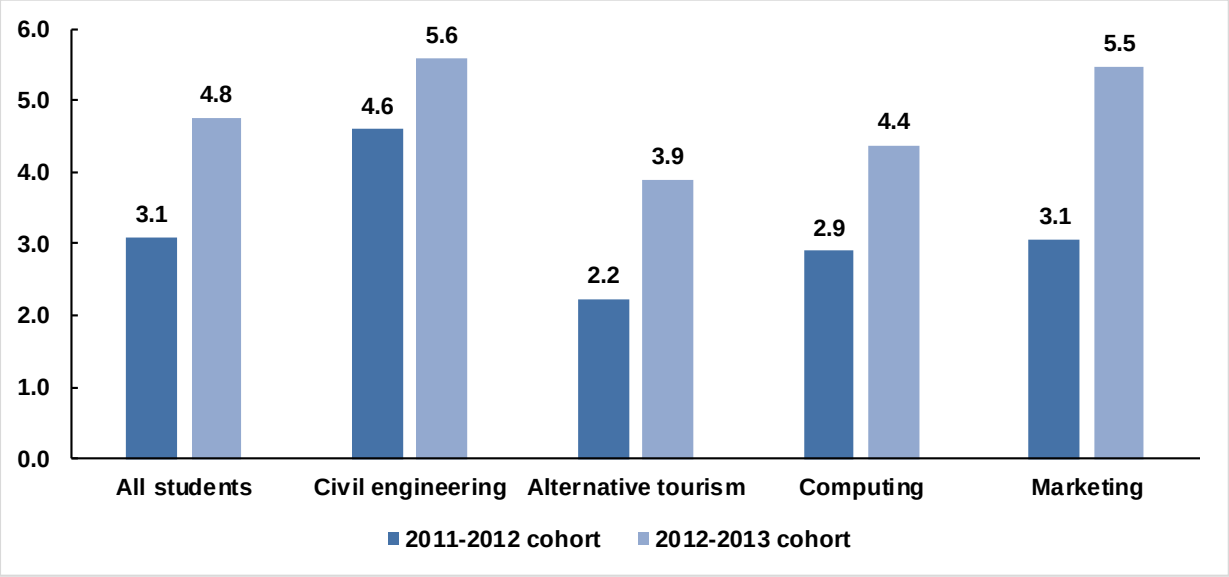


Source: 2013 and 2015 ITCHA follow-up surveys.

Notes: The sample size is 167 former students in the 2011–2012 cohort and 149 former students in the 2012–2013 cohort.

This outcome is conditional on reporting a job at follow-up, whereas Figures VI.12 and VI.14 are unconditional on reporting a job.

Figure VI.13. ITCHA students' average number of months in current job at followup

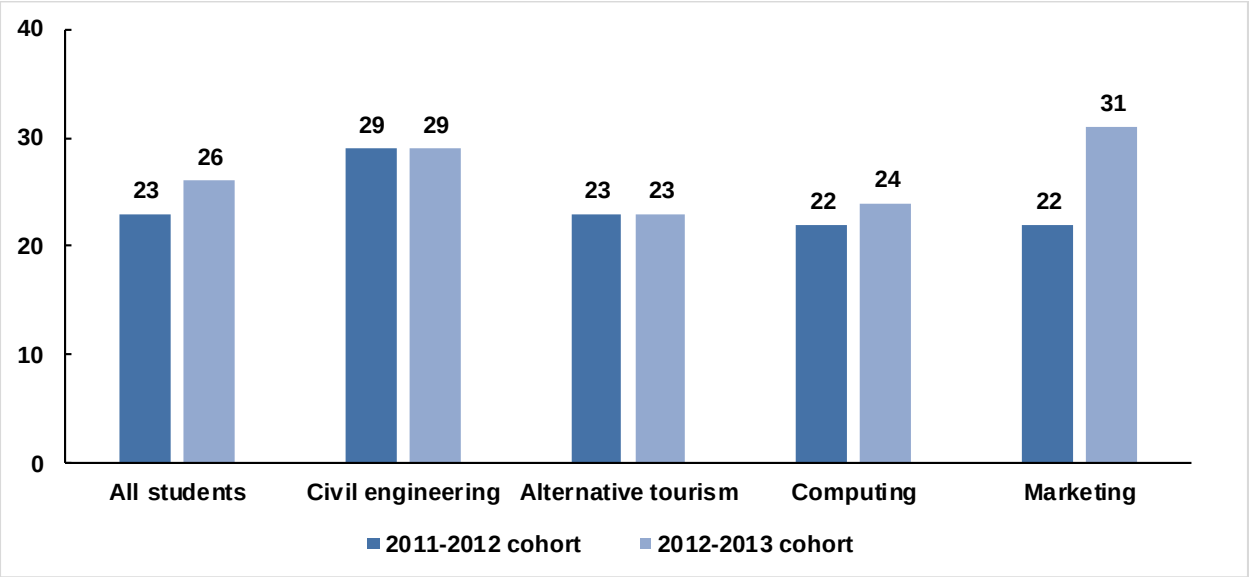


Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size is 319 former students in the 2011–2012 cohort and 242 former students in the 2012–2013 cohort.

Civil engineering and marketing students worked the most hours a week, on average, of students from all ITCHA programs. In both cohorts, civil engineering students reported working nearly 30 hours a week, and marketing students in the 2012–2013 reported similar hours (Figure VI.14). (These figures are unconditional on reporting a job—meaning that they include hours worked by employed as well as unemployed individuals, with the latter getting a value of zero hours worked per week.) These results largely reflect relatively high employment rates among students in these degree programs.

Figure VI.14. Weekly hours worked by ITCHA students



Source: 2013 and 2015 ITCHA follow-up surveys.

Notes: The sample size is 319 former students in the 2011–2012 cohort and 242 former students in the 2012–2013 cohort.

This outcome is unconditional on reporting a job at follow-up.

E. Subgroup analyses

In this section, we analyze education and labor market outcomes by important subgroups, including ITCHA dropouts versus graduates, males versus females, and students from linked secondary schools (who completed one year at ITCHA) versus students who completed two-year technical degrees at ITCHA.

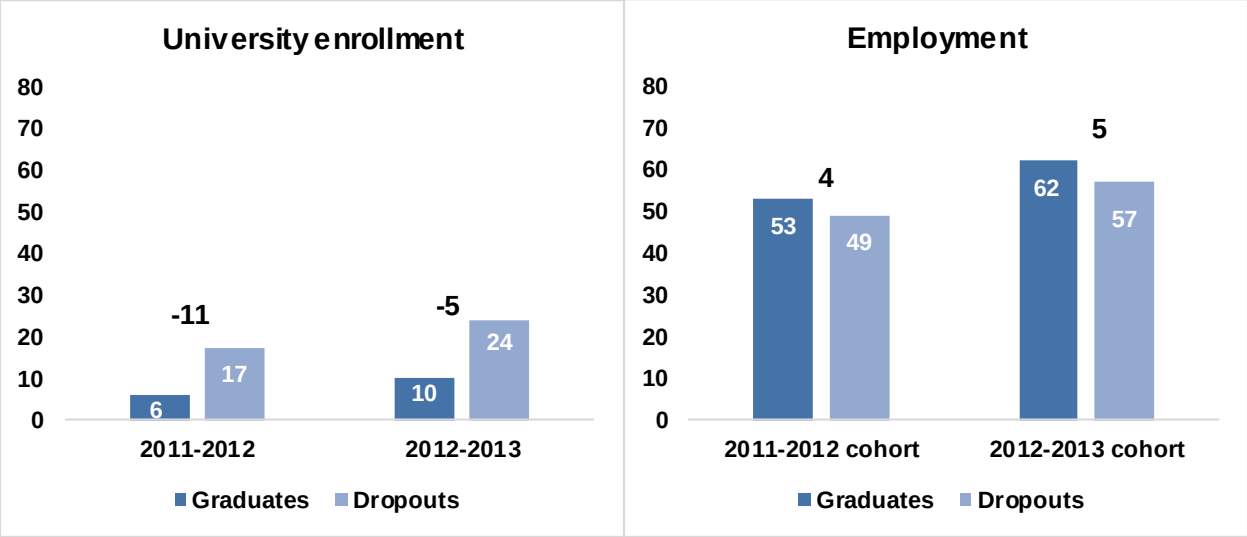
1. Dropouts versus graduates

Using student survey data and administrative data, we determined whether ITCHA students who graduated from ITCHA were more or less likely to excel in school, graduate, and find employment than students who dropped out. This comparison is of interest because it could offer insight into the careers and higher education opportunities that accompany an ITCHA degree. Due to likely systematic differences between graduates and dropouts that we cannot measure (and thus cannot control for), the difference between the two should not be interpreted as the impact of an ITCHA degree on student outcomes. For example, if ITCHA dropouts are, on average, less motivated to find employment than ITCHA graduates, the difference between dropouts' and graduates' employment rates might reflect the effect of an ITCHA degree, dropouts' lower motivation, as well as other unobserved differences between dropouts and graduates. As such, we should interpret any differences between the two groups as descriptive findings rather than impact estimates (as in Chapters IV and V).

Dropouts had lower grades at ITCHA but higher rates of enrollment in universities and other educational institutions. Average GPA was around 8.1 for graduates but closer to 7.5 for dropouts. However, dropouts were 5 to 11 percentage points more likely to enroll in university than graduates (Figure VI.15). In other words, a nontrivial portion of ITCHA dropouts enrolled in university studies within one to two years of leaving ITCHA. In interviews, these students reported academic, financial, and health problems while they were enrolled at ITCHA, and a minority of students cited the stronger potential of finding a job with a university degree relative to an ITCHA degree.

Dropouts had slightly lower employment rates than graduates, likely reflecting their higher rates of university enrollment. Among both surveyed cohorts, dropouts reported slightly lower employment than graduates at follow-up (Figure VI.15). These findings are in line with dropouts' higher rates of university enrollment at followup relative to graduates.

Figure VI.15. ITCHA students' university enrollment and employment rates, by graduation status (percentages)

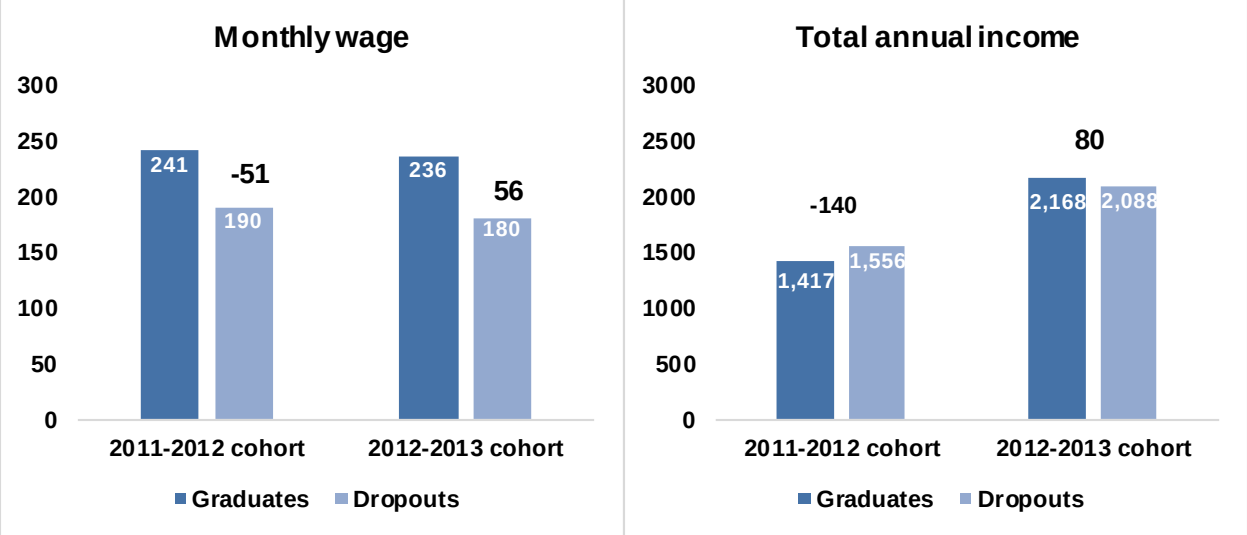


Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size for graduates and dropouts in the 2011–2012 cohort is 272 and 47, respectively. The sample size for graduates and dropouts in the 2012–2013 cohort is 221 and 21, respectively.

Dropouts had lower monthly salaries than graduates, but they had similar annual incomes. Interestingly, comparing dropouts who reported being employed to graduates who reported being employed, dropouts had lower monthly salaries (around $185 versus graduates' $240 across both cohorts; Figure VI.16). But total annual income was similar between dropouts and graduates, due in part to dropouts' nonlabor income (including scholarships) and relatively higher average number of months worked in the past year compared with ITCHA graduates in the 2011–2012 cohort. Analyzing only labor income, graduates and dropouts in the 2011–2012 cohort had similar annual labor income ($994 for graduates versus $1,103 for dropouts), but graduates in the 2012–2013 cohort had substantially higher labor income than dropouts ($1,861 versus $1,341; not shown in the figure).

Figure VI.16. ITCHA students' wages and income at follow-up, by graduation status (US$)



Source: 2013 and 2015 ITCHA follow-up surveys.

Notes: The sample size for graduates and dropouts in the 2011–2012 cohort is 272 and 47, respectively. The sample size for graduates and dropouts in the 2012–2013 cohort is 221 and 21, respectively.

Wages are among employed individuals, whereas total annual income is among all individuals.

2. Gender analysis

Next, we compare the education and labor market outcomes of male and female ITCHA students. The gender analysis is an essential component of any MCC evaluation, given that gender is a cross-cutting theme of all MCC projects. Male and female students could have different experiences at ITCHA as well as divergent employment outcomes and income at follow-up. In this analysis, we attempt to identify and contextualize any key gender disparities in education and labor market outcomes.

Education outcomes differed by gender in MEGATEC programs for the 2011–2012 cohort but not for the 2012–2013 cohort. Across all degree programs in both cohorts, males and females had comparable GPAs and rates of graduation (Table VI.3). However, we found gender differences within degree programs. In the 2011–2012 cohort, males had substantially

higher graduation rates and GPAs than females in the civil engineering program, whereas females had sizably higher graduation rates and GPAs in the alternative tourism program. These differences were not present in the 2012–2013 cohort, nor were there any notable gender differences in university enrollment at follow-up for either cohort (Figure VI.17).

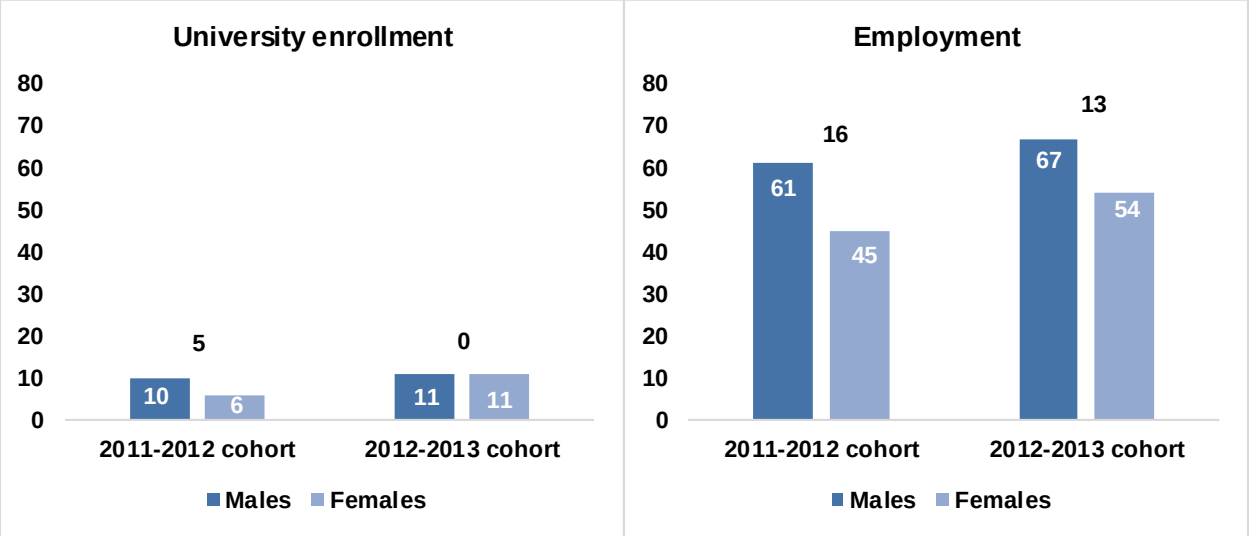
Table VI.3. Education outcomes, by gender

2011–2012 cohort				2012–2013 cohort			
Outcome	Males	Females	Difference	Outcome	Males	Females	Difference
All degree programs							
GPA	8.06	7.99	0.07	GPA	8.17	8.06	0.12
Graduated (%)	84	86	-2	Graduated (%)	92	90	3
Civil engineering							
GPA	8.2	7.9	0.3	GPA	8.2	8.1	0.1
Graduated (%)	90	78	13	Graduated (%)	98	100	-2
Alternative tourism							
GPA	8.1	7.9	0.2	GPA	8.3	8.0	0.3
Graduated (%)	71	88	-17	Graduated (%)	100	94	6

Source: 2013 and 2015 ITCHA follow-up surveys.

There was a significant gender imbalance in employment rates. Females in both cohorts reported employment rates 13 to 16 percentage points lower than males (Figure VI.17). These differences were also present within degree programs—male engineering students in the 2011–2012 cohort were 29 percentage points more likely to have a job than female engineering students, and male alternative tourism students in the 2012–2013 cohort were 27 percentage points more likely to have a job than female tourism students (not shown). In part, these gender differences may reflect somewhat higher graduation rates among males in these cohorts and degree programs. However, much of this difference is unexplained by educational outcomes.

Figure VI.17. ITCHA students' university enrollment and employment rates at follow-up, by gender (%)



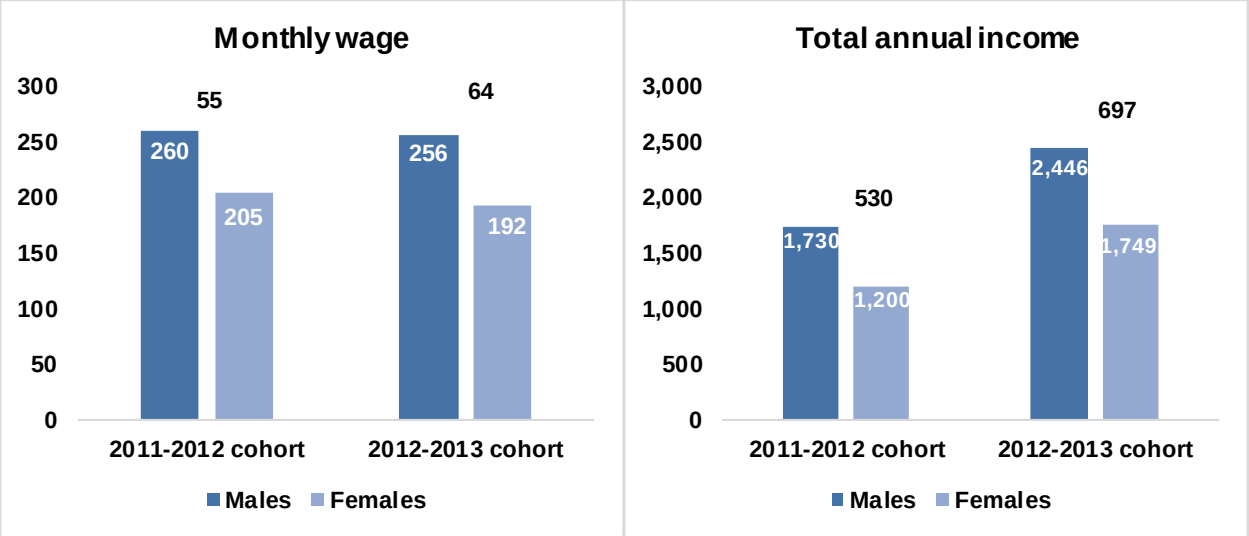
Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size in the 2011–2012 cohort is 144 men and 175 women across all degree programs. The sample size in the 2012–2013 cohort is 144 men and 98 women across all degree programs.

Males' monthly wages and annual income were higher than that of females. On average, employed males made at least $55 more than employed females on a monthly basis (Figure VI.18). We also found this difference within degree programs, with male engineering students reporting monthly salaries at least $50 higher, on average, than female engineering students, and a similar wage differential among tourism students as well (Figure VI.19). Reflecting gender differences in wages as well as employment rates, males' annual total income was over $500 higher than that of females in the 2011–2012 cohort and nearly $700 higher in the 2012–2013 cohort (Figure VI.18).

ITCHA staff cited discrimination and gender norms as a factor in the gender imbalances in employment and income. In follow-up interviews in 2015, ITCHA staff said they were unsurprised by these differences in male and female employment and income. They attributed females' relatively poor outcomes, in part, to the more narrow range of jobs that females could obtain in their fields of study, given persistent discrimination and gender norms in El Salvador. These findings appear to corroborate ITCHA student survey results, in which 16 percent of unemployed individuals—primarily women—cited gender issues as reasons for not having found employment at least one year following their ITCHA studies. These findings are concerning, given that across all degree programs, male and female students had similar education outcomes at ITCHA—including GPAs and graduation rates.

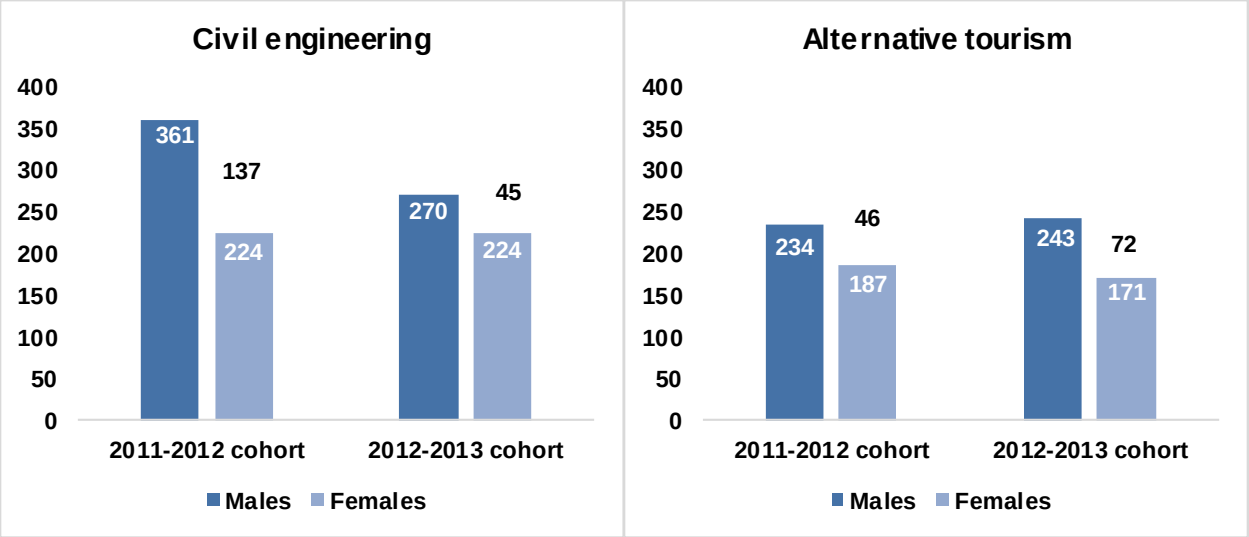
Figure VI.18. ITCHA students' wages and income at follow-up, by gender (US$)



Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size in the 2011–2012 cohort is 144 men and 175 women across all degree programs. The sample size in the 2012–2013 cohort is 144 men and 98 women across all degree programs.

Figure VI.19. ITCHA students' monthly wages at follow-up, by gender and degree program (averages in US$)



Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size in the 2011–2012 cohort is 144 men and 175 women across all degree programs. The sample size in the 2012–2013 cohort is 144 men and 98 women across all degree programs.

3. Linked versus nonlinked MEGATEC programs

Using student survey data and administrative data, we assessed whether ITCHA students who earned MEGATEC degrees in secondary school and completed only one year at ITCHA were more or less likely to excel in school, graduate, and find employment than ITCHA students who enrolled in two-year ITCHA programs. In theory, students from linked programs are exposed to four years of relevant modules, versus two years of relevant modules for students who complete two years at ITCHA. However, they are younger, on average, than students from nonlinked programs, and they complete only one year at the post-secondary level. For this reason, it's interesting to compare the experiences and outcomes of students from linked programs with other students. Due to likely systematic differences between these two groups for which this analysis cannot control, any differences presented below should not be interpreted as the effect of a linked versus nonlinked MEGATEC degree.

Among tourism students, students from linked secondary schools were more likely to graduate and find a job than students in two-year programs. Students who transferred directly into their second year at ITCHA were 8 percentage points more likely to graduate and were 19 percentage points more likely to report a job at follow-up than students who completed the two-year alternative tourism program (Table VI.4 and Figure VI.20). A similar trend occurred with civil engineering students: students from linked secondary schools were slightly more likely to graduate and find employment—and much more likely to enroll in university studies—than students enrolled in the two-year engineering program. In interviews, stakeholders identified no clear explanation for these discrepancies, other than the fact that some student cohorts are more motivated than others.

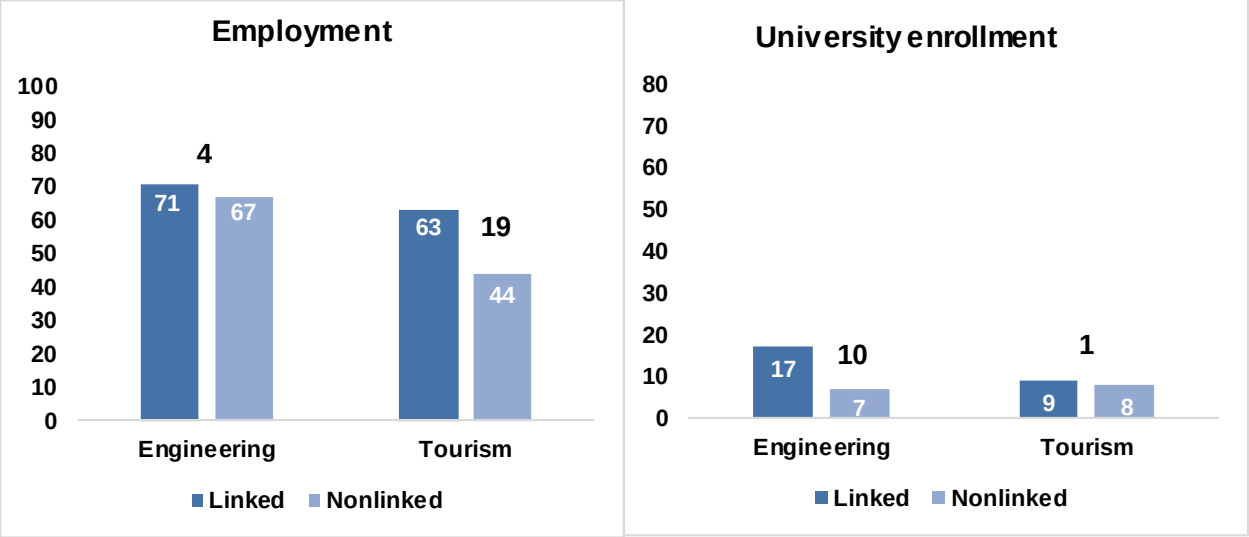
Table VI.4. Education outcomes for students of linked MEGATEC programs and general students

	Linked	Nonlinked	Difference
Civil engineering			
GPA	8.20	8.18	0.02
Graduated (%)	100	96	4
Alternative tourism			
GPA	8.13	8.08	0.05
Graduated (%)	100	92	8

Source: 2015 ITCHA follow-up surveys.

Note: The sample size is 41 linked civil engineering students, 35 linked tourism students, 27 nonlinked engineering students, and 25 nonlinked tourism students from the 2012–2013 cohort.

Figure VI.20. ITCHA students' university enrollment and employment rates at follow-up, by linked status (Percentages)

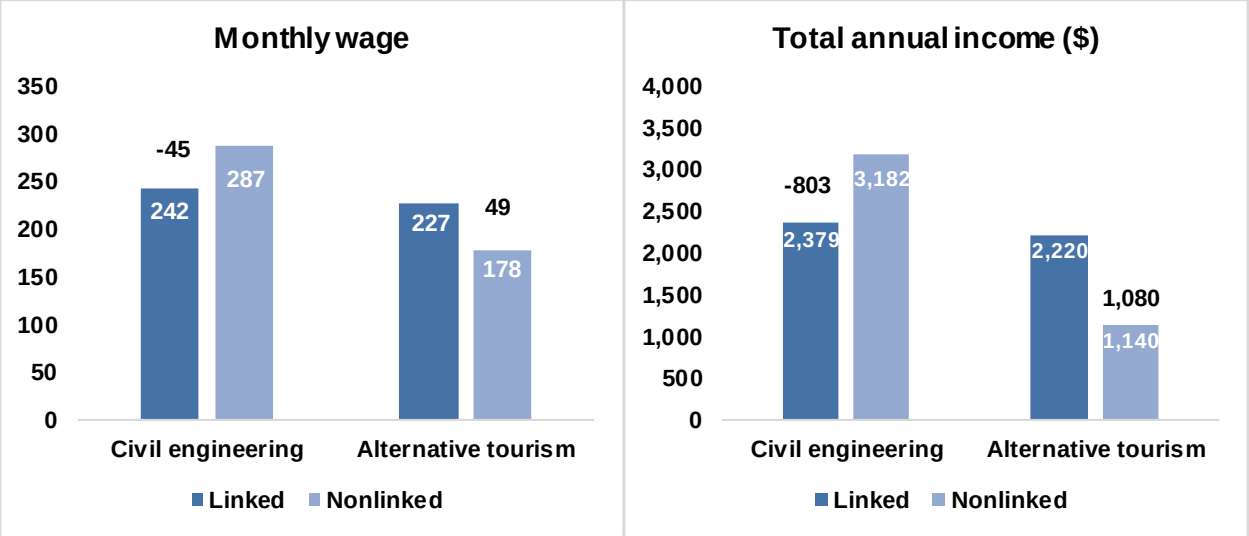


Source: 2015 ITCHA follow-up surveys.

Note: The sample size is 41 linked civil engineering students, 35 linked tourism students, 27 nonlinked engineering students, and 25 nonlinked tourism students from the 2012–2013 cohort.

Income was notably different among students coming from linked MEGATEC high schools. Total annual income was higher for linked alternative tourism graduates than for nonlinked graduates of the same program (Figure VI.21). The higher annual income of students from linked tourism programs is likely related to their higher rates of employment at follow-up, generally associated with sales or customer service positions obtained within 1.5 years of attending ITCHA. In contrast, the annual income of civil engineering students from linked programs was lower than that of students who completed two full years at ITCHA. This likely reflects, in part, the larger proportion of students from linked programs who enrolled in university studies during the followup period, likely foregoing labor income.

Figure VI.21. ITCHA students' wages and income at follow-up, by linked status (US$)



Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size is 41 linked civil engineering students, 35 linked tourism students, 27 nonlinked engineering students, and 25 nonlinked tourism students from the 2012–2013 cohort.

Students from linked MEGATEC program reported a smooth transition to ITCHA. In follow-up surveys, most students from linked MEGATEC programs (78 percent) reported no difficulties moving directly into their second year at ITCHA. The minority of students who reported difficulties mentioned shortcomings in their secondary school preparation with English and computing, that teaching methods at ITCHA were quite different, and that the burden of study was considerably larger at ITCHA than at their secondary school. In addition, almost 60 percent of students from linked programs said they felt just as prepared for the job market as students who completed two years at ITCHA, 34 percent felt they were better prepared, and only 6 percent said they felt less prepared (not shown).

F. Student satisfaction and suggestions to improve ITCHA

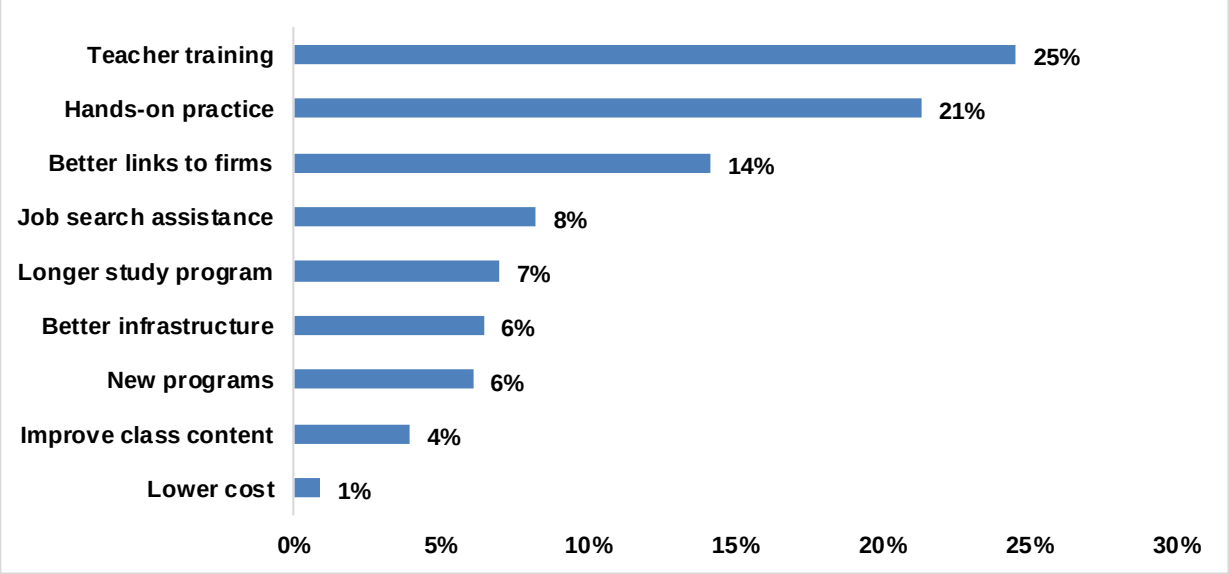
ITCHA follow-up surveys featured a battery of questions on students' experiences at ITCHA and their recommendations to improve the quality of education for future cohorts. Below, we synthesize the findings from both rounds of the survey.

Students reported high levels of satisfaction with the education received at ITCHA. In both cohorts, 96 percent of respondents said they were satisfied with their overall experience. Similarly, 86 and 90 percent of students in the 2011–2012 and 2012–2013 cohorts, respectively, reported that they believed ITCHA prepared them for a technical job. One student remarked, "[ITCHA] puts emphasis on what a job will actually be like; they teach us to overcome challenges that you'll actually face on the job." In addition, over 90 percent of students in both cohorts believed that ITCHA prepared them for university studies. One student who continued on to university studies noted, "In the time I spent [at ITCHA], they covered really advanced domains—I'm seeing the same material in the university, and we covered it at ITCHA in less time."

Students suggested improving teaching and providing more hands-on teaching. When asked how ITCHA could better prepare students for their jobs, students' most common answers across both cohorts were providing more teacher training and complementing the theoretical preparation with more practice time (Figure VI.22). With respect to teacher training, former students emphasized the importance of highly skilled teachers in English (an integral competency of the alternative tourism program) and marketing. In engineering, students emphasized the need for teachers to have an understanding of all machines in ITCHA workshops, including how to operate and maintain them. (This theme was also expressed by current ITCHA students during focus groups in mid-2015). Others stressed the need to train teachers on time management, didactic methods, and ways to treat and discipline students in a professional manner. Also common was the sentiment that theoretical instruction could be curtailed in some modules in favor of more practice in the field, as well as the suggestion to replace current computers with new ones.

Students also wanted ITCHA to strengthen linkages with firms and provide more job search assistance. Overall, 14 percent of ITCHA students suggested that the institute help build better links to firms, and 8 percent called for more job search assistance. One student said, "They teach well, but when it comes to looking for work, ITCHA came up a little short." Several students suggested more job fairs and agreements with businesses in the region with respect to internships, training, and potential job opportunities. Others suggested specific training in conducting a job search and writing a curriculum vitae, as well as follow-up efforts with graduates to help them find gainful employment.

Figure VI.22. Students' suggestions to improve ITCHA



Source: 2013 and 2015 ITCHA follow-up surveys.

Note: The sample size is 319 and 239 ITCHA students from the 2011–2012 and 2012–2013 cohorts, respectively. Students could provide more than one answer.

G. Summary of findings

Compact funds financed a new, fully equipped ITCHA facility. ITCHA's new facility was completed in April 2011, after some construction delays. The new facility included nine classrooms and 14 computer and technical laboratories. Although construction was more expensive than originally planned, total investments in ITCHA did not exceed the original budget. ITCHA administrators, teachers, and students reported being very satisfied with the new facility. Students reported that new classrooms were large, and each student had a desk, in contrast to the previous facility. Teachers stated that ITCHA's new offices met their needs and the school's administrative area had greatly improved. However, some ITCHA teachers reported that the configuration of the new non-MEGATEC labs was not optimal. The teachers reasoned that if they had been consulted, they could have helped design labs that were more conducive to high quality instruction.

Stakeholders designed and introduced new MEGATEC degree programs without major complications. In addition to infrastructure investments, FOMILENIO and CIDE staff designed the new competency-based MEGATEC degree programs in a collaborative effort, and the two new MEGATEC programs were introduced at ITCHA and linked schools in 2010. Challenges to implementing the new degree programs at ITCHA and four linked secondary schools included crowded classrooms, initial discrepancies in academic standards between ITCHA and secondary schools, and students' doubts about the new programs' legitimacy. However, stakeholders noted that teacher training was excellent, and they praised newly contracted MEGATEC teachers' enthusiasm for the degree programs as an asset to program intervention. At follow-up, teachers noted improvements in the quality of education linked to the new competency-based programs, but they would have liked more guidance with student assessment, less redundancy in competency-based modules, and more realistic goals with respect to students' mastery of the material.

Enrollment grew dramatically by 2011 but then decreased in the postcompact period. Enrollment at ITCHA more than doubled from just over 300 in 2008 to over 650 in 2011. Stakeholders largely attributed this dramatic growth to the availability of FOMILENIO scholarships from 2009 to 2011. However, ITCHA enrollment dipped substantially from 2012 to 2014, and total enrollment never again reached FOMILENIO's monitoring and evaluation target of 540 from 2013 onward. However, enrollment increased slightly in 2015, potentially in response to 100 additional first-year scholarships provided by MINED that year.

Scholarships likely played a pivotal role in students' enrollment at ITCHA. Most former ITCHA students reported that scholarships enabled them to enroll in post-secondary school. Approximately three-fourths of interviewed ITCHA students across both cohorts who had scholarships to attend ITCHA reported that they wouldn't have been able to attend without a scholarship, compared with one-fourth of students who said they would have studied at ITCHA regardless of the scholarship, either with support from their parents or by working.

ITCHA students excelled in school and had healthy graduation rates. On average, ITCHA students reported GPAs of around 8.0 out of 10 during their two years at ITCHA. At 85 percent and above, ITCHA students' graduation rates surpassed the key FOMILENIO monitoring and evaluation benchmark of a 73 percent graduation rate. In particular, students from linked secondary MEGATEC programs had a 100 percent graduation rate in 2013.

At below 65 percent, ITCHA students' employment rates at follow-up did not meet initial targets. Across all degree programs, employment rates at follow-up were 52 to 62 percent in the 2011–2012 and 2012–2013 cohorts, respectively. These rates are below the key target of 70 percent employment one year after ITCHA graduation outlined in the compact. In follow-up interviews, ITCHA administrators and FOMILENIO representatives suggested that economic factors played a large role in these employment rates, as there was limited demand in the region for individuals with technical skills in marketing, computers, and tourism. These employment rates also reflect students' continued education: 7 percent of all interviewed ITCHA students across both cohorts reported not working at follow-up because they were engaged in university studies.[44]

Employment rates were highest among civil engineering students and lowest among tourism and computing students. Employment rates were higher for civil engineering students (69 percent in both cohorts) than for students in other programs. In contrast, the employment rate for alternative tourism and computing programs was below 60 percent for both cohorts. According to ITCHA administrators, civil engineering graduates have secured high quality jobs throughout the country in recent years, linked to public and private construction projects. In contrast, tourism in the country is dependent upon Salvadoran nationals' disposable income and sense of security in the country, which have deteriorated in recent years. ITCHA staff also noted that a lack of public investment in tourism—particularly mountain tourism in the Northern Zone—likely hurt the employment rates of tourism students.

ITCHA dropouts had lower employment rates and monthly salaries than ITCHA graduates, but they had similar annual incomes. In both cohorts, ITCHA dropouts reported slightly lower employment rates than graduates at follow-up. These findings are in line with dropouts' higher rates of university enrollment. Comparing dropouts who reported jobs to graduates who reported jobs, dropouts had lower monthly salaries (around $240 for graduates versus around $185 for dropouts). Total annual income was well-balanced between dropouts and graduates, due in part to dropouts' nonlabor income (including scholarships) and relatively higher number of months worked in the past year compared with ITCHA graduates in the 2011–2012 cohort. However, it should be noted that the sample size for dropouts is relatively small—as low as 21 for the 2012–2013 cohort. For this reason, these results should be interpreted with caution.

[44] These rates were 6 and 9 percent or the 2011–2012 and 2012–2013 cohorts, respectively.

There was a gender imbalance in employment rates and annual income at follow-up. Despite no meaningful differences in GPA or graduation rates across all degree programs, females in both ITCHA cohorts reported employment rates 13 to 16 percentage points lower than males. Employed males also made at least $55 more, on average, than employed females on a monthly basis. This difference exists within degree programs, with male engineering students reporting monthly salaries that are at least $50 higher, on average, than female engineering students; a similar wage differential exists among male and female tourism students. ITCHA staff cited discrimination and gender norms as a factor in these imbalances.

VII. SUSTAINABILITY FINDINGS

In this chapter, we assess the sustainability of subactivity investments in strengthened secondary schools and ITCHA. For this analysis, we define sustainability as the presence of five key conditions that will enable strengthened schools to provide students in the region with a high-quality technical education in future years: (1) a sound, demand-based curriculum, (2) capable educators, (3) continued enrollment in improved schools, (4) continued maintenance and upgrades of school infrastructure and equipment, and (5) leadership and financial support from MINED. First, we assess the sustainability of secondary-level FOMILENIO investments—including training and infrastructure improvements to 20 schools, in addition to secondary scholarships. Next, we assess the sustainability of FOMILENIO investments in ITCHA and linked MEGATEC programs.

Tables VII.1 and VII.2 summarize our sustainability findings for secondary schools and ITCHA, respectively. In secondary schools as well as ITCHA, there appears to be a strong technical curriculum in place, as well as a mechanism to modify the curriculum based on labor market demand. In addition, there is adequate to strong potential for sustained enrollment, infrastructure, and political leadership at the secondary and post-secondary levels. However, the lack of a formal teacher training program—particularly for technical subjects—poses a threat to improved schools' ability to provide students with a high-quality technical education in future years.

Table VII.1. Sustainability assessment: secondary school strengthening

Key element	Findings	Sustainability Potential
Sound, labor demand-based curriculum	Stakeholders agree that technical degree programs have a strong curriculum. Technical graduates appear to be more attractive to employers than general graduates in the region.	Strong
Capable educators	A lack of consistent, formal teacher training for general and technical programs poses a threat to maintaining a cadre of capable teachers.	Weak
Continued secondary enrollment	Enrollment in strengthened secondary schools fell into the post-compact period, likely due to the discontinuation of FOMILENIO scholarships. New MINED scholarships may help stabilize enrollment in the region after a dip in enrollment in 2013 and 2014. These scholarships would have to be awarded to needy students finishing 9th grade, as opposed to students already enrolled in 10th grade, to better improve enrollment in secondary schools.	Adequate
Infrastructure and equipment	Secondary schools have been diligent in maintaining FOMILENIO-financed infrastructure improvements. However, technology updates are needed—particularly the purchase of new computers. MINED funds are available for maintenance but not for new purchases and construction. In follow-up interviews, MINED emphasized schools' own responsibility in finding funding for new infrastructure.	Adequate
Leadership and support	MINED appears committed to continuing secondary scholarships in the region and supporting strengthened schools. However, staffing constraints will likely limit MINED's interactions with strengthened schools in the Northern Zone in future years.	Adequate

Source: Authors' analysis.

Table VII.2. Sustainability assessment: ITCHA/MEGATEC investments

Key element	Findings	Sustainability Potential
Sound curriculum based on labor demand	In general, stakeholders support the institute's move to a competency-based curriculum. ITCHA updates its curriculum periodically to reflect current labor market demand. This is particularly important for the alternative tourism degree program, which had low employment rates at follow-up due to weak demand for tourism services.	Strong
Capable educators	ITCHA administrators expressed confidence in their training program, but students and teachers requested better and more regular technical training. In addition, the replacement of two CIDE-trained teachers hurt students' achievement, according to stakeholders.	Weak
Continued post-secondary enrollment	ITCHA enrollment and graduation was at an all-time high in 2011, but it dipped in the post-compact period, likely as a result of fewer scholarships. However, recent increases in the number of MINED and other scholarships may stabilize future enrollment.	Adequate
Infrastructure and equipment	New classrooms and labs are still operational, but ITCHA is already experiencing space constraints, particularly with respect to computer labs and workshops. Of primary importance in the near term is updating computers; ITCHA appears to have the funds to make this investment on a rolling basis over the next several years.	Adequate
Leadership and support	Political support for MEGATEC education is strong. MINED has committed to maintaining and expanding MEGATECs throughout the country, including ITCHA.	Strong

Source: Authors' analysis.

A. Sustainability of secondary school strengthening

1. A sound, demand-based curriculum

Overall, students, teachers, and principals praised the competency-based model of the new technical degree and diploma programs. During the 2011 school year, secondary school students who took a mix of MEGATEC and non-MEGATEC classes said they favored the competency-based approach to the more traditional, unit-focused teaching method. In follow-up visits in 2015, teachers and students continued to praise the MEGATEC curriculum, although several teachers and students noted some minor redundancies and sequencing problems in the curriculum's modules.

Technical degrees may give students an advantage in finding a job after secondary school graduation. During follow-up visits, students said most employers in the region preferred technical graduates—even for entry-level customer service positions—and that general degree graduates often had great difficulty finding a job. This finding suggests that FOMILENIO investments in expanding technical offerings in the Northern Zone, combined with MINED's efforts to offer scholarships to incentivize enrollment in these programs, could improve students' chances of employment following secondary school.

2. Capable educators

MINED provides teachers with some technical training, but there appears to be no formal technical training program. In recent years, MINED has partnered with universities to provide secondary teachers with technical instruction. For example, the Universidad de Don Bosco, a technical university based in San Salvador, trains some secondary teachers in the Northern Zone in software and electronics. In follow-up interviews in 2015, however, principals and teachers noted that they had attended MINED trainings in the past few years, but these trainings were not technical—and did not help reinforce technical competencies. One teacher said, "Since FOMILENIO ended, the teachers meet with the principal, but there haven't been formal training sessions. MINED says they have a training plan, but there hasn't been any." In an interview, MINED representatives said they would like to provide more technical training in the region, but they have few resources to do so. A lack of consistent, formal training for technical programs poses a threat to maintaining a cadre of capable teachers.

Students reported some teacher deficiencies across general and technical programs. According to secondary students in the focus groups, most teachers have a strong grasp of the subject material, but often they don't have strong teaching skills. Other students complained that teachers were not well-prepared for some lessons and that they often presented students with documents to copy (instead of using active teaching techniques). Other students noted that teachers often fail to impose discipline in the classroom. One student said, "The kids come and go, and some sleep right in class."

Some students and principals called attention to stand-out teachers. During focus groups in 2015, students mentioned teachers who had a talent for teaching, particularly in explaining difficult concepts in simple terms. Some principals highly praised teachers as well, often for going above and beyond their core teaching responsibilities. One principal said, "One of the teachers has organized the students to work with a cooperative that he formed—they go around [and] talk to mayor's offices—they offer tourism packages that could one day grow into more jobs."

3. Continued enrollment in secondary schools

Enrollment dipped in the post-compact period. After FOMILENIO secondary scholarships ended in 2012, MINED fulfilled its commitment to fund second- and third-year secondary school scholarships until the last cohort of FOMILENIO scholarship recipients finished secondary school in 2014. However, MINED did not make new scholarships available to incoming first-year students at strengthened schools in 2013 and 2014—it only renewed existing scholarships. Partly as a result of this, enrollment at the 20 strengthened schools waned such that total enrollment in 2014 was comparable to 2010—the first year of secondary school strengthening and widespread scholarships.

A 2015 round of MINED scholarships for secondary education may help stabilize enrollment in the region. MINED is currently funding 458 need-based first-year scholarships in the 17 technical schools for general and technical programs, at $400 per student (equal to the FOMILENIO scholarship). These scholarships go primarily to students in technical programs, including those linked to the MEGATEC program. The program is administered in cohorts, meaning that all available scholarship funds in 2016 and 2017 will cover the same students who

receive scholarships in 2015. MINED's continued investment in scholarships to support technical education in the region is a positive development, but its total number of first-year scholarships from 2015 to 2017 (458) falls far below the number of first-year FOMILENIO scholarships awarded from 2010 to 2012 (3,259). It also appears that at least some scholarships were awarded to students after they began the school year. If scholarships are awarded only to students who have already enrolled in 10th grade, they will likely have a smaller effect on enrollment than had they been awarded to needy students finishing 9th grade who might not be able to continue their education otherwise.

4. Maintenance of the new facilities and equipment

Most new school infrastructure is in good working condition, with some exceptions. In the 2015 follow-up visits, it appeared that most new classrooms and computer labs constructed with FOMILENIO funds were being used for their intended purpose, except for some nonfunctioning bathrooms and a laboratory that was being used for storage. Students in the tourism program reported that all items donated by FOMILENIO still worked, including helmets, repelling equipment, and GPS units. However, students studying civil engineering complained that some machinery was broken and that they lacked some materials required to complete modules—for example, pH meters.

Schools need an infusion of funds to replace computers. School principals, teachers, and students all noted the need to replace FOMILENIO-funded computers, which are nearing the end of their lifespan. MINED provides schools with funds to maintain computers and other equipment, but there are no ministry funds for technology purchases. As a result, schools must rely almost exclusively on donations for computers, TVs, and other technology. In an interview in 2015, MINED staff emphasized that as part of the FOMILENIO intervention, principals in the Northern Zone obtained useful skills in fundraising and community development that they should use to find alternative funding for new computers. During site visits, school principals described their efforts to secure funding for new computers through other means—particularly through foreign embassies and foundations—but they reported little success so far.

5. Leadership and financial support from MINED

MINED appears committed to continuing secondary scholarships in the region and supporting strengthened schools, but its dedicated staff are limited. Continued government support—and particularly MINED support—is necessary for sustain secondary schools' enrollment and degree programs. As of mid-2015, MINED had several staff assigned to provide follow-up work on FOMILENIO school-strengthening investments in the Northern Zone, including scheduling training and technical visits and coordinating a new round of scholarships in the region. However, only two or three people were assigned to these tasks, and they devoted only a portion of their time to them. As a result, there appears to be a limit to MINED's continued involvement with schools in the region, primarily due to staffing constraints.

B. Sustainability of ITCHA/MEGATEC investments

1. A sound, demand-based curriculum

Stakeholders supported the institute's move to a competency-based curriculum. Students and teachers alike praised the new MEGATEC degree at ITCHA and its linked

secondary schools. Students noted that their group and individual projects were interesting, and they enjoyed the program's technical visits and hands-on practice. According to ITCHA teachers, the school's conversion to a MEGATEC improved education in the traditional programs, as non-MEGATEC teachers found more opportunities to provide their students with practical, hands-on application of key concepts. The MEGATEC approach also generated interest in more hands-on practice among students of the traditional programs—particularly marketing students.

ITCHA updates the MEGATEC curriculum periodically and recently converted all its degree programs to the competency-based model. As of 2015, ITCHA staff were updating their agroindustry and tourism programs, as well as overhauling their marketing and computer programs, to employ a competency-based teaching approach. These updates required intense consultations with businesses, teachers, and former students, as well as substantial changes to core competencies and modules in the curriculum. For example, ITCHA staff have plans to reorient the tourism program to include hotel services, based on growth in the hospitality industry. These adjustments appear to be well-timed, given the relatively low employment rates of students who studied alternative tourism at ITCHA. Although teachers at one linked secondary school claimed the curriculum change will be disruptive to teaching, these changes may make the curriculum more responsive to current labor market demand.

2. Capable educators

MINED's hiring process resulted in the replacement of two highly trained teachers. At one linked secondary school, students and teachers reported that two CIDE-trained civil engineering teachers had been replaced in 2013 due to competition for their teaching spots. MINED opened the spots to competition, and two candidates with more experience won the spots. Students and teachers said this was a negative development, given that the newly hired teachers had no prior knowledge of the degree program's modules, and instruction suffered as a result. One student said, "The teachers that were here before—they were here for about four years—they were really good. Then they got rid of them." Teachers also said replacing the CIDE-trained teachers was a poor use of FOMILENIO resources spent to train them.[45]

Students expressed a range of opinions on their teachers' capabilities during site visits in 2015. In focus groups in 2015, students' assessments of their teachers were mixed: some students highlighted cases of stand-out teachers who were capable of modifying their explanations when students didn't understand; others complained that some teachers had technical deficiencies. One secondary student said, "Some teachers have a general idea of the material, but they don't go into depth, and we're left with a lot of questions." In addition, ITCHA students mentioned that some teachers did not know how to operate key machinery components, and that instruction suffered as a result. In part, these criticisms were directed at teachers who did not complete the original CIDE training in 2009 and 2010, but were contracted in recent years.

ITCHA administrators expressed confidence in their training programs, but teachers and students gave contrary opinions. ITCHA is in charge of training its teachers as well as

[45] A FOMILENIO representative recalled that the replacement of these teachers was regrettable, and that FOMILENIO and CIDE staff had called several meetings with MINED leadership to avoid the situation.

linked MEGATEC teachers, and they request training sessions when needed, either from MINED or from other sources. In addition, MINED has standard teacher training and quality control processes across all the MEGATECs. In follow-up interviews, ITCHA staff expressed confidence that they provide their teachers with the necessary training and follow-up, including technical and didactic training and follow-up. However, ITCHA teachers reported participating in general trainings but not many technical trainings. Overall, ITCHA teachers expressed a desire for more systematic technical training over the course of the year. In addition, a primary recommendation of surveyed ITCHA students was to improve teacher training, particularly with respect to technical modules.

3. Continued enrollment in ITCHA and feeder schools

Student enrollment at ITCHA seems to have stabilized in the last two years, despite decreases in recent years linked to discontinued FOMILENIO scholarships. According to ITCHA administrators, 2011 and 2012 had the highest number of graduates because the proportion of students with scholarships was at an all-time high at over 90 percent of all students. Although the number of available scholarships has decreased in recent years, over 70 percent of students currently have scholarships from MINED, ITCHA, or other sources. For example, as of late 2015, MINED had 350 active scholarships at ITCHA, and another foundation, Gloria de Kriete, funds multiple scholarships per year. This high rate of scholarships is essential to maintain ITCHA enrollment. Currently, it appears that these scholarships will continue into the future.

Enrollment from the linked tourism program has flagged in recent years, but enrollment from linked engineering program is healthy. ITCHA enrollment depends heavily on the pipeline of engineering and tourism students from the four linked schools in the region. In recent years, it doesn't appear that ITCHA can anticipate a size cohort of tourism students enrolling in their second year. However, they can anticipate a sustained supply of civil engineering students enrolling in their second year, based on the popularity of the program in its two linked programs.

Several university equivalency agreements are now in place. In mid-2015, ITCHA administrators noted that they had recently secured academic equivalency agreements with several universities in the country, including a nearby polytechnic institute, the Instituto Tecnologico Centroamericano (ITCA), and a technical university in Honduras. These linkages could have a positive effect on enrollment in future years, as they give students the option to pursue university studies after attending ITCHA.

4. Maintenance of the new facilities and equipment

New classrooms and labs are still operational, but ITCHA is already experiencing space constraints. In mid-2015, ITCHA installations—including its classrooms, science labs, bathrooms, cafeteria, and auditorium—are in good working order. However, ITCHA administrators noted that they are already experiencing space constraints, particularly given that they introduced a new agricultural degree program in 2012 and have moved to a competency-based curriculum for all degree programs. In mid–2015, ITCHA administrators were in discussions with a nearby technical institute involving a space-sharing arrangement.

FOMILENIO-donated computers are almost obsolete, but ITCHA is using some set-aside funds to buy new computers. Similar to strengthened secondary schools, ITCHA staff reported that their computers are almost six years old and near the end of their useful life. Starting in early 2016, they are going to replace some portion—perhaps 30 percent—of the FOMILENIO-financed computers. The purchases can be financed with ITCHA's internal fund, which is funded by the training sessions and events they administer.

5. Leadership and financial support

MINED is strongly committed to maintaining and expanding MEGATECs. During follow-up interviews, MINED noted that the current presidential administration is committed to supporting existing MEGATECs and expanding the MEGATEC model to three more post-secondary institutes. This appears to be a positive development for the future of ITCHA and similar MEGATECs throughout the country.

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REFERENCES

Angrist, Joshua, Daniel Lang, and Philip Oreopoulos. "Lead Them to Water and Pay Them to Drink: An Experiment with Services and Incentives for College Achievement." NBER Working Paper No. 12790, 2006.

Angrist, Joshua, and Victor Lavy. "Does Teacher Training Affect Pupil Learning? Evidence From Matched Comparisons in Jerusalem Public Schools." *Journal of Labor Economics*, vol. 19, no. 2, 2001, pp. 343–369.

Behrman, Jere R., Susan W. Parker, and Petra E. Todd. "Long-Term Impacts of the Oportunidades Conditional Cash Transfer Program on Rural Youth in Mexico." Discussion Paper 122. Göttingen, Germany: Ibero-America Institute for Economic Research, 2005.

Blair, Randall, Larissa Campuzano, and Raquel af Ursin. "The Chalatenango Technical Institute (ITCHA) Strengthening Intervention of the Human Development Project, El Salvador. Interim Implementation Report: Implementation from 2007 to 2011." Final draft report. Washington, DC: Mathematica Policy Research, October 2013.

Blair, Randall, Alexander Persaud, and Larissa Campuzano. "Baseline Comparison of Middle School Data, MCC-El Salvador." Princeton, NJ: Mathematica Policy Research, March 2010.

Bressoux, Pascal, Francis Kramarz, and Corinne Prost. "Teachers' Training, Class Size and Students' Outcomes: Learning From Administrative Forecasting Mistakes." *The Economic Journal*, vol. 119, no. 536, 2009, pp. 540–561.

Campuzano, Larissa, Lorenzo Moreno, and Randall Blair. "Final Impact Evaluation Design for Technical Middle School Activity. Memorandum." Princeton, NJ: Mathematica Policy Research, October 2010a.

Campuzano, Larissa, and Randall Blair. "Final Impact Evaluation Design for the Scholarship Activity. Memorandum." Princeton, NJ: Mathematica Policy Research, May 2010b.

Campuzano, Larissa, and Alexander Persaud. "Baseline Comparison of Administrative Data for the Middle School Strengthening Program, MCC-El Salvador. Memorandum." Princeton, NJ: Mathematica Policy Research, March 2011.

Campuzano, Larissa, Seth Morgan, and Randall Blair. "Impact Evaluation of the Secondary School Strengthening Intervention: Interim Results, 2010 to 2011. Memorandum ESVED2-31rev." Princeton, NJ: Mathematica Policy Research, May 2013a.

Campuzano, Larissa, Randall Blair, Lorenzo Moreno, and Seth Morgan. "Impact Evaluation of the Scholarship Intervention for Secondary Schools: Interim Results, 2010 to 2011. Memorandum ESVED2-29rev." Princeton, NJ: Mathematica Policy Research, May 2013b.

Campuzano, Larissa, and Randall Blair. Evaluation of the Formal Technical Education Sub-Activity of the Human Development Project, El Salvador. Princeton, NJ: Mathematica Policy Research, May 2014.

Cohen, Jacob. Statistical Power for the Behavioral Sciences (2nd ed.). Hillsdale, NJ: Erlbaum Associates, 1998.

Dehejia, R., and S. Wahba. "Causal Effects in Nonexperimental Studies: Reevaluating the Evaluation of Training Programs." *Journal of the American Statistical Association*, vol. 94, no. 448, 1999, pp. 1053–1062.

Dehejia, R., and S. Wahba. "Propensity Score Matching Methods for Nonexperimental Causal Studies." *The Review of Economics and Statistics*, vol. 84, no. 1, 2002, pp. 151–161.

Duarte, Jesús, Carlos Gargiulo, and Martín Moreno. "School Infrastructure and Learning in Latin American Elementary Education: An Analysis Based on the SERCE." Inter-American Development Bank, 2011.

Duflo, Esther, Pascaline Dupas, and Michael Kremer. "Returns to Secondary Schooling in Ghana." Project page on Innovations for Poverty Action website. 2013. Available at http://www.poverty-action.org/project/0077. Accessed November 14, 2013.

Fiszbein, Ariel, and Norbert Schady. "Conditional Cash Transfers. Reducing Present and Future Poverty." Washington, DC: The World Bank. 2009.

FOMILENIO Monitoring and Evaluation Plan. Updated January 2013. Available at https://assets.mcc.gov/documents/ME_Plan_-_SLV_-_V7_-_Post-Compact.pdf.

Jacob, Brian A., and Lars Lefgren. "The Impact of Teacher Training on Student Achievement: Quasi Experimental Evidence from School Reform Efforts in Chicago." *The Journal of Human Resources*, vol. 39, no. 1, Winter 2004, pp. 50–79. Available at http://jhr.uwpress.org/content/XXXIX/1/50.short.

Lopez-Acevedo, Gladys. "Learning Outcomes and School Cost-Effectiveness in Mexico." World Bank Policy Research Working Paper No. 2128. Washington, DC: The World Bank, May 1999.

López-Acevedo, Gladys. "An Alternative Technical Education System in Mexico: A Reassessment of CONALEP." Washington DC: The World Bank, December 2001.

Patrinos "Mexico—Determinants of Learning Policy Note." World Bank Report No. 31842-MX. Washington, DC: The World Bank, July 21, 2005. Available at https://openknowledge.worldbank.org/bitstream/handle/10986/8284/31842.txt?sequence=2.

Rosenbaum, P.R., and D.B. Rubin. 1983. "Reducing Bias in Observational Studies Using Subclassification on the Propensity Score." *Journal of the American Statistical Association*, vol. 79, no. 387, 1983, pp. 516–524.

Rosenbaum, P.R., and D.B. Rubin. 1985. "Constructing a Control Group Using Multivariate Matched Sampling Methods that Incorporate the Propensity Score." *The American Statistician*, vol. 39, no. 1, 1985, pp. 33–38.

Smith, J.A., and P.E. Todd. 2005. "Does Matching Overcome LaLonde's Critique of Nonexperimental Estimators?" *Journal of Econometrics*, vol. 125, no. 1–2, 2005, pp. 305–353.

UNICEF. "Defining Quality in Education." Presented at the meeting of The International Working Group on Education Florence, Italy, June 2000. Working Paper Series, Education Section, Programme Division, United Nations Children's Fund, New York, NY.

What Works Clearinghouse. "Procedures and Standards Handbook." Version 2.0, December 2008. Available at http://ies.ed.gov/ncee/wwc/pdf/reference_resources/wwc_procedures_v2_standards_handbook.pdf.

Zanin, M. "FOMILENIO/MCC Human Development Student Impact Evaluation Survey of the Formal Education Activity." 2010.

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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 Sesori"	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	Scholar-ships offered	Randomization of scholarships	MEGATEC	Scholar-ships available	Treat-ment	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			
10	Instituto Nacional de Aguilares	Yes	Yes	Comercial Secretariado		No	No		0	0	
				Comercial Contaduria		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	No	No		0	0	
				Comercial Contaduria	Comercio Justo	Yes	Yes		60	60	21

No.	School name	Gen.	Tech.	Technical programs	Diplomas	Scholar-ships offered	Randomizatio n of scholarships	MEGATEC	Scholar-ships available	Treat-ment	Control
				General		No	No		0	0	
15	Complejo Educativ o General Manuel Jose Arce	Yes	Yes	Comercial Secretariado		Yes	No		28	0	
				Comercial Contaduria		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	No	No		0	0	
				Comercial Contaduria	Desechos	Yes	No		55	0	
				General	Orgánicos y Sólidos	Yes	No				
18	Instituto Nacional de Osicala	Yes	Yes	Comercial Secretariado	Promotor	Yes	Yes		60	60	33
				Comercial Contaduria	Comunitario	Yes	Yes				
				General		No	No		0	0	
19	Instituto Nacional Anamoros	Yes	Yes	Comercial Secretariado	Transf ormación	No	No		0	0	
				Comercial Contaduria	de Leche	No	No		0	0	
				General		Yes	Yes		45	45	10
20	Instituto Nacional de Chapeltique	Yes	Yes	Comercial Secretariado	Agrof oresteria	No	No		0	0	
				Comercial Contaduria		No	No		0	0	
				General		Yes	Yes		40	40	24
TOTAL									**1,000**	**515**	**236**

Table A.3. Characteristics of respondents and non-respondents

	Respondents	Non-respondents	Difference	*p*-value
Age (years)	16.1	16.3	-0.3	0.08
Female (%)	59	48	12	0.02
Annual household income (in USD)	155	145	11	0.22
Household size	5.7	5.5	0.2	0.44
Grade average	7.8	7.7	0.1	0.11
Annual expenditures (in USD)	148	139	9	0.23
Urban (%)	15	8	7	0.02
Sample sizes	**604**	**147**	**457**	

Source: Data from 2009 scholarship application form (FEPADE's records).

APPENDIX B

ADDITIONAL FINDINGS FOR STRENGTHENING OF SECONDARY SCHOOLS INTERVENTION

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Table B.1. Impacts of secondary school strengthening on enrollment (number of students)

Outcome	Treatment			Comparison			Adjusted difference	*p*-value
	Adjusted mean	SD	N	Mean	SD	N		
Enrollment in all grades								
General 2010	99	168	20	101	76	20	-2	0.88
Technical 2010	185	248	20	164	201	20	21	0.20
General 2011	105	158	20	105	82	20	0	0.99
Technical 2011	205	269	20	169	220	20	36*	0.03
General 2012	105	145	20	112	92	20	-7	0.73
Technical 2012	217	276	20	171	213	20	46*	0.01
Enrollment in 10th grade								
10th grade General 2010	59	94	20	49	36	20	10	0.20
10th grade Technical 2010	78	94	20	67	78	20	11	0.24
10th grade General 2011	56	81	20	60	50	20	-5	0.66
10th grade Technical 2011	88	105	20	69	90	20	19*	0.02
10th grade General 2012	59	83	20	58	50	20	1	0.94
10th grade Technical 2012	90	105	20	66	75	20	24*	0.01
Enrollment in 11th grade								
11th grade General 2010	42	76	20	52	41	20	-10	0.08
11th grade Technical 2010	59	84	20	50	65	20	8	0.12
11th grade General 2011	51	78	20	44	34	20	7	0.30
11th grade Technical 2011	62	83	20	51	65	20	12*	0.05
11th grade General 2012	48	63	20	54	44	20	-6	0.48
11th grade Technical 2012	72	97	20	57	78	20	15*	0.03
Enrollment in 12th grade								
12th grade Technical 2010	50	73	20	47	59	20	3	0.60
12th grade Technical 2011	55	84	20	49	67	20	6	0.30
12th grade Technical 2012	56	76	20	48	64	20	8	0.24

Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from 2006-2008 Final Enrollment, School Census.

Note: Enrollment is aggregated at the school level from student level records. Treatment means are regression adjusted using ordinary least squares to account for the average enrollment across the baseline years (2006, 2007, and 2008). Comparison means are unadjusted. Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Table B.2. Impacts of secondary school strengthening on dropout rates (percentages)

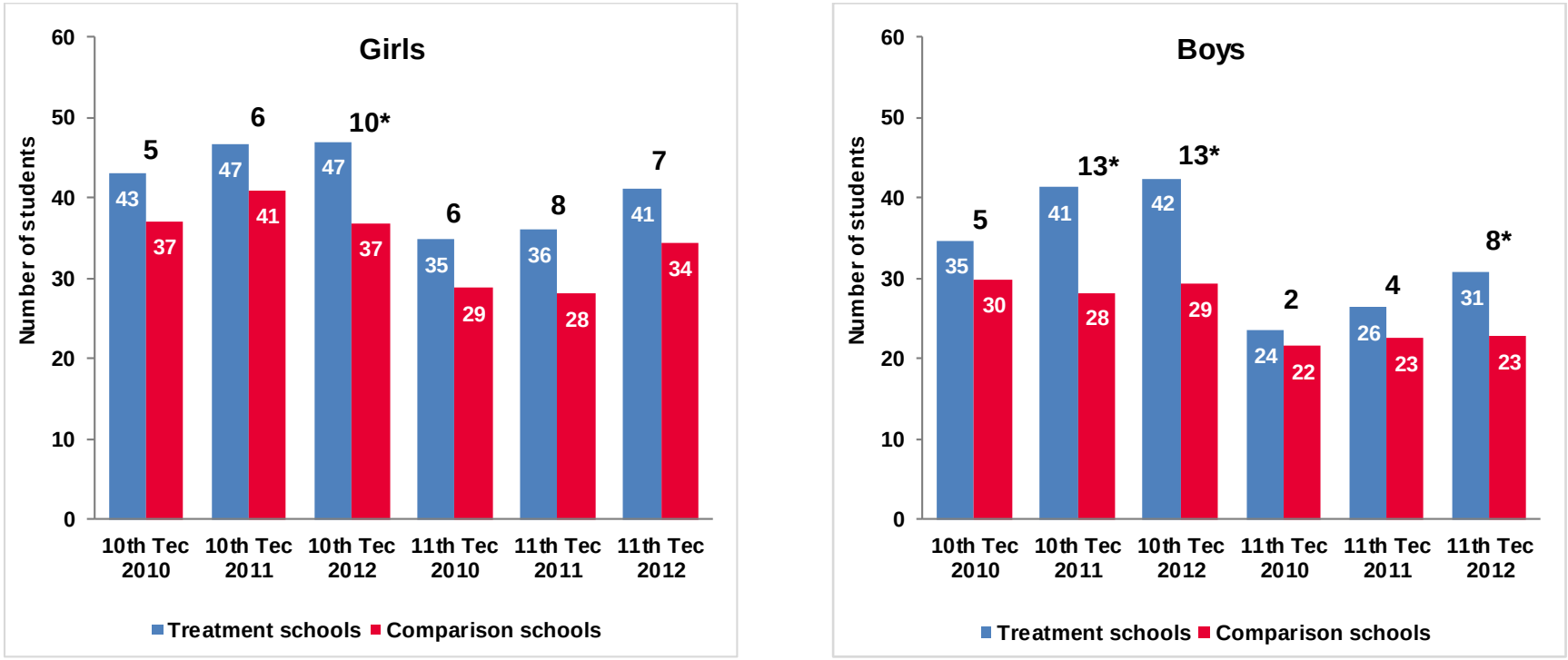
Outcome	Treatment group			Control group			Adjusted difference	*p*-value
	Adjusted mean	Number of schools	Number of students	Mean	Number of schools	Number of students		
2010								
Dropped out of 10th grade	13	20	3,561	12	20	2,317	0	0.88
Dropped out of 10th general	14	18	1,556	13	19	979	1	0.72
Dropped out of 10th technical	11	16	2,005	12	16	1,338	-1	0.70
Dropped out of 11th grade	4	20	2,750	5	20	2,035	0	0.71
Dropped out of 11th general	5	18	1,164	7	19	1,031	-2	0.33
Dropped out of 11th technical	4	16	1,586	3	16	1,004	2	0.32
Dropped out of 12th technical	1	16	1,365	1	16	935	1	0.11
2011								
Dropped out of 10th grade	11	20	3,697	9	20	2,591	2	0.40
Dropped out of 10th general	13	18	1,437	12	20	1,209	1	0.78
Dropped out of 10th technical	10	16	2,260	7	16	1,382	3	0.10
Dropped out of 11th grade	5	20	2,982	4	20	1,909	1	0.65
Dropped out of 11th general	6	18	1,319	4	20	893	2	0.19
Dropped out of 11th technical	4	16	1,663	5	16	1,016	0	0.88
Dropped out of 12th technical	1	16	1,526	1	16	975	1	0.17

Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from 2008 Final Enrollment, School Census.

Note: Treatment means are regression adjusted to control for the baseline dropout rates in 2008, using a random effects specification to account for students clustered in schools. Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Figure B.1. Impacts of secondary school strengthening on enrollment, by gender (number of students)

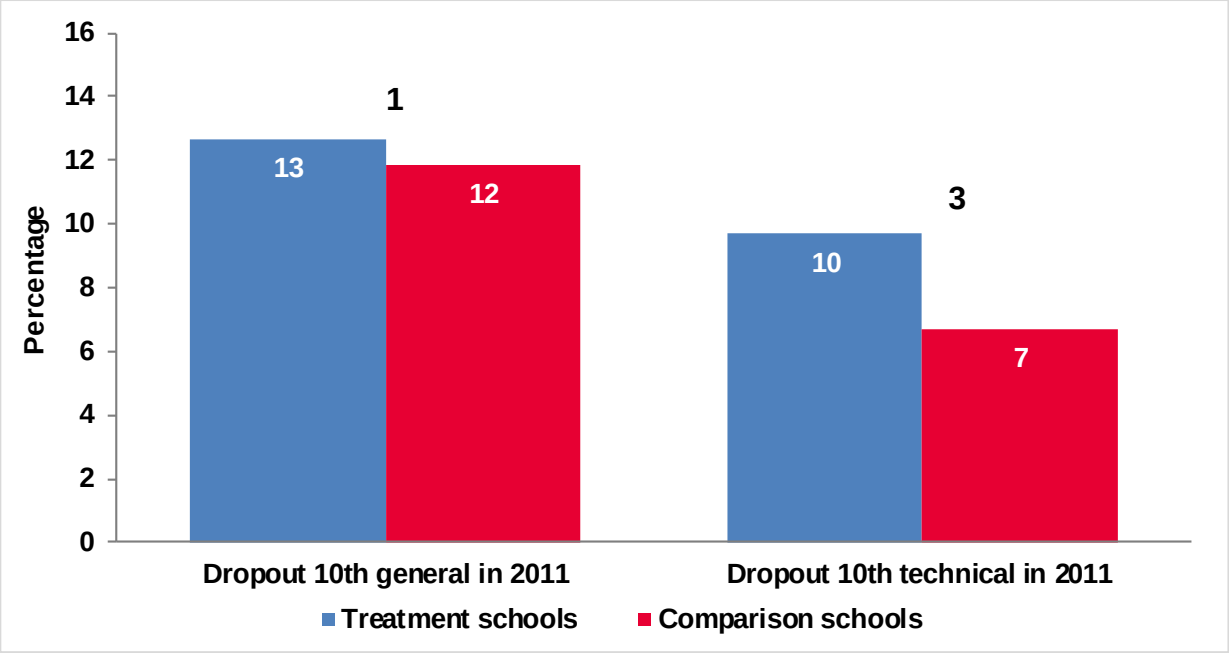


Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from 2006-2008 Final Enrollment, School Census.

Note: Enrollment is aggregated at the school level using student level records. Treatment means are regression adjusted using ordinary least squares. We included as the covariate the average enrollment across the years 2006, 2007, and 2008 to account for baseline differences in enrollment. Comparison means are unadjusted. Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Figure B.2. Impacts of secondary school strengthening on dropout rates for the cohort of students enrolled in grade 10 in 2011 (percentages)

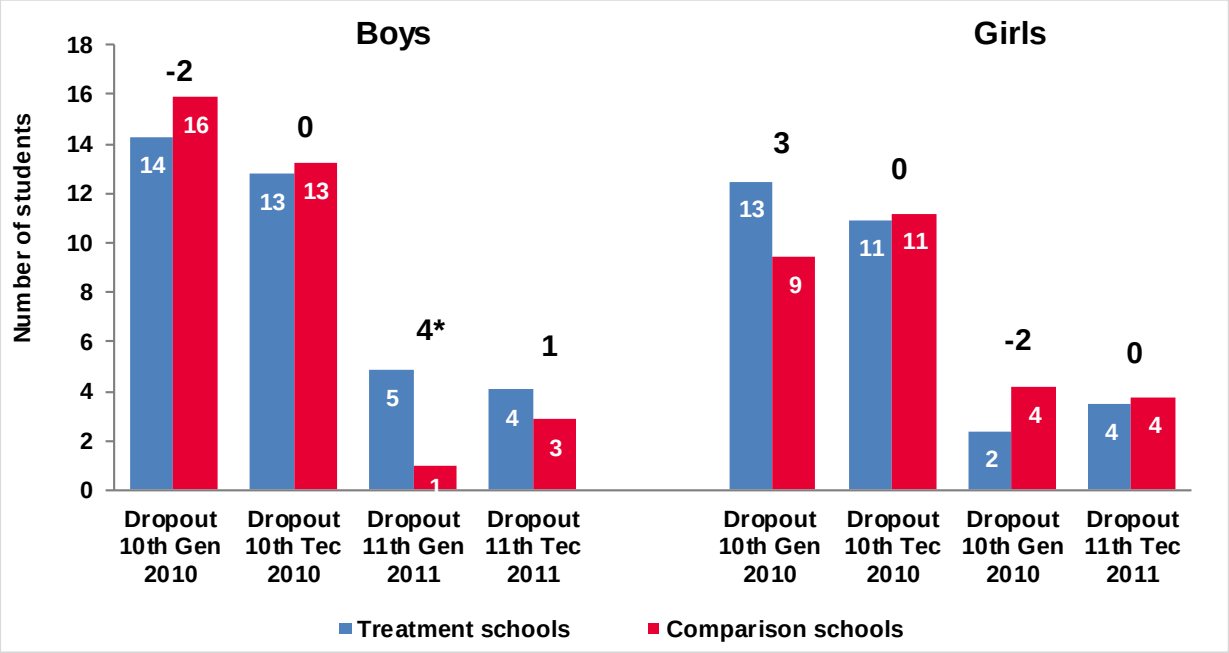


Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from 2008 Final Enrollment, School Census.

Note: Results are adjusted for students clustered within schools. Treatment means are regression adjusted using Generalized Least Squares (GLS) random effects to account for the average drop-out rate across the baseline year (2008). Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Figure B.3. Impacts of secondary school strengthening on dropout rates for the cohort of students enrolled in grade 10 in 2010, by gender (percentages)



Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from 2008 Final Enrollment, School Census.

Note: Results are adjusted for students clustered within schools. Treatment means are regression adjusted using Generalized Least Squares (GLS) random effects to account for the average dropout rate across the baseline year (2008). Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Table B.3. Impacts of secondary school strengthening on repeating grade in the same program in 2011 and 2012 (percentages)

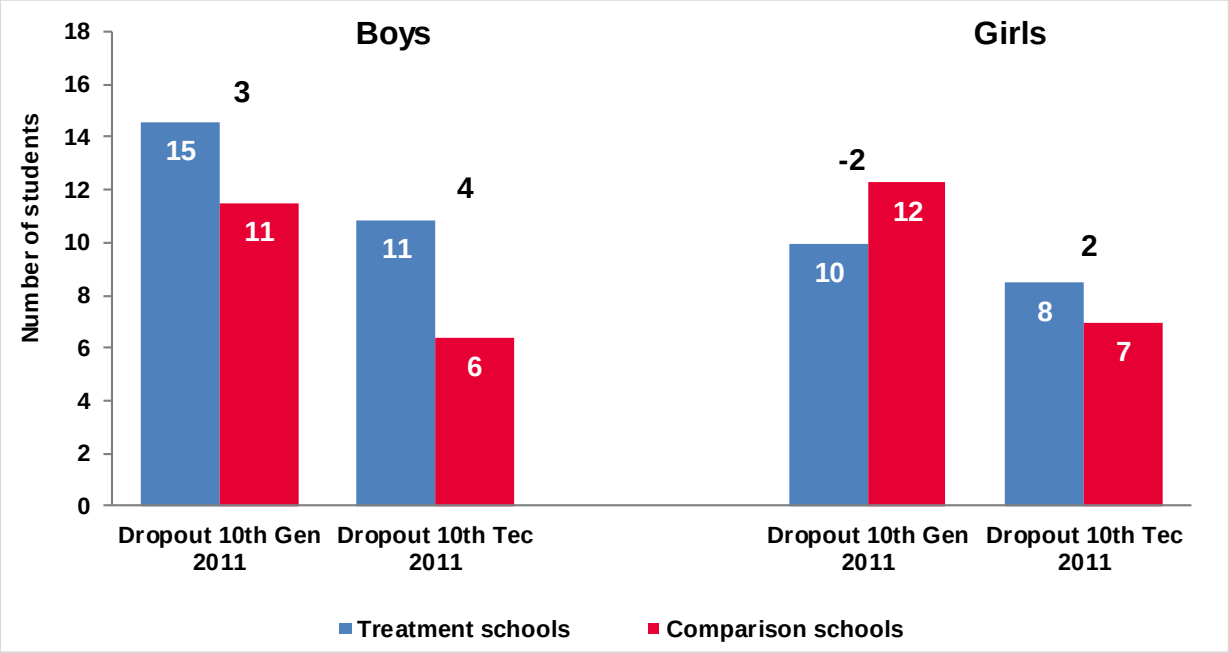
Outcome	Treatment schools			Comparison schools			Adjusted difference	*p*-value
	Adjusted mean	Number of schools	Number of students	Mean	Number of schools	Number of students		
Repeat grade in 2011 for those enrolled in 2010								
Repeat 10th grade	3	20	3,561	3	20	2,317	0	0.81
Repeat 10th grade general	4	18	1,556	6	19	979	-2	0.41
Repeat 10th grade technical	2	16	2,005	1	16	1,338	1	0.30
Repeat 11th grade	1	20	2,750	2	20	2,035	-1	0.18
Repeat 11th grade general	2	18	1,164	2	19	1,031	-1	0.54
Repeat 11th grade technical	0	16	1,586	1	16	1,004	-1	0.22
Repeat grade in 2012 for those enrolled in 2011								
Repeat 10th grade	3	20	3,697	2	20	2,591	1	0.56
Repeat 10th grade general	4	18	1,437	4	20	1,209	0	0.81
Repeat 10th grade technical	3	16	2,260	1	16	1,382	1	0.38
Repeat 11th grade	2	20	2,982	1	20	1,909	1	0.27
Repeat 11th grade general	3	18	1,319	2	20	893	2*	0.01
Repeat 11th grade technical	1	16	1,663	1	16	1,016	0	0.37

Source: School records at the student level for 2010, 2011, and 2012.

Note: Results are adjusted for students clustered within schools. No baseline characteristics are used because data at baseline are not available. Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Figure B.4. Impacts of secondary school strengthening on dropout rates for the cohort of students enrolled in grade 10 in 2011, by gender (percentages)

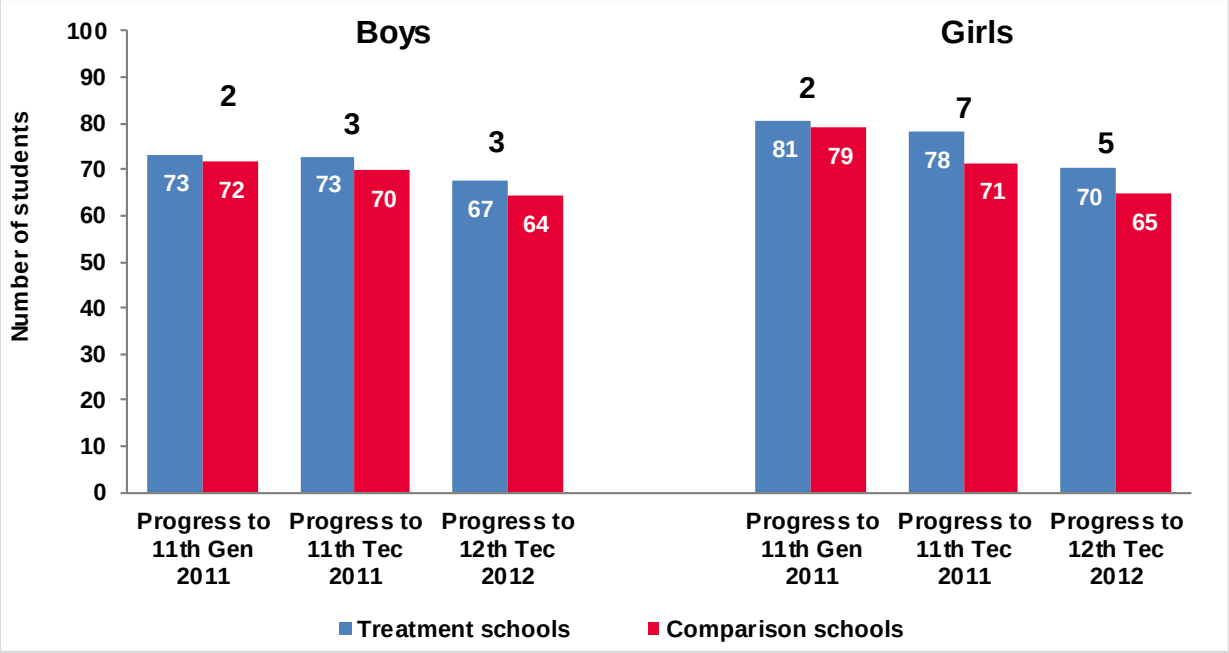


Source: School records at the student level for 2010, 2011, and 2012. Baseline controls from 2008 Final Enrollment, School Census.

Note: Results are adjusted for students clustered within schools. Treatment means are regression adjusted using Generalized Least Squares (GLS) random effects to account for the average drop-out rate across the baseline year (2008). Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Figure B.5. Impacts of secondary school strengthening on progressing on time in the same program for the cohort that enrolled in grade 10 in 2010, gender (percentages)

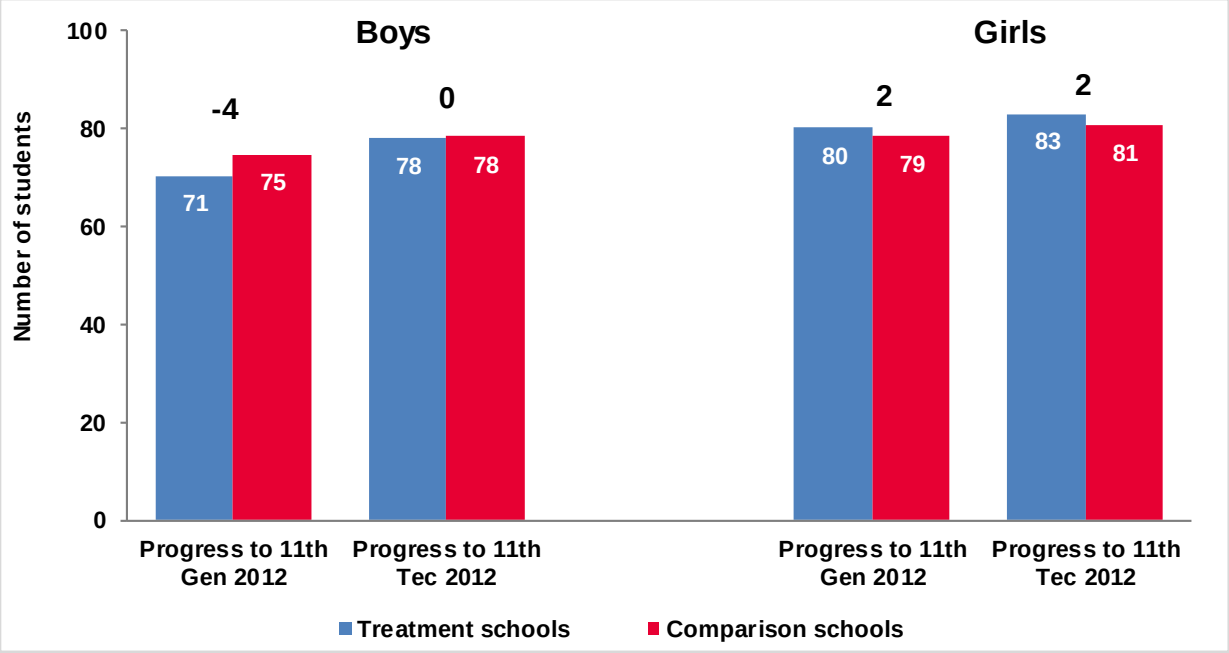


Source: School records at the student level for 2010, 2011, and 2012.

Note: Results are adjusted for students clustered within schools. No baseline characteristics are used because data at baseline are not available. Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Figure B.6. Impacts of secondary school strengthening on progressing on time in the same program for the cohort that enrolled in grade 10 in 2011, by gender (percentages)

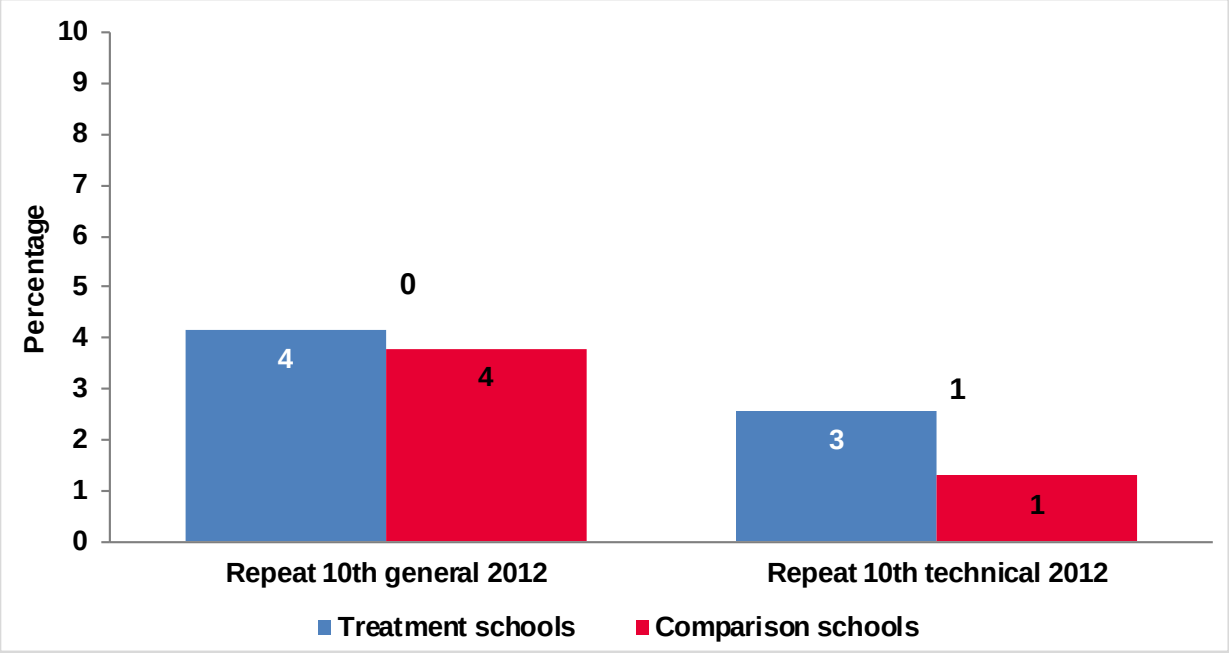


Source: School records at the student level for 2010, 2011, and 2012.

Note: Results are adjusted for students clustered within schools. No baseline characteristics are used because data at baseline are not available. Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Figure B.7. Impacts of secondary school strengthening on repeating grade in the same program for the cohort that enrolled in grade 10 in 2011 (percentages)

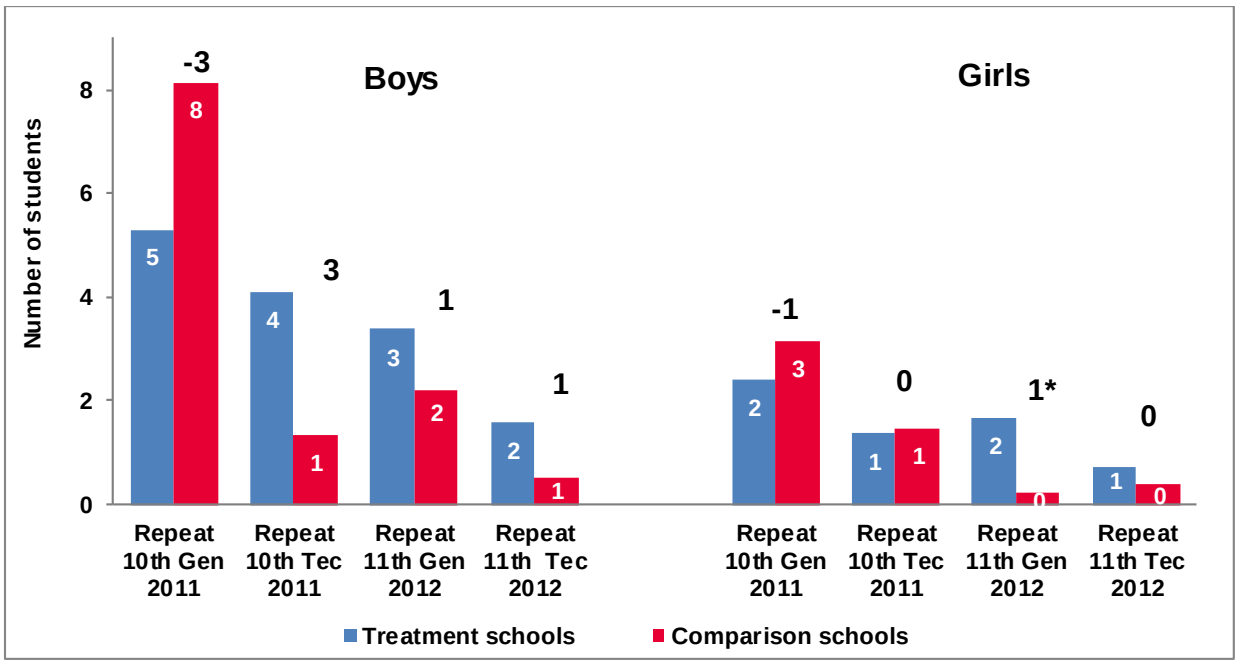


Source: School records at the student level for 2010, 2011, and 2012.

Note: Results are adjusted for students clustered within schools. No baseline characteristics are used because data at baseline are not available. Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Figure B.8. Impacts of secondary school strengthening on repeating grade in the same program for the cohort that enrolled in grade 10 in 2010, by gender (percentages)

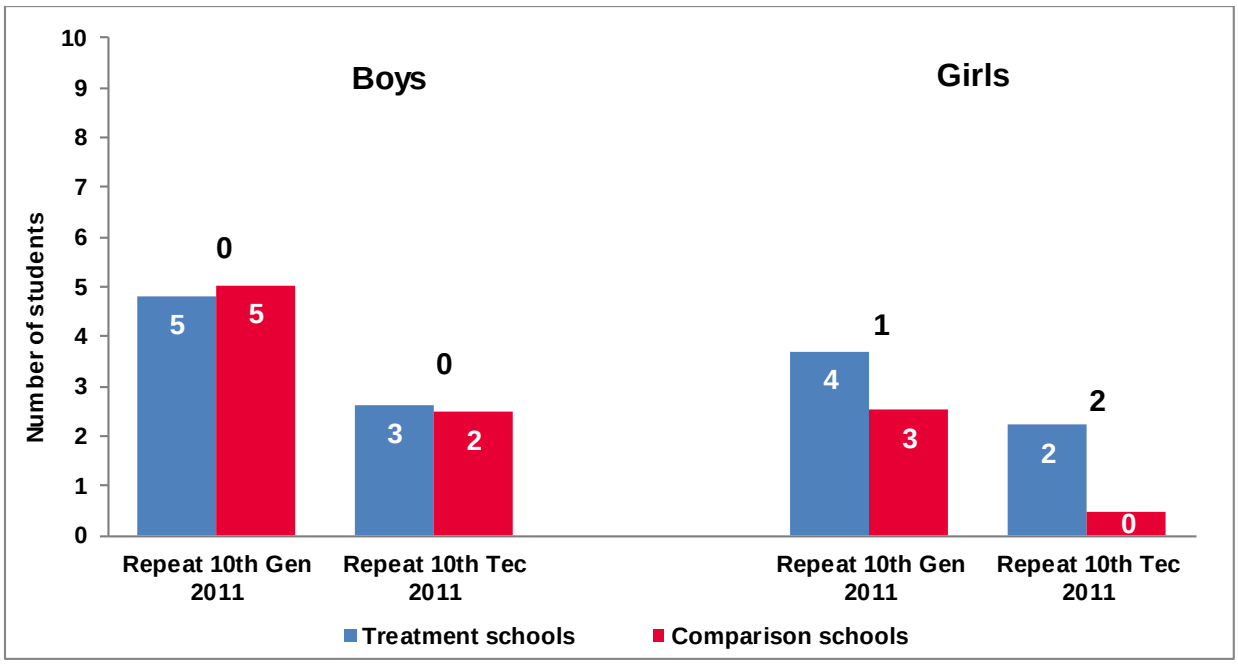


Source: School records at the student level for 2010, 2011, and 2012.

Note: Results are adjusted for students clustered within schools. No baseline characteristics are used because data at baseline are not available. Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Figure B.9. Impacts of secondary school strengthening on repeating grade in the same program for the cohort that enrolled in grade 10 in 2011, gender (percentages)



Source: School records at the student level for 2010, 2011, and 2012.

Note: Results are adjusted for students clustered within schools. No baseline characteristics are used because data at baseline are not available. Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Table B.4. Impacts of secondary school strengthening on progressing to 11th grade and changing from technical to general for cohorts 2010 and 2011 (percentages)

	Treatment schools			Comparison schools				
Characteristic	Adjusted mean	Number of schools	Number of students	Mean	Number of schools	Number of students	Adjusted difference	*p*-value
Progress to the next grade and change program in 2011 for 2010 cohort								
Progress to 11th grade and change from technical to general	0	16	2,005	4	16	1,338	-4*	0.00
Progress to next grade and change program in 2012 for 2011 cohort								
Progress to 11th grade and change from technical to general	0	16	2,260	4	16	1,382	-3	0.12

Source: School records at the student level for 2010, 2011, and 2012.

Note: Results are adjusted for students clustered within schools. No baseline characteristics are used because data at baseline are not available. Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Table B.5. Impacts of secondary school strengthening on repeating grade and changing programs for cohorts 2010 and 2011 (percentages)

Characteristic	Treatment schools			Comparison schools			Adjusted difference	*p*-value
	Adjusted mean	Number of schools	Number of students	Mean	Number of schools	Number of students		
Repeat grade and change programs in 2011 for the cohort that enrolled in 10th grade in 2010								
Repeat 10th grade and change general to technical	2	18	1,556	0	19	979	1*	0.03
Repeat 10th grade and change technical to general	2	16	2,005	3	16	1,338	-1	0.27
Repeat grade and change program in 2012 for the cohort that enrolled in 10th grade in 2010								
Repeat 11th grade and change technical to general	1	16	2,005	1	16	1,338	0	0.88
Repeat grade and change program in 2012 for the cohort that enrolled in 10th grade in 2011								
Repeat 10th grade and change general to technical	0	18	1,437	0	20	1,209	0	0.09
Repeat 10th grade and change technical to general	2	16	2,260	1	16	1,382	1	0.06

Source: School records at the student level for 2010, 2011, and 2012.

Note: Results are adjusted for students clustered within schools. No baseline characteristics are used because data at baseline are not available. Comparison means are unadjusted. Note that not all schools offer both general and technical degree options, so the sample sizes refer to the number of schools offering that option (or program). Some adjusted differences do not equal treatment means minus comparison means, due to rounding.

* Impact estimate is statistically significant at the .05 level.

Table B.6. Number of students in the sample and response rates for 2013 survey

	Research sample	Treatment group	Comparison group
Number of students in the survey sample	1,429	863	566
Number of completed interviews	1,196	742	454
Response rate (%)	84	86	80

Source: Mathematica administrative data and follow-up survey conducted in 2013.

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APPENDIX C

MONITORING AND EVALUATION GOALS, FORMAL TECHNICAL EDUCATION SUB-ACTIVITY

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Appendix C.1. Table of monitoring and evaluation goals, Formal Technical Education Sub-Activity

Type	Indicator	Baseline (2006)	Compact Goal	Updated M&E Target[a]	Reported or Estimated Value[b] (2012/2013)	Discussion
Program Output	Secondary and post-secondary scholarships administered	NA	3,600	4,377: 3,445 secondary and 932 post-secondary	4,330: 3,409 secondary and 921 post-secondary	Goal combines secondary and post-secondary scholarships.
Program Output	Instructors trained or certified	NA	NA	500	566	This indicator includes teachers (378), administrative staff (148) and members of CDE (School Board of Directors: 40) from the 21 strengthened institutions, including ITCHA.
Program Output	Students enrolled in secondary schools in 2012	6,000 according to compact, 7,600 according to 2012 M&E plan	9,000	9,413	9,720 as reported in the ITT of 2012 (all students, including night and distance programs) 8,924 according to MINED census data from 2012 (students enrolled in regular day programs)	MINED census data reflects the number of students enrolled full-time, but not weekend and night students. This may explain a portion of the discrepancy with enrollment numbers in the ITT of 2012.
Program Output	ITCHA students enrolled in 2012	264 (from 2012 M&E plan)	1,100 ITCHA	540	613	
Key Benchmark	Secondary school graduation rate	71 percent of those that start secondary school	Not mentioned in compact	71 percent	91 percent of students enrolled in their last year of secondary school	The rate estimated in this study should not be interpreted as the graduation rate of those who started secondary school, which is what MCC intended with its M&E target of a 71 percent graduation rate.

Type	Indicator	Baseline (2006)	Compact Goal	Updated M&E Target[a]	Reported or Estimated Value[b] (2012/2013)	Discussion
Key Benchmark	ITCHA graduation rate	73 percent	Not mentioned in compact	73 percent	2011-2012 cohort: 85 percent 2012-2013 cohort: 87 percent	The graduation rate calculated in this study pertains to students who entered 2-year academic programs; it excludes students from linked schools who completed just one year at ITCHA. In 2012, these students had a graduation rate of nearly 100%.
Key Benchmark	Employment rate among secondary school graduates	50 percent according to compact; 66 percent according to 2012 M&E plan	50 percent	66 percent	34 percent	This study estimated employment one year after attending secondary school among technical and general students expected to graduate in late 2012 in FOMILENIO schools.
Key Benchmark	Employment rate of ITCHA graduates	70 percent	70 percent	70 percent	2011-2012 cohort: 53% 2012-2013 cohort: 62%	The higher employment rate of 2012-2013 cohort reflects, in part, a longer follow-up period of 1.5 years after attending ITCHA, compared 1 year for the 2011-2012 cohort.
Final Outcome	Incremental increase in secondary graduates' income (the comparison is to income with only a 9th grade education)	NA	37 percent	64 percent	Not calculated	The study did not collect data to calculate the income change as defined by MCC. However, we estimated that in FOMILENIO schools, among technical and general students who were projected to graduate in 2012, annual income at follow-up was $956 in the year following expected graduation.
Final Outcome	Incremental increase in income of ITCHA graduates (the comparison is to income with secondary education)	NA	42 percent	40 percent	Not calculated	The study did not collect data to calculate the income change as defined by MCC. However, ITCHA graduates' annual income at follow-up was $1,417 for the 2011-2012 cohort and

Type	Indicator	Baseline (2006)	Compact Goal	Updated M&E Target[a]	Reported or Estimated Value[b] (2012/2013)	Discussion
						$2,168 for the 2012-2013 cohort after 1 and 1.5 years of follow-up, respectively.

[a]Updated as of September 2012. NA = not applicable.

[b]In this column, we use values reported in the ITT of September 2012 for indicators that were not estimated in this study. In cases where this study collected data and estimated similar indicators, we report our estimates. The next column, discusses differences between the values estimated in this study and the ones defined by MCC.

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