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# CODING BOOTCAMPS FOR YOUTH EMPLOYMENT

## EVIDENCE FROM COLOMBIA, LEBANON, AND KENYA

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# EXECUTIVE SUMMARY

**Coding bootcamps are intensive short-term programs designed to train participants in programming skills to make them immediately employable (Meng 2013).** They combine characteristics of traditional vocational training programs with the intensity of military bootcamps for new recruits, intermingling socioemotional and tech skills learning in an intense and experiential manner, in what could be referred to as "skills accelerators." We refer to coding bootcamps in this report as the Ready-to-Work model. This model follows a structured process with three main characteristic features: 1) intense rapid-skills training, 2) experiential learning approach, and 3) curricula based on, and continuously adapting to, industry's demand. Depending on the organization, the model has yielded job placement rates ranging from 60 to 100 per cent (ITU 2016). Thus, coding bootcamps provide a mix of technical and practical skills directly connected to industry demand, making them a potentially effective tool for the requirements of the new tech-led economy. This makes coding bootcamps a potential tool for developing economies in building a talent pipeline ready to face disruptions in the employment and skills landscape arising from the so-called Fourth Industrial Revolution (The World Economic Forum 2016).

**To understand the potential of coding bootcamps for developing countries, the World Bank launched the Decoding Bootcamps initiative, the objective of which is four-fold**: (i) to assess the impact of coding bootcamps on local, young jobseekers to secure quick employment and income generation opportunities; (ii) to compare employment patterns, and employability in new-economy jobs, between bootcamp participants and those who have not received the training; (iii) to identify key success factors of coding bootcamps for emerging economies and devise a toolkit for designing a coding bootcamp from scratch based on an overview of existing tools and best-practice methods; and (iv) to inform policy makers in emerging markets on how to support the establishment, implementation, and growth of demand-driven rapid tech skills training to combat youth unemployment.

**The report addresses these objectives by presenting the findings from an impact evaluation of coding bootcamps in Medellín complemented with qualitative studies in Beirut (Lebanon) and Nairobi (Kenya) -three developing country cities-.** The studies followed different methodologies, namely qualitative focus groups in Beirut and Nairobi, and a randomized controlled trial (RCT) in Medellín. The selection of methodology took into account the different market conditions (for example, availability of sample size for the experiment timeline and/or immaturity of the bootcamp providers' market) in each location. All locations used the same baseline and final surveys, making findings complementary. Together, these three studies provide a good understanding of the impact of coding bootcamp programs in developing countries, beyond self-reporting figures.

**The findings from the three impact evaluations suggest that coding bootcamps may have three specific effects:**

1. **Employment:** Coding bootcamps do not have a particular impact on providing access to employment generically, but they may have an impact on providing access to high-quality jobs (particularly high-quality tech jobs).

2. **Business creation (self-employment):** Coding bootcamps may have a positive effect on business (that is, startup) creation for those with low incomes, suggesting that bootcamps could also be leveraged to provide tech-related self-employment for those segments of the population that may face job access structural barriers in developing countries.

3. **Education:** Coding bootcamps seem to support the completion of tertiary educational programs, suggesting that they could potentially play a complementary role and that there may be a need to incorporate some of its methodologies in existing tertiary educational programs.

**Coding bootcamps are not easy to implement in the context of developing countries, but they may be catalyzed with policy interventions.** In particular, it was found that: (i) bootcamp programs are difficult to implement and require links with potential employers, (ii) not all bootcamps are the same and quality has a significant impact on results, and, (iii) bootcamp programs can be catalyzed through policy intervention. Appendix D provides a guide for implementing bootcamp programs in developing countries, aiming to inform public policy interventions and bootcamp providers.

# ABBREVIATIONS

| | |
|---|---|
| **API** | Application Programming Interface |
| **BPO** | Business Process Outsourcing |
| **CAQDAS** | Computer Aided Qualitative Data Analysis Software |
| **CSS** | Cascading Style Sheets |
| **DANE** | National Administrative Department of Statistics (Colombia) |
| **EPM** | Empresas Públicas de Medellín (Medellín Public Enterprises) |
| **HTML** | HyperText Markup Language |
| **ICT** | Information and CommunicationTechnologies |
| **iOS** | iPhone Operating System |
| **IT** | Information Technology |
| **ITT** | Intent to Treat |
| **ITU** | International Telecommunication Union |
| **M&E** | Monitoring & Evaluation |
| **MNC** | Multinational Corporations |
| **MOOC** | Massive Open Online Course |
| **MVC** | Model-View-Controller |
| **OLS** | Ordinary Least Squares |
| **ORM** | Object-relational Mapping |
| **PHP** | Hypertext Preprocessor (originally Personal Home Page) |
| **RCT** | Randomized Controlled Trial |
| **SME** | Small and Medium Enterprises |
| **SSOM** | Standard Student Outcomes Methodology |
| **UVA** | Unidad de Vida Articulada (Articulated Life Vehicle) |
| **WBG** | World Bank Group |
| **WTM** | World Tech Makers |

All dollar amounts are U.S. dollars unless otherwise indicated.

# INTRODUCTION

**The recent rise of coding bootcamps across Africa, Asia, and Latin America can be explained in part by the global shortage in technology skills (ITU 2016)**. Their founders seek to leverage local talent for work at international companies with coding-related outsourcing needs. They are typically technology entrepreneurs who are embedded in the local technology industry. In turn, this allows them to better assess industry demand, optimize curriculum development, and develop a strong network of potential employers for bootcamp participants.

**Coding bootcamps were designed to address the gaps in formal education in tech skills by providing young people an accelerated path to developing coding skills that are increasingly important globally (ITU 2016).** Bootcamp graduates appear to have a stronger path to employment in tech-related jobs than those of alternative training options in this field, such as online tutorials or massive open online courses (MOOCs). Coding bootcamps focus on developing software development skills, which are predicted to be in high demand.

**This report is part of the *Decoding Bootcamps* initiative funded through the Jobs Umbrella Multi-Donor Trust Fund**. The initiative aims to collect and share examples and lessons of bootcamps in emerging markets, and measure the impact of bootcamp training on youth employment in selected countries. The program seeks to establish a framework of best practice for future projects in technology upskilling in the developing world. The World Bank piloted this initiative between March 2016 and July 2017 in three cities: Beirut, Lebanon; Medellín, Colombia; and Nairobi, Kenya. These cities were selected because of their vibrant local tech innovation ecosystems, the relevant size of the low-income youth population, and high youth unemployment.

Coding bootcamps are intensive short-term programs designed to train participants in programming skills to make them immediately employable (Meng 2013). They combine characteristics of traditional vocational training programs with the intensity of military bootcamps for new recruits, intermingling socioemotional and tech skills learning in an intense and experiential manner, in what could be referred to as "skills accelerators." We refer to coding bootcamps in this report as the Ready-to-Work model. This model follows a structured process with three main characteristic features: 1) intense rapid-skills training, 2) experiential learning approach, and 3) curricula based on, and continuously adapting to, industry's demand. Depending on the organization, the model has yielded job placement rates ranging from 60 to 100 percent (ITU 2016). Thus, coding bootcamps provide a mix of technical and practical skills directly connected to industry demand, making them a potentially effective tool for the requirements of the new tech-led economy. For developing economies, they are particularly useful in building a talent pipeline ready to face disruptions in the employment and skills landscape arising from the Fourth Industrial Revolution (World Economic Forum 2016). For more information on coding bootcamps, see the first report of the Decoding Bootcamp initiative (Mulas and others 2017).

**The objective of the Decoding Bootcamps initiative is four-fold**: (i) to assess the impact of coding bootcamps on local, young jobseekers to secure quick employment and income generation opportunities; (ii) to compare employment patterns, and employability in new-economy jobs, between bootcamp participants and those who have not received the training; (iii) to identify key success factors of coding bootcamps for emerging economies and devise a toolkit for designing a coding bootcamp from scratch based on an overview of existing tools and best-practice methods; and (iv) to inform policy makers in emerging markets on how to support the establishment, implementation, and growth of demand-driven rapid tech skills training to combat youth unemployment.

**The report highlights the results of a randomized controlled trial (RCT) carried out in Medellín (Colombia), complemented with qualitative studies in Beirut (Lebanon) and Nairobi (Kenya).** In Medellín, government support, local industry demand for technology talent, and the ability of the bootcamp provider to scale, enabled the team to secure a higher sample size sufficient for the RCT. (For more information on the RCT Design, see Appendix A.) In Beirut and Nairobi, the market conditions (that is, lack of availability of sample size necessary for the experiment timeline and/or immaturity of the bootcamp providers' market) were not conducive to an RCT experimental design because of the infeasibility of randomization. Thus, the World Bank carried out qualitative studies in these two additional locations to gain a deeper understanding of the effects of coding bootcamps on participants and provide additional insights from two additional developing country locations. This report

complements the initial findings of the Decoding Bootcamps initiative's first publication (Mulas and others 2017), which presented preliminary evidence of the impact of coding bootcamps in the context of emerging economies.

**The emphasis of the two qualitative studies is on the experiences (emotional, behavioral, and educational adjustments) of bootcamp participants as a result of their exposure to training and post-training employment patterns.** They explain why in some cases participating in bootcamps is a career promoter and a life-changing experience, while in others it is not. The current research develops theories of the determinants of positive outcomes of bootcamp training. An observation-focused qualitative case study design was implemented to explain the exact mechanisms that improve post-training quality of life outcomes for some students over others. (For more information on the Qualitative Research Design, see Appendix B.)

**Students filled out the same baseline and final surveys in the three countries.** The coding bootcamps were similar in length, using a learning-by-doing approach. To address the issue of skills mismatch, they leveraged their connection to the local IT industry, ensuring that coding languages taught in each location reflected specific industry needs. Bootcamp participants (and the control group in Medellín) were monitored for six months after its end to understand the impact of the training on their employability (defined through access to new job opportunities, better quality of jobs, entrepreneurship opportunities, and so on), employment (following employment history), and salary.

**Coding bootcamps are a recent phenomenon, with many providers being startups with little or no implementation experience.** At the time of implementation of this initiative, coding bootcamps were only just starting to appear in developing countries. Providers were still experimenting with curricula and methodologies, and it was not clear how the bootcamp methodology could be best implemented in the context of an emerging economy. Thus, this initiative focused on testing this rapid skills training methodology in locations where either local coding bootcamps existed or local providers could potentially implement the training, having an understanding of local conditions and the capacity to adapt the methodology accordingly.

**The Decoding Bootcamp initiative was designed to also test whether these providers could implement bootcamps in emerging economies.** In Beirut and Nairobi, the activity targeted existing bootcamps providers, although they were still maturing their business models and adapting their methodologies to their local markets. The activity also targeted Medellín, a city where coding bootcamps did not exist, despite market demand. The local government in Medellín demonstrated a clear commitment to attract such training providers to the city, after having identified an important skills gap in entry-level tech jobs (Ruta N Medellín and others 2015). This made Medellín an ideal location to test the implementation of coding bootcamps in a developing country context where demand existed but providers were not yet present. The activity's experimental bootcamp built on a market-fit pilot implemented by Ruta N Corporation, the local innovation agency, with 25 students in Medellín. This allowed to test the potential for implementation of the coding bootcamp methodology in an emerging economy, while identifying challenges and requirements. Building on the lessons of this additional applied research, this report presents policy recommendations to create an enabling environment for bootcamp attraction and growth, and a methodological toolkit for practitioners, based on best-practice cases (see Appendix D).

**For this initiative, the World Bank worked closely with local research partners and government agencies to execute the training and conduct data collection.** Research partners advised on program design, collected relevant data, and launched calls for applications for bootcamp providers based on their knowledge of local tech ecosystems and youth-related issues. In Beirut and Nairobi, these were key nodes in the innovation and technology entrepreneurship ecosystem with demonstrated research capability, and they secured partnerships with local bootcamp providers. In Medellín, the World Bank relied primarily on government agencies, which provided space, equipment, as well as critical outreach support for data collection.

**The experiment aimed to be inclusive, primarily targeting the low-income population in Medellin.** This posed a challenge in terms of recruitment, student engagement through the end of the training, and outreach to participants (treatment and control in the case of Medellín) for the final survey. As mitigating measures, the World Bank and the providers identified instructors who could help students who were lagging behind in class, and hired a local survey firm that followed up on the final survey with participants.

Table 1.1 summarizes the intervention in each of the three cities selected for this program.

## **Table 1.1:** Summary of interventions

| | Medellín | Beirut | Nairobi |
|---|---|---|---|
| **Impact Evaluation Methodology** | Randomized Controlled Trial (baseline and final surveys) | Qualitative study (surveys, interviews, focus group discussions) | Qualitative study (surveys, interviews, focus group discussions) |
| **Year of first bootcamp in the city** | May 2014 (Bogotá)<br>May 2016 (Medellín)[a] | March 2016 (Beirut) | January 2015 (Nairobi) |
| **Bootcamp provider** | World Tech Makers | SE Factory | Moringa School |
| **Rationale for choosing provider** | Competitive selection process (there were no bootcamps in Medellín at the time this project was defined) | Comparative review of bootcamps in Lebanon (selected bootcamp used the model in line with the goals of the research experiment) | Comparative review of bootcamps in Nairobi (selected bootcamp used the model in line with the goals of the research experiment) |
| **Other providers of model in the city at time of experiment** | Cymetria, Make It Real (both Bogotá)[b] | LeWagon [now closed] | Nairobi Developer School (DevSchool) [now closed] |
| **Bootcamp program implementation dates** | May–August 2016 (12 weeks) | July–October 2016 (12 weeks) | April–August 2016 (16 weeks) |
| **Coding language** | Ruby, Rails, HTML, JavaScript, etc. | Full-stack web development (Apache, SQL, PHP, HTML / CSS, JavaScript, etc.) | Android, Python, UI and UX, HTML and CSS, and JavaScript |
| **Audience** | Youth between 18 and 28 years of age. No previous studies or coding knowledge required | Computer science students or graduates from less privileged backgrounds | People with some programming basics and that passed the intensive selection process (included coding challenges, motivational questions…) |
| **Number of students** | 120 students (and 161 participants in the control group) | 15 students (13 participated in the study); no control group | 18 students (16 participated in the study); no control group |
| **Price per student (subsidy)** | $750-1,000, depending on the socioeconomic strata[c] | $100[d] | $2,500[e] |
| **Research partners** | Ruta N Corporation, Secretariat of Youth (Municipality of Medellin) | Berytech | iHub |

*Note*: a. Bootcamp in Medellín was catalyzed by the activity; b. Coding bootcamps active by mid-2017; c. Tuition was subsidized by this activity for the bootcamp in Medellin. Regular tuition fee in Colombia is $2,000; d. SE Factory bootcamp follows a non-for-profit model, where tuition fees are subsidized; e. After this cohort, Moringa School in Kenya changed their bootcamp structure, and reduced the pricing to $1,200.

The next chapter describes the intervention in Medellín, including the experimental allocation of training slots to the bootcamp. Chapters 3 and 4 present the qualitative studies in Beirut and Nairobi. The main findings from the three interventions are presented in Chapter 5, and lessons for future impact evaluations are described in Chapter 6.

## Notes:

1. For more detail on this rapid skills training program, see http://www.decodingbootcamps.org.
2. http://www.worldbank.org/en/topic/jobsanddevelopment.
3. The model is the traditional approach to coding bootcamps (ITU, 2016). It typically refers to an intensive 12 to 24 weeks full- or part-time rapid skills training programs that prepare people to qualify for employment as junior developer, either working for a company or as freelancers, shortly after the training ends.
4. The World Economic Forum (2016) forecasts strong employment growth in the Architecture and Engineering and Computer and Mathematical job families by 2020. The Future of Jobs Survey has identified big data analytics, the Internet of things, and mobile internet and cloud technology as important drivers of change of this growth.
5. A Randomized Controlled Trial (RCT) is an experimental form of impact evaluation in which the population receiving the program or policy intervention is chosen at random from the eligible population, and a control group is also chosen at random from the same eligible population. It tests the extent to which specific, planned impacts are being achieved. The distinguishing feature of an RCT is the random assignment of units (e.g. people, schools, villages, etc.) to the intervention or control groups (UNICEF, https://www.unicef-irc.org/KM/IE/impact_7.php).
6. For more information on the structure of coding bootcamps, see Mulas and others 2017.
7. An entry-level technology job is a job that is normally designed or designated for recent graduates of a technological discipline and typically does not require prior experience in the field or profession.
8. A startup company is an entrepreneurial venture which is typically a newly emerged, fast-growing business that aims to meet a marketplace need by developing a viable business model around an innovative product, service, process, or a platform.

# IMPACT EVALUATION IN MEDELLÍN, COLOMBIA

This chapter describes the randomized controlled trial (RCT) evaluation of the coding bootcamp program in Medellín. The RCT used baseline data as well as survey information collected six to seven months following the end of the bootcamp. The most notable impacts of the intervention are on participants' educational outcomes, as well as post training type of employment.

## Context

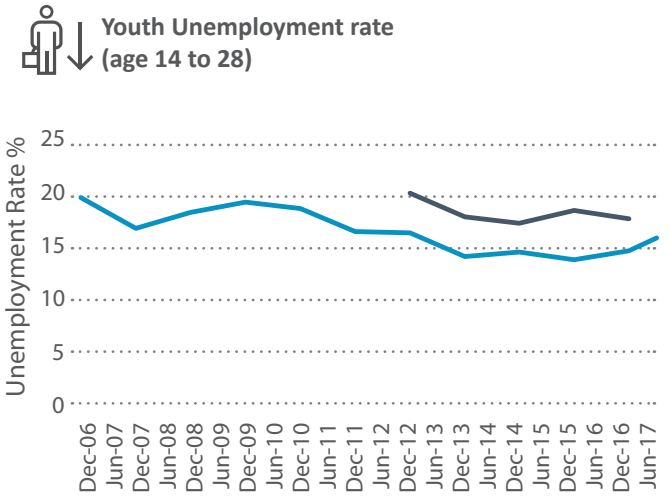
### Why Colombia?

**Recent trends suggest that, to continue growing, Colombia needs to shift from high dependency on natural resources to a more knowledge-based economy.** This hinges on strengthening human capital, which has become a centerpiece of the country's development strategy and educational policy efforts. The most recent results of the Programme for International Student Assessment (PISA) show that, in 2015, Colombian students were developing better skills than their peers in 2012 and 2009.

**While unemployment, particularly among young people, has declined during a large expansionary period, there are signs of a reverse trend.** Though Colombia's unemployment rate stood at 9.1 percent in 2014, the country has been unable to generate employment in line with the increase in the labor force. The informal sector is also growing, representing about 70 percent of those who are employed. A constant growth rate has allowed Colombia to make significant headway in its socioeconomic indicators. However, the fall in oil prices in recent years has reversed this trend. Figure 2.1 shows that youth unemployment had steadily declined between 2006 and 2013. In the past three years, however, it has been on the rise, indicating that young Colombians are having a relatively hard time finding a job. Medellín's youth face a similar challenge, with a slightly higher unemployment rate than the rest of the country.

**Over the past few years, public and private efforts to support tech entrepreneurship have grown in number and scale.** That success is also being nurtured by a constellation of support organizations, incubators, and accelerators, many of which receive direct government support. Government-sponsored programs like INNpulsa and Apps.co have been touted as having played an important role in providing

**Figure 2.1:** Youth unemployment rate in Colombia (2006-2017)




| | Dec-06 | Dec-07 | Dec-08 | Dec-09 | Dec-10 | Dec-11 | Dec-12 | Dec-13 | Dec-14 | Dec-15 | Dec-16 | Jun-17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Colombia | 19.4 | 16.5 | 18 | 19 | 18.4 | 16.2 | 16.1 | 13.9 | 14.3 | 13.6 | 14.4 | 15.6 |
| Medellín | | | | | | 19.8 | 17.6 | 17 | 18.2 | 17.4 | | |

*Source*: DANE, and Medellín Cómo Vamos 2016.

support for early-stage startups. In addition, ProColombia, the government body responsible for the promotion of trade, foreign investment, and tourism, now aims to build upon these foundations to transform the country into a business process outsourcing (BPO) powerhouse not just in Latin America, but on a global scale.

**As a result, Colombia has seen a fivefold increase in its software and information technology (IT) market between 2003 and 2015. The country is now among the top IT services providers in Latin America, and has been lauded as one of the region's most promising tech hubs.** Colombia is turning itself into an attractive market by incentivizing hard science and IT-related education, and this is achieving results. According to International Data Collection

(IDC), the Colombian IT sector grew 14.1 percent (CAGR 2003-2016) and is the fourth largest IT market in the region . Technology companies are concentrated in Colombia's largest metropolitan areas, most notably Bogotá and Medellín (World Bank and Endeavour Insight 2015). The digital industry in Medellín, a city with a population of 2.5 million, is increasingly growing because of the recent use of digital tools in various individual, entrepreneurial, and industrial processes. Established in 2010, the center of Medellín's innovation scene is Ruta N, which provides incubation, landing services, and office space for innovative startups and service providers. It has generated some 2,900 jobs by attracting 73 companies . Another important ecosystem player with a presence in both Bogotá and Medellín is coworking space Atom House.

## Medellín's Startup Ecosystem

**As of 2015, the number of tech firms in Colombia numbered at least 678, and these tech companies currently employ an estimated 20,000 people (World Bank and Endeavour Insight 2015).** This talent is largely concentrated in a few large cities, and the vast majority of connections between entrepreneurs involve either Bogotá or Medellín. The recent uptick in entrepreneurial activity has produced an ecosystem that is now growing at a rate of 15 percent annually. If the sector as a whole continues to grow at this rate, it will, by 2020, the number of people it employs will double (World Bank and Endeavour Insight 2015).

**Named Innovative City of the Year by the Wall Street Journal in 2013, Medellín has therefore developed a vibrant tech industry, and 18 percent of the IT companies from Medellín generate 80 percent of the employment in the Antioquia region (World Bank and Endeavour Insight 2015).** However, Medellín only has a few startup success stories. It still lags behind Bogotá, and has some way to go before it can be compared to other global tech hubs. One explanation for this is the mismatch between the demand and supply of labor with technical skills. As captured in a 2015 study by Ruta N Medellín, software developers are in high demand in Medellín, with junior developers being the most sought after by companies (47 percent of the total companies surveyed and 73 percent of large companies surveyed reported requiring junior software developers). However, there appear to be technical skills gaps: companies surveyed in the study reported that sourcing web developers was difficult, while SMEs also additionally reported struggling to hire senior mobile app developers in the market. In addition, more investor confidence is needed to attract private capital in Medellín and the supply of adequately trained professionals to meet the demand from IT and BPO companies is not sufficient.

**In this context, Medellín has made a strong commitment to diversifying its economic structure through its *Medellín Ciudad Innovadora* (Medellín Innovative City) program, with policies to attract IT companies to the city.** The Mayor's Office has instigated several programs for this purpose. Ruta N Medellín, the local innovation agency, conducted a study concluding that there is a high need for IT skills in the city, especially for those skills required for entry-level positions. The implementation of coding bootcamps is a relevant strategy to tackle this skills gap. According to employment agency El Empleo, 6.05 percent of the total of new offers in its web portal are in the systems and technology field. Colombia has a relatively high demand for skilled workers in these fields. The general areas with higher demand are: commercial and sales (24.6 percent), administrative and financial (13.6 percent), and customer service (8.9 percent). There is still a gap between applicants and job offers: only 4.2 percent of the applicants on the portal had an adequate profile for the systems and technology field.

**Moreover, Medellín still faces the same challenges as the rest of the country, concerning poverty, inequality, and crime.** In the city, the divide between rich and poor is wide, as is the case in many parts of the country. Though poverty in Colombia has declined markedly since the late 1990s (from 50 percent in 2002 to 28.5 percent in 2014), the benefits of stronger growth have not resulted in equally strong reductions in income inequality. The Gini coefficient declined only from 57.2 percent in 2002 to 53.8 percent in 2014, and inequality in Colombia remains among the highest in the world (International Monetary Fund 2015). With over six million Colombians still living in poverty, strategies that help reduce this number are very relevant for the Colombian context. A key strategy to reduce poverty and consolidate the middle class is education. Education will allow people to increase their long-term income, and improve their quality of life.

**Given the potential of the tech industry to create jobs and tackle youth unemployment, the World Bank has been actively supporting the tech startup ecosystem in Medellín, most recently through its Decoding Bootcamps initiative in partnership with the Municipality of Medellín.** In conjunction with Ruta N Corporation and the Secretariat of Youth, the World Bank expanded the scope of bootcamps

in Medellín to train low-income youth, offering subsidies according to participants' income levels. The World Bank Group supported Ruta N on the design of the program to teach, in the short run, entry-level programming skills with the goal of increasing employability and job satisfaction of young people in Medellín. The World Bank also designed and developed the impact evaluation to generate high-quality evidence of the effectiveness of coding bootcamps in large cities in developing countries.

# Program Background

**Medellín did not have any bootcamp providers serving the market.** The first step for implementing the activity was to test the feasibility of a bootcamp program in Medellín. The local government actively supported this effort, particularly through Ruta N and the Secretariat of Youth of the Municipality of Medellín (Box 2.1).

**Ruta N catalyzed the establishment of these programs in the city.** Ruta N conducted a competitive selection process to establish and develop a coding bootcamp in the city. The selection criteria included: (i) proven experience providing coding bootcamps, including a complementary online platform and a component on socioemotional skills; (ii) capacity to work with a minimum of 100 students; and, (iii) a contextualized curriculum that ensured the relevance of acquired skills to the local market in Medellín. World Tech Makers (WTM) was awarded the contract out of four proposals, establishing and conducting an initial coding bootcamp for 25 participants. This pilot tested the feasibility of the coding bootcamps model in the city. The activity launched a competitive process to conduct a larger scale bootcamp to conduct the randomized controlled trial (RCT).

**In April 2016, WTM launched the call for applications for the RCT bootcamp program, mainly through digital and mass media publications.** Over a 20-day period, the bootcamp was advertised as an incentive to find a job in the ICT sector. News stories on local television channels and other outreach activities, ranging from posts of the partners' (see Box 2.1) social media accounts to WTM's visits to local universities, attracted 903 applicants to the program. As part of the process, students were asked to explain their motivation for applying. Eligibility requirements included: (i) being Medellín residents between 18 and 28 years of age, (ii) showing an intent to find a job after the bootcamp, (iii) having basic computer and internet skills, and (iv) attending training in the assigned facilities during the entire duration of the program.

## Box 2.1: Local partnerships

The World Bank partnered with Ruta N Corporation and the Secretariat of Youth for this activity. EPM and Microempresas de Colombia provided in-kind contributions.

*Ruta N Corporation* is a public joint venture between the Mayor's Office of Medellin, UNE Telco (UNE), and the public utilities company, EPM. To develop Medellín's innovation ecosystem, Ruta N focuses on boosting talent, access to capital, infrastructure, and innovative business development. In addition, its Landing Program facilitates access to a working space for local and international companies. Ruta N first developed the coding bootcamp concept in Medellín. As the World Bank's main partner, it provided monetary and in-kind contributions.

*The Secretariat of Youth of the Municipality of Medellín* is the agency responsible for equipping young people with knowledge, training, and citizen participation opportunities to transform them into agents of change. The Secretariat of Youth provided advice and coordinated the activity's communications campaign.

*Empresas Públicas de Medellín (EPM, Medellín Public Enterprises)* was established as a residential public utilities company, which initially served the residents of Medellín, and has now expanded to 11 Colombian regions and Panama. EPM provides electricity, gas, water, sanitation, and telecommunications. EPM provided the bootcamp locations (UVAs) in the city of Medellín.

*Microempresas de Colombia* is a savings and credits association, which aims to stimulate national savings as real insurance for the future. The association also provided space for one of the bootcamps.

The Secretariat of Youth, Ruta N, and WTM notified those participants that had been selected and were invited to the Launch Event in Ruta N's building on May 24, 2016.

**Students' participation fees were determined according to their socioeconomic strata (see** Box 2.2**).** The World Bank, Ruta N Corporation, and the Secretariat of Youth agreed on a subsidy scheme. The program was free for students in strata 1 and 2. Those in strata 3 paid Col$300,000 (about $100), and those in strata 4 through 6 paid a total of about Col$750,000 (about $250).

## **Box 2.2:** Socioeconomic strata in Colombia

The Colombian government has implemented a socioeconomic stratification system to classify urban populations into different strata with similar economic characteristics. It is in accordance with DANE's real estate property classification, which evaluates real estate units based on poverty levels, public services, location, and indigenous population.

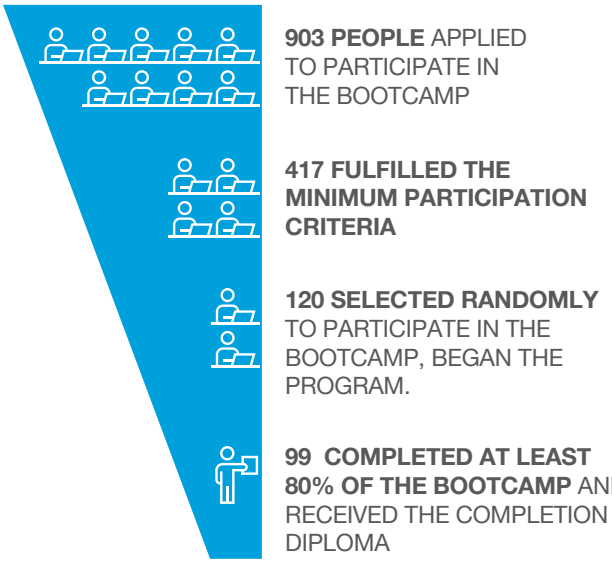
This system determines tax levels, public services (water, energy, phone and gas) fees, access to free health services, fares at public universities, access to poverty alleviation programs, and so on. In most cases strata 1 and 2 are subsidized by the upper strata 5 and 6.

It classified areas on a scale from 1 to 6, as follows:

1. Low-low
2. Low
3. Medium-Low
4. Medium
5. Medium-High
6. High

*Sources*: DANE, http://dane.gov.co; Congress of Colombia. Law 142 from 1994 (July 11), article 102.

## **Figure 2.2:** Selection process and program uptake




**The program took place from May to August 2016 in six different local government training center locations (Unidades de Vida Articuladas, UVAs). 120 students participated, 108 of whom completed the program but only 99 received a completion certificate (see Figure 2.2).** A certificate was awarded to students who attended more than 80 percent of the classes. There were six classes of 20 people each (two in the morning, two in the afternoon, and two in the evening). The in-person training program was carried out in six UVAs with desktops, donated by EPM and the Secretariat of Youth, across the city. The Secretariat of Youth assigned students based on the UVA's proximity to their homes. However, the use of the UVAs as bootcamp training locations proved to be problematic in some instances. As public spaces, UVAs may hold other activities in the same training space, causing distraction among students. In the first weeks of the program, a number of students were robbed at the UVAs that were in less safe locations. This was corrected by the Secretary of the Youth who arranged local police escorts for students' transit between the UVA and the closest metro/bus station.

Table 2.1 summarizes the main characteristics of the intervention in Medellín.

## **Table 2.1:** Decoding Bootcamps Program RCT in Medellín

| | |
|---|---|
| ***Impact Evaluation*** | |
| Methodology | Randomized controlled trial (RCT) |
| ***Coding Bootcamp*** | |
| Bootcamp provider | World Tech Makers |
| Implementation dates | May–August 2016 |
| Cost to participants | Subsidies provided up to $250 (varied depending on the socioeconomic situation of the student) |
| Bootcamp curriculum | Ruby, Rails, HTML, JavaScript, etc. |
| Number of bootcamps | 6 classes of 20 students each |
| Final class size | 120 students (and 161 participants in the control group) |
| ***Participants' profile*** | |
| Age | 18-20: 24 percent<br>21-25: 62 percent<br>25-28: 13 percent |
| Gender | Male: 72 percent<br>Female: 28 percent |
| Socioeconomic standing at baseline | Strata 1-2 (65 percent), strata 3 (31 percent), strata 4-6 (4 percent)<br>Employed (18 percent); Unemployed (82 percent)<br>High school and Baccalaureate (35 percent); Technical diploma (38 percent); University students or graduates (28 percent) |

*Source*: Authors.

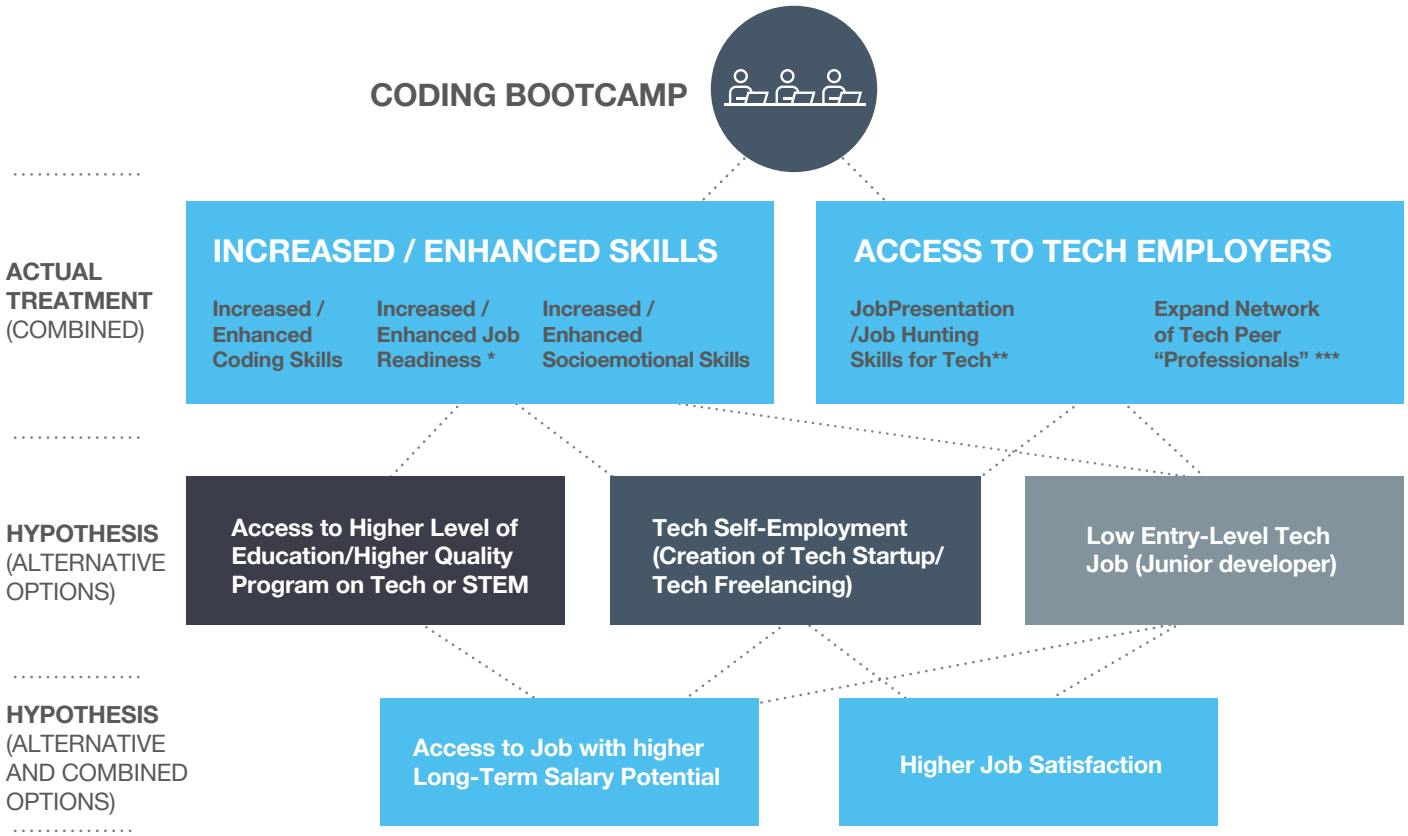
## Theory of Change

**The stated objective of the Decoding Bootcamps program was to reduce *youth unemployment, and provide access to good quality jobs and higher job satisfaction,*** while promoting the technology sector and contributing to the local economy's transformation**.** The program provided training to young people in Medellín, defined as those between 18 and 28 years old. The program was designed around two main pillars: (i) providing participants with skills relevant for the labor market (that is, coding, job readiness and socioemotional skills); and (ii) establishing linkages between graduates and employers (see Figure 2.3). Through this design, the program was expected to equip graduates with skills to access entry-level IT jobs, which would progressively turn into good quality jobs. An alternative path was to equip graduates with the skills and motivation to continue studies in the IT area. The ultimate objective was to provide graduates with better long-term employment options.

**The "increased/enhanced skills" pillar aimed to increase: (i) coding skills acquisition, (ii) socioemotional skill development, and (iii) job readiness.** More than 90 percent of the bootcamp was dedicated to learning entry-level coding skills. As coding is taught through an experiential and project centered approach, students needed to develop certain skills to thrive, including socioemotional skills. They learned about teamwork, how to implement large projects, and how to work in a dynamic environment.

**The labor market component included two main activities.** Through an end-of-bootcamp project, students developed a minimum viable product for an external organization of their choice. On September 19, 2016, WTM hosted a demo day at Ruta N's headquarters, where some students presented their websites. More than 400 people, including bootcamp students, IT companies as potential employers, civil society, governmental institutions and other partners, were in attendance. Prior to the demo day, all students received an eight-hour training on the elevator pitch methodology.

**Figure 2.3:** Theory of change of coding bootcamps




* Practical Jobs Skills (eg simulations of real-work environment coding projects) ** Demo Day preparation and Demo Day presentations *** Assuming cohort peers will join tech work force

Source: Authors.

**WTM also provided job opportunities in technology related companies.** WTM's Medellín Office is based at Ruta N, where many of the IT companies and startups in the city are located. This connection to the ecosystem is essential to get continuous and real-time inputs from companies on the tech skills that they require to link graduates to employment opportunities. For the experiment, all bootcamp participants were trained in the same coding languages (Ruby, Rails, HTML, JavaScript, and so on) determined by the local bootcamp provider, WTM.

# EVALUATION DESIGN

## Research Questions

**The impact evaluation of the program has the purpose of answering the following research questions: does bootcamp participation improve job and educational outcomes? Does bootcamp participation lead to improved socioemotional skills?**

Table 2.2 shows the detail of the hypothesized impacts of bootcamp participation on job, educational, and socioemotional outcomes.

All outcomes in Table 2.2 are relevant for the economic development and well-being improvement in low and middle-income countries. Jobs are the main pathway to financial stability, savings, and higher consumption; education improves the odds of higher income and social mobility, reduces risky behaviors, and improves health outcomes; and finally, socioemotional skills are associated with general better life satisfaction.

Table 2.2's structure shows in the first column the three main categories of impacts of participation on coding bootcamps, in the second column the outcomes (dependent variables) to be assessed, and in the third column the precise research question that is going to be answered by this evaluation.

**Table 2.2:** List of variables and research question, by category

| Category | Outcomes | Research questions |
|---|---|---|
| Job outcomes | Job | Are there differences between the unemployment rates of bootcamp participants, and members in the control group? |
| | Job satisfaction | Are there differences on the reported job satisfaction between bootcamp participants and members in the control group? |
| | Job benefits | Are there differences on the probability of having job benefits between bootcamp participants and members in the control group? |
| | Business creation | Are there differences on the business creation rate between bootcamp participants and members in the control group? |
| | High-quality job status[a] | Are there differences on the high-quality employment rate between bootcamp participants and members in the control group? |
| Educational outcomes | Program completion | Are there differences on the program completion rate between bootcamp participants and members in the control group? |
| | Program initiation | Are there differences on the program initiation rate between bootcamp participants and members in the control group? |
| Socioemotional outcomes | GRIT | Are there differences on socioemotional skills, as measured by GRIT, between bootcamp participants and members in the control group? |

*Note*: In the baseline and follow-up surveys the team asked participants' title of their current job position. Jobs were considered to be high quality if they were tech-related or usually, in the Colombian context, required a four-year program.

The GRIT is a continuous scale that measures people's determination, courage, and strength of character, used here as proxy of participants' long-term commitment, perseverance, and drive for success, that will be explained in more detail in the next section.

## Research Design

**The evaluation was designed as a randomized controlled trial**. This means that participants were selected randomly among eligible candidates to belong to the treatment and control groups to achieve two main goals: 1) participants in the treatment and control groups would have similar observable characteristics on average, and therefore 2) outcomes from bootcamps participation could be causally associated with participation in the program.

**Once the treatment and control groups were defined, the field instruments were applied to both groups to collect the necessary information to set up the variables of interest**. Table 2.3 describes the principal questions asked to participants in treatment and control groups to assess the hypothesized outcomes of bootcamp participation. As shown in the table; these questions are related to the job, educational, and socioemotional outcomes derived from the research questions in Table 2.3 which shows all the questionnaires used in the Colombian project.

**Most of the outcomes created from Table 2.3 were analyzed as dichotomous variables**. In the case of the variable of High-quality Job Status, the title of the job position provided by the respondents was modified into a dichotomous variable differentiating high-quality jobs from the rest. There was only one exception: the GRIT measurement was left as a continuous variable, as reported, and it was analyzed in that way.

**To measure the socioemotional variable, participants were assessed on the 17 item GRIT questionnaire and the Review of Personal Effectiveness with Locus of Control (ROPELOC) instrument at endline**. Impacts on GRIT were analyzed and on the 15 items measured by ROPELOC (*Active Involvement, Cooperative Teamwork, Leadership Ability, Open Thinking, Quality Seeking, Self-Confidence, Self-Efficacy, Social Effectiveness, Stress Management, Time Efficiency, Coping with Change, Overall Effectiveness, Internal Locus of control,* and *External Locus of Control*). The version of GRIT used for this exercise had 17 items, self-reporting how likely it is that respondents will react in a certain way when facing certain situations, and participants earn between 1 and 5 points depending on their answers. These scores are then added to generate a value between 17 and 85. In the end, a person with a higher score is evaluated with a higher GRIT. On the other hand, ROPELOC measures each construct mentioned in the parenthesis with three items. The score for these items is also added.

### **Table 2.3:** Questions to determine experiment outcomes

| Category | Outcomes | Questions |
|---|---|---|
| Job outcomes | Job status | Are you currently working? |
| | Job satisfaction | To what degree are you satisfied with your current job? (scale from 1 to 4, 1=really unsatisfied, 4=really satisfied) |
| | Job benefits | Does your job provide any benefits? Health insurance, paid vacation, training, pension fund, etc. |
| | Business creation | After participating in the bootcamp, did you create your own business? |
| | High-quality job status | What is the job title for your position at your current job? |
| Educational outcomes | Program completion | Since May 2016 have you completed any education program, besides the coding bootcamp? |
| | Program initiation | Since May 2016, have you applied to any education program? |
| Socioemotional outcomes | GRIT | The 17 item GRIT questionnaire was applied. |

## Model

The simple framework for the experimental design is described in Equation 1 as an Analysis of Variance (ANOVA) to determine, with the highest statistical power, the mean differences between treatment and control groups.

### **Equation 1:** ANOVA test for treatment impact

$$\mu\_(\text{treat.pre-treatment control value}) = \mu\_(\text{control.pre-treatment control value})$$

**The means of the variables of interest for the treatment group after treatment were compared taking into account the values of these variables before treatment.** Randomization of the individuals participating in the field experiment ensures that the bootcamp program, and no other confounding factors, explains the difference in outcomes (randomization ensures that that baseline values are similar between these groups). For more information on the RCT research design, see Appendix A.

**To estimate the impact of the program on the outcomes described above, the following ANOVA model was used**:

$$\text{OUTCOME}_{ijk} = \mu + \alpha\_{\text{TREAT}} + \beta\_{\text{OUTCOME AT BASELINE}} + \alpha\beta_{\text{TREAT*OUTCOME AT BASELINE}} + \epsilon_{ijk}$$

Where the outcomes are those described in Table 2.10 to measure changes in labor, education, and socioemotional variables.

**To measure the average impact of the training program, intention-to-treat (ITT) effects were first estimated by ANOVA to test the treatment effects on the hypothesized outcomes** (labor and educational outcomes, and socioemotional skills) on the random assignment to treatment variable. **Then, a similar analysis was done to test the effects on the same outcomes of bootcamp completion.** Unconditional ANOVA will show if there are unconditional treatment effects on each of the desired labor and educational outcomes.

**To validate this analysis Table 2.4 compares the people who finished the bootcamp with those who did not.** As shown in this table, there were no statistically significant differences between participants who finished the program, interpreted as attending more than 80 percent of the sessions, and those who did not.

### **Table 2.4:** Comparison of participants who dropped out of the bootcamp and those who finished

| Variable | Finished Bootcamp | Dropped Out | N Finished | N Dropped Out | P Value |
|---|---|---|---|---|---|
| Age | 24.6 | 24.1 | 170 | 109 | 0.16 |
| Gender (female) | 32.3% | 28.4% | 170 | 109 | 0.49 |
| High socioeconomic level | 35.9% | 34.9% | 170 | 109 | 0.86 |
| Rural location | 10.6% | 11.9% | 170 | 109 | 0.72 |
| Baseline job status | 19.4% | 18.3% | 170 | 109 | 0.82 |
| Baseline job benefits | 47.1% | 52.9% | 34 | 17 | 0.69 |
| Baseline job satisfaction | 34.4% | 33.3% | 32 | 15 | 0.94 |
| Has work experience at baseline | 80.6% | 82.6% | 170 | 109 | 0.67 |
| Finished high school at baseline | 28.8% | 32.1% | 170 | 109 | 0.56 |
| Has some tertiary at baseline | 67.6% | 66.1% | 170 | 109 | 0.78 |
| Has a high quality or it job at baseline | 43.5% | 45% | 33 | 20 | 0.97 |
| Has own business at baseline | 4.1% | 5.5% | 170 | 109 | 0.59 |

*Source*: authors' calculations.

**Then, the multifactor ANOVA other variables that are usually associated with our chosen outcomes were included:** age, gender, socioeconomic stratum, rural location, mother's education, and maximum education level achieved. Table 2.5 shows these variables and the hypothesized association with education and labor outcomes.

## **Table 2.5:** Hypothesized relationship between control variables and labor and education outcomes

| Variable | Education | Labor |
|---|---|---|
| Age | Positive | Inverted U |
| Gender (female) | Positive | Negative |
| High socioeconomic level | Positive | Positive |
| Rural location | Negative | Negative |
| Mother's education | Positive | Positive |
| Higher education level | Positive | Positive |

**Finally, a set of relevant interactions variables were added to the model to identify differential effects of bootcamp participation among specific groups of the population**: *treat*tertiary, treat*female,* and *treat*high stratum*. It was hypothesized that these groups were more likely to be impacted by the program, for the following reasons:

a) *Treat*Tertiary*: People with tertiary education are more likely to find jobs; in Colombia, there are many recent graduates who take more than six months to find a job (80.4 percent of people who earned a tertiary education degree in 2013 were employed in 2014). This makes relevant the differentiation of the impact between people who have already completed this education level and people who have not. Since people who do not have a tertiary education degree in Colombia are more likely to have lower incomes, lower quality jobs, and be unemployed.

b) *Treat*Female*: Colombia is a very unequal society for women; women are less likely to get jobs and are more likely to receive a smaller salary. In the context of this evaluation, it is in our interest to focus on programs that address these differences in Colombia. We want that education and employment programs have better or similar impacts on men and women, so gender gaps in Colombia are reduced. This interaction will help us identify the differential impact of the program for men and women.

c) *Treat*High stratum:* As with people with higher education levels, people from higher income backgrounds, in general, have better odds at having jobs, and having better paid ones. Another strong source of inequality in Colombia is family-income level. Colombia is the country with the second largest gap in Latin America between the poor and the rich, as measured by the GINI index, as well as a strong correlation between academic results and income level. We hope that educational and job programs are more beneficial for the low-income population than for the rest of the population; these interactions will allow us to identify this difference.

**Table 2.6, Table 2.7 and Table 2.8 show that the balance among interaction groups was broadly achieved.** Table 2.6 shows that the distribution for women between socioeconomic strata was not completely balanced. On average, there were more women in the low-income group than in the high-income one. Caution should be used when interpreting the results for this interaction since it is likely that its effects will be more likely associated with strata than gender.

**Table 2.7 and Table 2.8 show a more balanced scenario. The distribution of women and education level was better distributed than in the previous one, showing a small asymmetry towards women being more educated**. Again, interpretation of this interaction should take this into account and highlights that, for this interaction, the association between gender and the outcomes could be biased by education level. Table 2.8 shows an almost perfectly balanced distribution between education and strata.

## **Table 2.6:** Population balance between women and high strata

| Strata\gender | Male | Female | TOTAL |
|---|---|---|---|
| Low socioeconomic strata | 117 (65%/60.2%) | 63 (35%/73.3%) | 180 (100%/64.5%) |
| High socioeconomic strata | 76 (76.8%/39.4%) | 23 (23.2%/26.7%) | 99 (100%/35.5%) |
| TOTAL | 193 (69.2%/100%) | 86 (30.8%/100%) | 279 |

*Note*: row percentage/column percentage.

## Table 2.7: Population balance between women and tertiary education

| Gender\Tertiary Education | No Tertiary Education | Some Tertiary Education | TOTAL |
|---|---|---|---|
| Male | 71 (36.8%/77.2%) | 122 (63.2%/65.2%) | 193 (100%/69.2%) |
| Female | 21 (24.2%/22.8%) | 65 (75.6%/34.8%) | 86 (100%/30.8%) |
| TOTAL | 92 (33%/100%) | 187 (67%/100%) | 279 |

Note: row percentage/column percentage.

## Table 2.8: Population balance between tertiary education and high strata

| Strata/Tertiary Education | No Tertiary Education | Some Tertiary Education | TOTAL |
|---|---|---|---|
| Low Socioeconomic Strata | 59 (32.8%/64.1%) | 121 (67.2%/64.7%) | 180 (100%/64.5%) |
| High Socioeconomic Strata | 33 (33.3%/35.9%) | 66 (66.7%/35.3%) | 99 (100%/35.5%) |
| TOTAL | 92 (33%/100%) | 187 (67%/100%) | 279 |

*Note*: row percentage/column percentage.

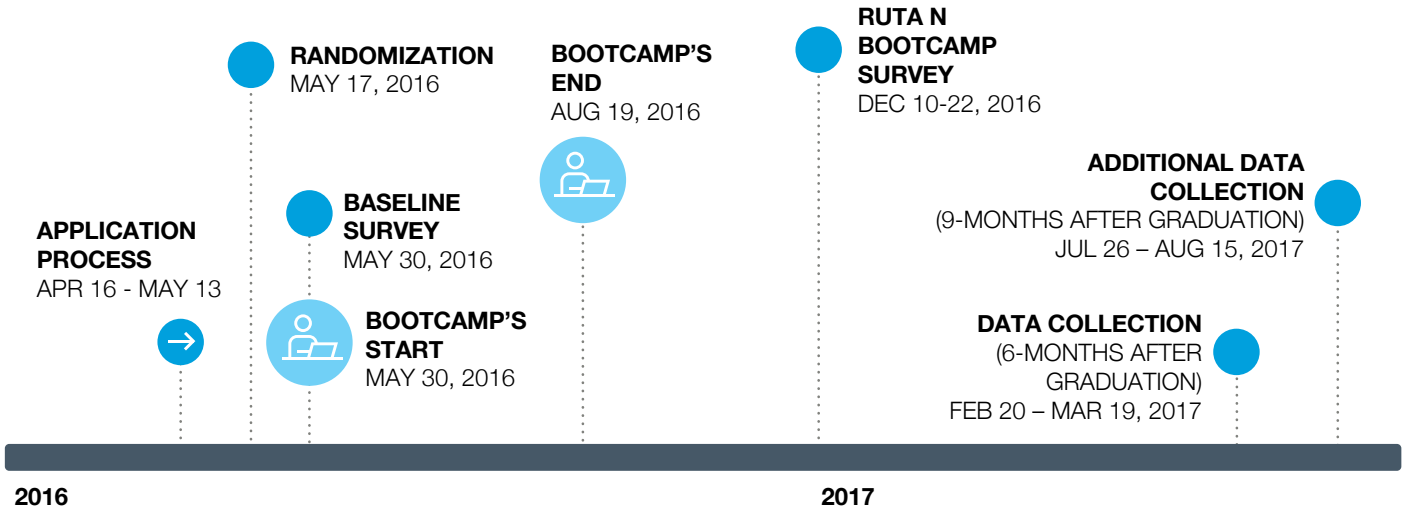
# SAMPLE

## Data Collection

**Based on anticipated sample size requirements, including attrition estimates, initial power calculations estimated that 120 participants were required for the treatment group, and a minimum of 120 participants for the control group.** In other words, 120 participants were randomly selected to receive the bootcamp training (the treatment group) and the remainder, which consisted of more than 120 people, were assigned to the control group. All the treatment and control participants would be monitored for 6-9 months after the end of the bootcamp.

**Concerning statistical power, achieving one of 0.8 and a statistical significance of 0.05, the team selected a sample size of 280-300 participants, with 120 participants in the treatment group.** Power tests were conducted for a dichotomous outcome variable (employed versus not employed). The results of the power test supported the initial calculations for effect sizes of 20-35 percent improvement from baseline. Significant attrition in either would lead to a severely underpowered experiment that would prevent detection of even significant impacts and would therefore likely be inconclusive.

## Figure 2.4: Timeline of pilot activities in Colombia



Data was collected at baseline (April-May 2016) through the program online application form, which included questions on demographics, employment status, and education outcomes, as well as salary aspirations and previous knowledge of programming languages. All participants were made aware of the nature of the study and consented to participate. To be eligible, participants needed to be willing to provide information regardless of their group assignment. In total, information of 420 eligible participants was collected at this stage.

**Table 2.9 shows the differences between those who refused treatment and those who did not.** Even though the groups are not identical, in their observable characteristics, the differences between the groups are not statistically significant. This means that treatment refusal most likely happened because of unobserved characteristics.

The endline survey took place in March 2017, between six and seven months after the end of the bootcamp. Beneficiaries and control group participants were asked to fill out a survey which aimed to collect information on labor market and education outcomes; information for 239 participants was collected at the endline.

Owing to the low response rate from the control group, since there were many missing values in key variables in the endline survey, a survey firm was hired to make another attempt to collect the missing data on both treatment and control groups. This was done through phone calls and in-person visits for the participants who initially refused to provide certain data. The next section describes in more detail the methodological implications of this and other adjustments made in the evaluation.

## **Table 2.9:** Characteristics of participants compared to those who refused

| Variable | Participant | Refused | N Participant | N Refused | P Value |
|---|---|---|---|---|---|
| Age | 24.4 | 23.9 | 279 | 140 | 0.09 |
| Gender (female) | 30.8% | 32.9% | 279 | 140 | 0.67 |
| High socioeconomic strata | 35.5% | 33.6% | 279 | 140 | 0.69 |
| Rural location | 11.1% | 12.1% | 279 | 140 | 0.75 |
| Is working at baseline | 19% | 22.1% | 279 | 140 | 0.44 |
| Has job benefits at baseline | 49% | 50% | 51 | 30 | 0.93 |
| Is satisfied at baseline | 34% | 46.7% | 47 | 30 | 0.27 |
| Has work experience at baseline | 81.4% | 75% | 279 | 140 | 0.13 |
| Highest level of education is high school at baseline | 30.1% | 27.1% | 279 | 140 | 0.52 |
| Has some tertiary education at baseline | 67% | 70.7% | 279 | 140 | 0.44 |
| Job generates income at baseline | 87.5% | 80.6% | 48 | 31 | 0.41 |
| Has a high quality or IT job at baseline | 45.3% | 41.9% | 53 | 31 | 0.76 |
| Owns a company at baseline | 4.7% | 5.7% | 279 | 140 | 0.64 |

*Source*: authors' calculations.

## Methodological Limitations

**The implementation of this evaluation was not free from problems. In this sense, it is important to mention at least two types of concern:** the first is related to the adjustments in the selection strategy of treatment and control group from the original plan; and the second is related to the limitation of the endline data collection.

**In the first case, there were three factors leading to changes in the structure of the treatment and control groups**. First, participants were not allowed enough time to determine whether they wanted, and were able, to commit to a three-month intensive bootcamp. This led many participants to drop out. The second source of structural changes in the treatment group had to do with bootcamp location; some participants were assigned to locations that were far away from their home, leading them to abandon the program before starting because of transport difficulties. The third source was associated with the replacement strategy, and the magnitude of the replacements needed in the program. Whenever a participant refused the program, a person in the control group, belonging to a randomly created list, was offered participation. This, added to the fact that 140 people who were offered participation refused, altered the initial plan of the construction of the treatment group.

**These problems with data collection and the construction of the treatment and control groups could lead to biases, mostly because of omitted variables, for the following reasons**:

- **Given that a large number of treatment group participants were replaced from the intended control group, it is likely that the initial randomization could have led to essentially different treatment and control groups**. Even though similarity between these groups was confirmed, it was still possible that they differed on nonobserved characteristics. In this case, this was not considered to be a significant problem, since the waitlist was also randomly assigned. It is unlikely that participants had similar nonobserved characteristics, given that observable ones were still evenly distributed between treatment and control groups.
- **High program dropout was also another possible source of bias. Some people dropped out because they were too busy by the time they were notified of participation, because the location of the bootcamps was far from their home, or because they never responded to e-mails and calls notifying that they had been selected**. This implies that those who did participate had one of the following characteristics: either they had time available and little chance of finding an occupation, or they were highly motivated to participate in the bootcamp. Each of these scenarios generates a possible bias. For instance, people who were available could have low income, a poor network, and a lack of access to employment or education opportunities; this could lead to negative bias in our results, because, in this scenario, participants could be very vulnerable, and this was not reflected in the data, leading to unobserved hardship on achieving positive employment and education outcomes. On the other hand, if participation is associated with people who have more drive and motivation, it is likely that our results are positively biased since, perhaps, participants' success is more likely to be explained by their own motivation than by program participation. This issue is more important than the previous one, since it is hard to determine, with the existing data, the direction and magnitude of the bias (see Table 2.9).
- **Finally, participants refused to provide all the information requested, and there were also some problems in the accuracy of the information provided**. Income information was difficult to collect: not all participants accurately provided this information, and some of those who provided it did so in an inaccurate way. Also, all the information was self-reported, so bias in the data provided, collected, and analyzed is likely. This source of bias is minor as the data collected was not tied to incentives. In Colombia, people usually do not like reporting their income: DANE works around this problem through proxies.

**There were additional challenges concerning the data collection that could lead to possible biases.** The surveys specific to the impact evaluation were not the only ones that participants were asked complete, as other public entities involved – partners of the WBG for this activity – also carried out their own surveys. This led to survey fatigue among participants. Some of the control group participants that did not respond had their phone numbers deactivated after participation, which was a cause for nonresponse.

**The team also tried contacting these participants through other means (such as home visits or social media) but some of these attempts at communication were not successful**. Finally, all 239 participants, for whom data was incomplete, were contacted to provide the missing information. This greatly reduced the number of missing values.

## Balance at Baseline

**It was assumed that no external factors other than participation in the bootcamp would explain any differences in outcomes between the treatment and comparison groups.** To validate this assumption, eligible participants in the respective groups were tested as to whether they had similar characteristics at the baseline. Random allocation of treatment assignment produced balance across the treatment and control groups, with no significant differences across 12 variables, including covariates and outcomes, as shown in Table 2.10.

**Table 2.11 shows that participants from the sample were more likely to have completed tertiary education, to be male urban residents, and to come from slightly lower strata than the average population of Medellin.** However, it is important to mention that the data for the experiment group in Medellin only included participants between the ages of 18 and 28.

### **Table 2.10:** Outcomes and covariates of treatment and control groups

| Main characteristics | Treatment group | Control group | N Treat | N Control | p-value |
|---|---|---|---|---|---|
| Outcome variables | | | | | |
| Job status (employed) | 17% | 20% | 119 | 160 | 0.68 |
| Job benefits (Yes) | 8% | 9% | 18 | 33 | 0.25 |
| Job satisfaction (satisfied) | 31% | 35% | 16 | 31 | 0.61 |
| Looking for a job (Yes) | 88% | 85% | 119 | 160 | 0.26 |
| Socioeconomic variables | | | | | |
| Age (Average) | 24.2 | 24.6 | 119 | 160 | 0.88 |
| Females | 28% | 33% | 119 | 160 | 0.83 |
| Average socioeconomic strata | 2.3 | 2.4 | 119 | 160 | 0.89 |
| Rural population | 11% | 11% | 119 | 160 | 0.53 |
| Mothers who finished high school | 55% | 60% | 119 | 160 | 0.80 |
| Only finished high school | 33% | 28% | 119 | 160 | 0.2 |
| Have some tertiary education | 66% | 68% | 119 | 160 | 0.67 |
| Have previous work experience | 82% | 81% | 119 | 160 | 0.35 |

*Source*: authors' calculations.

## **Table 2.11:** Descriptive statistics of the sample

| | Sample (Treatment and Control) | Medellín |
|---|---|---|
| Average age | 24.4 | 34.9 |
| Female (between 18 -24) | 30.8% | 55% |
| Rural population | 11.1% | n.a. |
| Father finished high school | 53.7% | 18.8%[a] |
| Mother finished high school | 58.4% | 13.4%[a] |
| Only completed high school education | 30.1% | 25.2% |
| Have some level of tertiary education | 67% | 21.3% |
| Average number of years of education | 12.8 | 11.8 |
| Average socioeconomic strata | 2.3 | 2.2 |

*Source*: authors' calculations and DANE (GEIH and ENCV 2015).

*Note*: a. This data is for the Department of Antioquia in urban areas. Antioquia is Colombia's most populated province and the country's largest economy after the capital district of Bogota. Its capital is Medellín.

# RESULTS

**This section describes the results of the empirical specifications structured around the program's theory of change.** Results on labor market outcomes are presented first, particularly the probability of being employed, and having a job with benefits and job satisfaction. The section then explores the program's impact on acquiring high-quality or technical jobs. The impact of the program on education outcomes was then analyzed, particularly the probability of dropping out of a program, or starting a new program. Finally, tentative evidence of the impact of the program on socioemotional skills is explored.

**Given that the impact evaluation tests multiple hypotheses, the team made adjustments to prevent finding statistically significant results by chance using the Bonferroni adjustment.** To make sure that our results are statistically robust, the chosen alpha level to accept statistical significance is 5%. Considering that the impact evaluation tests for seven different outcomes, after doing the Bonferroni adjustment, statistical significance is reached if p-values are smaller than 0.007.

## Impact on Labor Market Outcomes

**The impact of bootcamp participation on job status, job satisfaction, job benefits, business creation, and high-quality employment status are analyzed below.** Each section presents the ANOVA results and a brief description of them.

**Table 2.12 shows that none of the treatment coefficients, linking job status and treatment, are statistically significantly different from zero.** In other words, this means that the likelihood of being employed was not significantly different between treatment and comparison groups on average. Models 1 through 3, which do not consider statistical interactions have average treatment effects that are not statistically different from 0. This means that participation in the treatment does not have an impact, in any direction, on job status.

**When interacting the treatment variable with a dummy variable for being a woman (column 4), having tertiary education (column 5) or belonging to a household that lives in socioeconomic strata 3 or higher (column 6), no significant differential treatment effects between the groups was observed, since none of the coefficients for these interaction variables are statistically significant.** Further, when interacting both gender and socioeconomic strata, there are no significant differences.

**This means that treatment not only lacks an effect on job status (that is, being employed), on average, but also does not generate better odds for finding a job, in general, for people belonging to different population groups**. There is no differential impact among people depending on their gender, socioeconomic strata, and education level.

## **Table 2.12:** Treatment impact on job status

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Variables** | ***Unconditional Intention-to-treat*** | ***Unconditional Treatment on the treated*** | ***Regression with Controls*** | ***Controls and interaction between gender and treatment*** | ***Controls and interaction between tertiary education and treatment*** | ***Controls and interaction between strata and treatment*** | ***Controls and interaction between gender, strata and treatment*** |
| *Treatment* | 0.00545 | | 0.00674 | 0.0496 | -0.0309 | -0.00916 | -0.00910 |
| | (0.0554) | | (0.0556) | (0.0673) | (0.101) | (0.0696) | (0.0585) |
| *Completed 80 percent of Bootcamp* | | -0.0312 | | | | | |
| | | (0.0561) | | | | | |
| *Treatment* Female* | | | | -0.136 | | | |
| | | | | (0.121) | | | |
| *Treatment* Tertiary Education* | | | | | 0.0541 | | |
| | | | | | (0.121) | | |
| *Treatment* High Strata* | | | | | | 0.0443 | |
| | | | | | | (0.116) | |
| *Treatment* Female* Strata* | | | | | | | 0.136 |
| *Observations* | 239 | 239 | 239 | 239 | 239 | 239 | 239 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Results on job satisfaction show similar patterns.** The probability of being satisfied with their job is shown in **Table 2.13**. The average treatment effects for this variable (column 1) show no impact on average. This also holds for the treatment effect of bootcamp completion; thus, it cannot be concluded that treatment has an impact on job satisfaction.

Similarly, none of the interactions are statistically different from zero even when they have positive coefficients. No impact is observed, on average or for the previously mentioned population groups, on employee satisfaction resulting from participation in the program. These results may be influenced by the short timeframe for the population to become employed after the program (in some cases less than 6 months), which could make difficult to understand the satisfaction of a specific job compared with being employed for the first time.

## **Table 2.13:** Treatment impact on job satisfaction

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Variables** | ***Unconditional Intention-to-treat*** | ***Unconditional Treatment on the treated*** | ***Regression with Controls*** | ***Controls and interaction between gender and treatment*** | ***Controls and interaction between tertiary education and treatment*** | ***Controls and interaction between strata and treatment*** | ***Controls and interaction between gender, strata and treatment*** |
| *Treatment* | -0.141 | | -0.156 | -0.0848 | -0.162 | -0.375 | -0.170 |
| | (0.157) | | (0.178) | (0.226) | (0.369) | (0.276) | (0.190) |
| *Completed 80 percent of Bootcamp* | | -0.144 | | | | | |
| | | (0.163) | | | | | |
| *Treatment* Female* | | | | -0.243 | | | |
| | | | | (0.468) | | | |
| *Treatment* ertiary Education* | | | | | 0.00767 | | |
| | | | | | (0.427) | | |
| *Treatment* High Strata* | | | | | | 0.378 | |
| | | | | | | (0.364) | |
| *Treatment* Female* Strata* | | | | | | | 0.129 |
| *Observations* | 279 | 279 | 279 | 279 | 279 | 279 | 279 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Table 2.14 also shows that the average treatment effect is not significant on the proportion of participants reporting to have job benefits.** On average, participants who attended and completed the bootcamp did not report higher job benefits than those who did not. Even when the coefficients for treatment are negative, they are not statistically significantly different from zero.

The lack of significant impacts in Colombia may be due in part to labor market rigidities, which leads companies to hire workers with service contracts (*prestación de servicios*) without formal benefits rather than as employees. In this kind of contract, people only receive payment for services rendered, and in addition they need to arrange and pay for benefits themselves (mainly, health services, retirement savings, and work-related risk insurance). This is because of the high costs of formal labor, understanding formal labor as having a "*contrato laboral*" which includes health benefits, retirement savings, work-related risk insurance, vacations, and reimbursements. Because of these rigidities, the fact that a worker has additional skills may be irrelevant for the type of contract that they are offered.

Regarding the interaction variables, the same lack of statistical significance as in the previous models was observed. There were no differential impacts of bootcamp participation on the acquisition of job benefits relative to people's gender, strata, or education level.

## **Table 2.14:** Treatment impact on job benefits

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Variables** | ***Unconditional Attempt to Treat*** | ***Unconditional Treatment on the Treated*** | ***Regression with Controls*** | ***Controls and interaction between gender and treatment*** | ***Controls and interaction between tertiary education and treatment*** | ***Controls and interaction between strata and treatment*** | ***Controls and interaction between gender, strata and treatment*** |
| *Treatment* | -0.0493 | | -0.0840 | -0.0852 | -0.257 | -0.181 | -0.107 |
| | (0.143) | | (0.161) | (0.198) | (0.346) | (0.244) | (0.171) |
| *Completed 80 percent of Bootcamp* | | -0.0818 | | | | | |
| | | (0.149) | | | | | |
| *Treatment* Female* | | | | 0.00418 | | | |
| | | | | (0.401) | | | |
| *Treatment* Tertiary Education* | | | | | 0.223 | | |
| | | | | | (0.394) | | |
| *Treatment* High Strata* | | | | | | 0.169 | |
| | | | | | | (0.318) | |
| *Treatment* Female* Strata* | | | | | | | 0.171 |
| *Observations* | 279 | 279 | 279 | 279 | 279 | 279 | 279 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Results on the probability of creating a business, in Table 2.15, show a similar pattern.** There was no impact on average on participants; none of the coefficients for the unconditional models, or the controlled model with interaction, was statistically significant. This means that, on average, bootcamp participation had no impact on business creation.

The same result was found for all the other models, considering interactions. As in the previous cases, there were no statistically significant impacts on business creation from bootcamp participation for the analyzed population groups.

## **Table 2.15:** Treatment impact on business creation

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Variables** | ***Unconditional Attempt to Treat*** | ***Unconditional Treatment on the Treated*** | ***Regression with Controls*** | ***Controls and interaction between gender and treatment*** | ***Controls and interaction between tertiary education and treatment*** | ***Controls and interaction between strata and treatment*** | ***Controls and interaction between gender, strata and treatment*** |
| *Treatment* | 0.0423 | | 0.0490 | 0.0172 | -0.00278 | 0.0935 | 0.0547 |
| | (0.0461) | | (0.0473) | (0.0572) | (0.0862) | (0.0591) | (0.0499) |
| *Completed 80 percent of Bootcamp* | | -0.00406 | | | | | |
| | | (0.0469) | | | | | |
| *Treatment* Female* | | | | 0.102 | | | |
| | | | | (0.103) | | | |
| *Treatment* Tertiary Education* | | | | | 0.0746 | | |
| | | | | | (0.104) | | |
| *Treatment* High Strata* | | | | | | -0.124 | |
| | | | | | | (0.0988) | |
| *Treatment* Female* Strata* | | | | | | | -0.0493 |
| *Observations* | 239 | 239 | 239 | 239 | 239 | 239 | 239 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**As previously mentioned, the team also used a qualitative variable to complement the analysis on job status and employment type.** A dummy variable was created of high job quality, as indicated by the job titles/positions reported by participants. This variable was defined using the following criteria:

- 1 if: position contained the word engineer, developer, director (head or coordinator), programmer, analyst, advisor, or the name of a profession that usually requires a four-year college degree, or if the name of the position had anything to do with the IT sector. 60.1% of participants had a job fitting these criteria.
- 0 otherwise.

As Table 2.16 shows, there was no statistically significant impacts of bootcamp participation **and completion on acquisition of high-quality or tech-related jobs**. As in the previous cases, there were no statistically significant effects of bootcamp participation on this variable. Even though, the treatment coefficients for ANOVA were positive, they were not statistically significant, thus it cannot be concluded that bootcamp participation has an impact on acquisition of high-quality jobs.

## **Table 2.16:** Treatment impact on high quality and IT jobs

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Variables** | ***Intention-to- treat*** | ***Treatment on the Treated*** | ***Regression with Controls*** | ***Controls and interaction between gender and treatment*** | ***Controls and interaction between tertiary education and treatment*** | ***Controls and interaction between strata and treatment*** | ***Controls and interaction between gender, strata and treatment*** |
| *Treatment* | 0.0423 | | 0.0490 | 0.0172 | -0.00278 | 0.0935 | 0.0547 |
| | (0.0461) | | (0.0473) | (0.0572) | (0.0862) | (0.0591) | (0.0499) |
| *Completed 80 percent of Bootcamp* | | -0.00406 | | | | | |
| | | (0.0469) | | | | | |
| *Treatment* Female* | | | | 0.102 | | | |
| | | | | (0.103) | | | |
| *Treatment* Tertiary Education* | | | | | 0.0746 | | |
| | | | | | (0.104) | | |
| *Treatment* High Strata* | | | | | | -0.124 | |
| | | | | | | (0.0988) | |
| *Treatment* Female* Strata* | | | | | | | -0.0493 |
| *Observations* | 279 | 279 | 279 | 279 | 279 | 279 | 279 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**The results on the impact of the program do not show statistically significant job outcomes**. The program did not have an effect on any of the job variables. This has to do with two main reasons: the first (which will be developed in the Summary of Results) has to do with the statistical power of the sample; the second is associated with the Bonferroni adjustment, which was needed because of the multiple hypotheses testing.

**The lack of average impacts has at least three explanations**. First, the program may not be providing the skills required in the labor market; thus, it does not help employment outcomes, or it may not be providing the skills that different populations need. Different populations enroll in the bootcamp with different skills; and bootcamp participation does not necessarily provide the needed skills for everyone. To bolster the effectiveness of bootcamps, greater focus could be placed on the skills needed by particular population groups.

**Second, even if the program is providing the right skills, labor market rigidities may prevent the application of these skills to job requirements**. For example, well-documented constraints such as the relatively high costs of firing workers or the cost of formal employment may actually be binding in the Colombian case. According to Clavijo, Vera, Cuellar, and Rios (2015), the additional costs of formality in Colombia amount to 49% of contract value.

**Third, the evaluation period may be too short, and the targeted population may take more time to find formal jobs**. Most participants were studying at baseline, and the bootcamp was provided during the summer, with many students returning to their programs after it ended. Timing was a constraint in the design of this evaluation. Thus, while short-term impacts may not be seen, it does not mean that long-term outcomes would not improve. However, the impact on educational outcomes, which are discussed next, can be used as a proxy for future labor market opportunities. The study considers two educational outcomes: the probability of continuing with an existing educational program (broadly defined), and the probability of starting a new program.

## Impact on Education Outcomes

**The impact of this program on education outcomes can be observed through at least two channels: (1) returning to school, and (2) leading students to consider education more relevant by not dropping out from the program.** The bootcamp sought to provide practical and technical skills, emulating the work environment.

**These activities could have two main effects on students' perception of higher education: first, to help them determine their interest, and second, to help them see the usefulness of those skills**. This may have motivated participants to successfully complete their studies if they were enrolled in a program. The widely documented shortcomings in the quality assurance system, especially for technical and technological programs (which a majority of beneficiaries were studying) may mean that participants benefit from a standardized, practical, market-relevant component to motivate the continuation of their studies.

**On the other hand, participants not enrolled in any program may have been motivated to return to school to pursue further studies**. This could happen because, given high-quality content and relevant skills being taught, participants noticed that pursuing further studies would improve their skills and job market opportunities, showing participants the importance and real-life applicability of these skills. It is also likely that bootcamp participants in Colombia do not need to immediately enroll in additional programs since they consider the bootcamps a formal education program. The following section presents the results for these two variables.

**The results on the impact of the program on educational outcomes are not statistically significant either**. Table 2.17 shows the impact of bootcamp participation on formal education program completion.

## **Table 2.17:** Treatment impact on dropping out from education programs

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Variables** | ***Unconditional Attempt to Treat*** | ***Unconditional Treatment on the Treated*** | ***Regression with Controls*** | ***Controls and interaction between gender and treatment*** | ***Controls and interaction between tertiary education and treatment*** | ***Controls and interaction between strata and treatment*** | ***Controls and interaction between gender, strata and treatment*** |
| *Treatment* | -0.157 | | -0.168 | -0.159 | -0.336* | -0.118 | -0.164 |
| | (0.0999) | | (0.102) | (0.128) | (0.193) | (0.122) | (0.107) |
| *Completed 80 percent of Bootcamp* | | -0.189* | | | | | |
| | | (0.102) | | | | | |
| *Treatment* Female* | | | | -0.0264 | | | |
| | | | | (0.215) | | | |
| *Treatment* Tertiary Education* | | | | | 0.232 | | |
| | | | | | (0.227) | | |
| *Treatment* High Strata* | | | | | | -0.176 | |
| | | | | | | (0.230) | |
| *Treatment* Female* Strata* | | | | | | | -0.0480 |
| *Observations* | 239 | 239 | 239 | 239 | 239 | 239 | 239 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Average treatment effects are not statistically significantly different from 0, after adjusting p-values with the Bonferroni adjustment. As in the previous cases, there are no statistically significant impacts of bootcamp participation on educational program drop out. Some of the ANOVA coefficients are statistically significant at the 10% confidence level (before Bonferroni adjustment) and in the expected direction. This leads to the conclusion that the sample lacked the necessary power required to find statistically significant results.

On the other hand, the impact on starting a program upon completion of the bootcamps behaves in the same way as the impact on dropping out from formal education programs (see Table 2.18. Once again, as in the previous cases conclusions cannot be drawn on the impact of bootcamp participation on education outcomes.

## **Table 2.18:** Treatment impact on starting a postsecondary education program

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| **Variables** | ***Unconditional Attempt to Treat*** | ***Unconditional Treatment on the Treated*** | ***Regression with Controls*** | ***Controls and interaction between gender and treatment*** | ***Controls and interaction between tertiary education and treatment*** | ***Controls and interaction between strata and treatment*** | ***Controls and interaction between gender, strata and treatment*** |
| *Treatment* | -0.0959 | | -0.102* | -0.0805 | -0.137 | -0.0986 | -0.0917 |
| | (0.0583) | | (0.0593) | (0.0718) | (0.108) | (0.0744) | (0.0625) |
| *Completed 80 percent of Bootcamp* | | -0.0719 | | | | | |
| | | (0.0593) | | | | | |
| *Treatment*Female* | | | | -0.0682 | | | |
| | | | | (0.129) | | | |
| *Treatment* Tertiary Education* | | | | | 0.0500 | | |
| | | | | | (0.130) | | |
| *Treatment* High Strata* | | | | | | -0.00890 | |
| | | | | | | (0.124) | |
| *Treatment* Female* Strata* | | | | | | | -0.0862 |
| *Observations* | 239 | 239 | 239 | 239 | 239 | 239 | 239 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

## Impact on Socioemotional Skills

Bootcamps are project-based, experiential, and executed in dynamic and close to real-life environments. Even though the provider did not execute the socioemotional skills component, it is likely that bootcamp participation could lead to improved socioemotional skills. In this sense, measurement was focused on the GRIT scale, since it is a reliable measurement of the socioemotional skills most relevant to success. The GRIT scale measures people's determination, courage, and strength of character. It has been used to determine people's general soft skills.

The regression outcomes show that there was no statistically significant impact of bootcamp participation on GRIT (shown in Table 2.19). Also, no statistically significant impacts were found on any of the ROPELOC constructs (thus, this is not reported).

### **Table 2.19:** Treatment impact on GRIT

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| **Variables** | ***Uncontrolled Attempt to Treat*** | ***Uncontrolled Treatment on the Treated*** | ***Regression with Controls*** | ***Controls and interaction between gender and treatment*** | ***Controls and interaction between tertiary education and treatment*** | ***Controls and interaction between strata and treatment*** | ***Controls and interaction between gender, strata and treatment*** | ***Attempt to Treat*** |
| *Treatment* | -0.0612 | | -0.0391 | 0.0374 | 0.112 | -0.0157 | -0.0269 | -0.0612 |
| | (0.0765) | | (0.0776) | (0.0949) | (0.142) | (0.0977) | (0.0822) | (0.0765) |
| *Completed 80 percent of Bootcamp* | | -0.0854 | | | | | | |
| | | (0.0768) | | | | | | |
| *Treatment* Female* | | | | -0.234 | | | | |
| | | | | (0.168) | | | | |
| *Treatment* Tertiary Education* | | | | | -0.214 | | | |
| | | | | | (0.169) | | | |
| *Treatment* High Strata* | | | | | | -0.0643 | | |
| | | | | | | (0.163) | | |
| *Treatment* Mother completed Highschool* | | | | | | | -0.0962 | |
| | | | | | | | (0.209) | |
| *Treatment* Female* Strata* | -0.0612 | | -0.0391 | 0.0374 | 0.112 | -0.0157 | -0.0269 | -0.0612 |
| *Observations* | 207 | 207 | 207 | 207 | 207 | 207 | 207 | 207 |
| *Treatment* | 0.003 | 0.006 | 0.034 | 0.044 | 0.042 | 0.035 | 0.049 | 0.035 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

## Summary of Results

In general, the results presented in this section do not show significant outcomes in the key three domains usually impacted by bootcamps. This section briefly summarizes and analyzes the results for each domain. Appendix E shows regressions that account for the lack of full program completion of the treatment group using an instrumental variable approach. The results do not change.

***Job Outcomes***

This was the main goal of bootcamp participation. In this regard, it would be accurate to state that the goal of the intervention was not achieved. On average, bootcamps participants did not report higher job satisfaction, job benefits, employment, high quality jobs, or business creation. This means that participants' general job outcomes were not improved by bootcamp participation.

As previously discussed, there are several possible reasons for these results. It is possible that program implementation and curriculum, or treatment group identification design could have led to different outcomes than expected. The importance of better targeting women is highlighted, since this group was underrepresented in the training.

***Education Outcomes***

The secondary goal of bootcamp participation was to provide useful skills and to show trainees that these skills were useful. This was not assessed, but the likelihood of dropping out from current formal education programs and of starting new formal education programs was measured, but no impact was found. This is most likely because of the time frame; perhaps these participants will enroll in other formal education programs in the future.

***Socioemotional Outcomes***

This part of the program was not fully implemented and, unfortunately, did not provide statistically significant results. On average, participants did not have stronger GRIT than their peers. This is one of the key theoretical outcomes of bootcamp participation. This most likely means that participants need the metacognition process to fully develop these skills. In the Colombian case, participants only worked collaboratively in the dynamic bootcamp environment, but did not have workshops to develop and reflect on the process.

***Sample Power***

The main finding from the impact evaluation in Colombia is not that bootcamps do not help low income populations' socioemotional skills, job status, or education. Rather, in order have sound results, larger samples are needed to achieve greater power.

There are two sources of reduced power for the experiment. The first is associated with the multiple impacts that bootcamps typically have (at least three) on jobs, education, and socioemotional skills. This condition led to a Bonferroni adjustment to all the p-values, to ensure that statistically significant outcomes were not found by chance. This made p-values smaller than usual, thus leading to the need for a larger sample.

The second source is associated with the sample's power, and its associated minimum detectable effect (MDE), calculated with the collected data. The team did ex post calculations to determine the MDE for each of the variables, given the sample and each variable's descriptive statistics. Table 2.20 shows the MDE for the model in general and for each of the job status outcomes in percentage points, without taking into consideration Bonferroni adjustments. Impacts of the program need to be quite large to be detectable with the sample used.

**Table 2.20:** MDE for impact evaluation

| Variable | Minimum Detectable Effect |
|---|---|
| General | 0.20 |
| Job Status | 0.13 |
| Job Satisfaction | 0.16 |
| Job Benefits | 0.17 |
| Business creation | 0.06 |
| High Quality Jobs | 0.09 |

Key recommendations for next steps include:

- Focus intervention on the inclusion of women in IT-related jobs and training. The Colombian case shows that women were underrepresented and had lower outcomes than their male peers.
- Develop a platform for business creation support for lower income populations, and use the lessons of this training program for future interventions in Colombia to guarantee better implementation.
- Use larger samples, and choose providers who have experience with larger bootcamps.
- Focus the research question on fewer outcomes, to prevent large impacts of multiple hypotheses testing.

## Notes:

1. http://www.intellectualcapitals.com/colombia-leads-in-office-outsourcing.
2. http://www.investincolombia.com.co/sectors/services/software-and-services-it.html.
3. http://www.investincolombia.com.co/sectors/services/software-and-services-it.html.
4. https://www.fdiintelligence.com/Locations/Americas/Colombia/Medellin-s-renaissance-how-tech-investment-is-transforming-Colombia-s-second-city.
5. See https://www.epm.com.co/site/nuestros-proyectos/proyecto-uva.
6. Ruta N Corporation's Landing Program provides business space to companies to quickly start operations in Medellín.
7. Even though when doing a randomized experiment, control variables are not necessary.
8. Observatorio Laboral, Colombian Ministry of Education.
9. This variable was considered, however, it has several possible sources of bias. In the baseline survey, people were asked their approximate date of formal education. Six participants in the treatment group were already planning to finish their formal education programs after the bootcamp, while only four were planning to do so in the control group. Additionally, participants were asked the program finished by the endline. Among the differences between the treatment and control group were: (a) only five participants in the control group reported finishing "other" education programs. Among these programs the answers provided were: "diploma" and "English class", and (b) 20 people in the treatment group reported finishing "other" education programs. Six of them reported the bootcamp as the education program. Among the answers provided for this "other" classification was the "diploma" and "English class, but also: "certificate," "analytics certificate," "course," and "seminars." All of these categories could also be confounding variables for the bootcamp.
10. $0.05/7 = 0.007$.
11. These are jobs that in Colombia usually require a degree. For example, school teachers people a four-year college degree or a normal school degree. These requirements are usually enforced more rigorously in cities

# QUALITATIVE STUDY IN BEIRUT, LEBANON

To complement the impact evaluation in Medellín, the World Bank carried out two qualitative case studies: one in Beirut (Lebanon) and another in Nairobi (Kenya). This chapter describes the qualitative case study in Beirut, which was framed around focus group discussions with bootcamp students before the program and following their graduation. It was complemented by interviews with graduates' employers in the IT industry, as well as a baseline, midline, and exit surveys that shed light on students' perceptions and employment situation.

## CONTEXT

### Why Beirut?

Lebanon has continued to face security challenges since the end of the Lebanese civil war in 1990. More recently, the country has been unable to escape unscathed from conflicts in its neighborhood, most notably the Syrian civil war, which has rendered Lebanon the largest host of Syrian refugees in proportion to its population: the four million strong country is home to some two million registered and unregistered Syrian refugees. On the upside, Lebanon has managed to bypass the domestic political deadlock, which culminated in the election of a president after a two-year leadership vacuum.

Lebanon is a regionally acclaimed leader in the provision of high-quality education. Beirut, in particular, is also known for its growing multilingual entrepreneurial society. The city has already developed some key elements of a technology ecosystem, including incubators, venture capital firms, clusters, and a number of successful startups that reach out to regional and global markets.

The country and its capital, however, face a considerable urban unemployment challenge. Lebanon's population is 88 percent urban, and nearly one third of its population live in Beirut (World Bank 2015). The poverty level in Beirut is estimated at 16 percent, the lowest in a country that has an overall poverty rate of 27 percent (Central Administration for Statistics and World Bank 2015).

Before the Syrian crisis, Lebanon's unemployment rate was 11 percent. Today, over half of Beirut's labor force (55 percent) are wage employees, 25 percent are self-employed, and 13 percent are unemployed (Central Administration for Statistics and World Bank 2015). The youth unemployment rate – 34 percent— is alarmingly high, partially explained by low domestic market demand for educated but not highly experienced labor. Overall, the country lacks the capacity to accommodate and use this specific human capital. The shortage of quality jobs is pushing youth, and others who are disillusioned with the status quo, to emigrate. According to an independent study that included 25 percent of emigrants as a sample, 26.6 percent of respondents had engineering and technology degrees, 9.8 percent had mathematics and computer science degrees, and 26.5 percent were specialized in business management (World Bank 2015).

In 2013, the revenues of Lebanon's ICT services sector, three-quarters of which is dominated by communications services, contributed 2.8 percent to GDP (World Bank 2015). The tech ecosystem can therefore help diversify the ICT services sector from traditional telecom services and equipment sales toward consumer-oriented applications development.

### The Lebanese Startup Ecosystem

ICT startup entrepreneurship in Lebanon epitomizes the private sector's solutions to the country's socioeconomic problems of stagnating growth, a young workforce subject to unemployment, or brain drain. The startup ecosystem also facilitates Lebanon's development into an innovative knowledge economy.

Lebanon's tech scene is becoming increasingly attractive, driven by successful startups that have tapped into regional and global markets. The ArabNet Start-up Database identifies about 170 tech startups that are currently operational. Among them, 33 specialize in mobile app development, 24 in software, 19 in e-commerce, and 13 in entertainment, including games. Lebanon's tech ecosystem includes a number of coworking spaces (for example, AltCity, Coworking+961, Cloud5, and DigiHive); business incubators (Business Incubation Association of Tripoli (BIAT)); startup accelerators (for example, UK Lebanon Tech Hub, Speed@BDD, Berytech, and Flat6 Labs); networking and event organizers (for example, Bader, ArabNet, and Wamda); mentorship and support nonprofits (for example, Endeavor and Lebanon for Entrepreneurs (LFE)); as well as universities with technology and entrepreneurship programs (for example, Lebanese University, Saint Joseph University (USJ), American University of Beirut (AUB), and Beirut Arab University (BAU)).

The Beirut Digital District (BDD), a large redevelopment project in the Bachoura neighborhood in the center of the city, aims to become the heart of Lebanon's tech ecosystem. The project is a public-private partnership between ZRE, a real estate firm, Berytech, and the Ministry of Telecommunications. BDD consists of several new and renovated buildings covering three city blocks aimed at hosting established ICT firms and startups, as well as other organizations involved in the ecosystem. By 2016, 55 companies and 700 employees were expected to be working at BDD (World Bank 2015).

The Lebanese government is addressing financial and entrepreneurial constraints to startups' development. It facilitates access to commercial bank funding, guarantees, and tax exemptions for new technology SMEs through institutions such as Kafalat and the Investment Development Authority of Lebanon. In addition, in August 2013, the Central Bank of Lebanon (Banque du Liban) issued an Intermediate Circular no. 331 that guarantees up to 75 percent of investment in Lebanese startups (Mulas and others 2016, 51). According to Banque du Liban, local and regional equity investment firms have invested over $10 million in Lebanese startups since 2010. Other investment options include venture capital firm investments (such as Berytech Fund II and IMPACT Fund), grants and other financial mechanisms provided by international organizations and donors, and international crowdfunding efforts (Mulas and others 2016, 51).

The World Bank has been actively supporting the tech startup ecosystem in Lebanon. Current World Bank projects include assistance to support innovation for SMEs. Together with the Ministry of Telecommunications, the World Bank also devised the Mobile Internet Ecosystem Project (MIEP), which was later cancelled as the leadership vacuum prevented its ratification. The project, however, was instrumental in helping ecosystem stakeholders prepare and test the design of the Mobile Innovation Hub (MiHub), which became an unofficial forum for programs and events coordination within the ecosystem (Mulas and others 2016, 56).

# PROGRAM BACKGROUND

In 2016 and the first part of 2017, the World Bank partnered with Berytech, as research partner, and SE (Software Engendering) Factory, a coding bootcamp, to develop this assessment in Beirut (see Table 3.1). The cost of the bootcamp was $100 per student, and partners agreed on a pay-per-survey scheme to fund up to $90 per student. SE Factory was selected because it was the only bootcamp provider that was affordable to all income brackets of the population.

SE Factory operates as a nonprofit organization and only accepts computer science students or graduates from less-privileged backgrounds in order to provide them with the most up-to-date programming languages and tools to make them employable as junior web developers. SE Factory became operational in March 2016. To date, it has trained 23 students in two cohorts. Its first cohort consisted of eight students from the low-income strata, selected from 50 eligible applicants. The second cohort trained 15 students. For a detailed profile of SE Factory, see Mulas and others (2017).

# RESEARCH DESIGN

**Table 3.1:** Decoding Bootcamps Program in Beirut

| | |
|---|---|
| ***Impact Evaluation*** | |
| Methodology | Qualitative study (surveys, interviews, focus group discussions) |
| ***Coding Bootcamp*** | |
| Bootcamp provider | SE Factory |
| Implementation dates | July–October 2016 |
| Cost to participants | $100 |
| Bootcamp curriculum | Full-stack web development (Apache, SQL, PHP, HTML / CSS, JavaScript, etc.) |
| Number of bootcamps | 1 cohort |
| Final class size | 15 students |
| Final number of study participants | 13 students |
| **Participants' profile** | |
| Age | 21-22: 46 percent<br>23-24: 31 percent<br>25-26: 23 percent |
| Gender | Male: 69 percent<br>Female: 31 percent |
| Socioeconomic standing at baseline | Employed (15 percent); unemployed (62 percent); economically inactive (23 percent).<br>Undergraduate student (23 percent); Technical diploma (8 percent); Bachelor/Master degree holders (70 percent). |

Source: Authors.

**Methodology:** The qualitative research for the Beirut pilot was based on focus group discussions (FGDs) with bootcamp students (at the beginning of the bootcamp and four months after graduation) and interviews with bootcamp graduates' employers in the IT industry. In addition, the qualitative research was complemented by three quantitative surveys. All three pilots that are part of this study (Medellín, Beirut, and Nairobi) included the same baseline and exit surveys, and there was also a midline survey in Beirut and Nairobi to better understand students' perceptions.

Owing to the small sample size (13 students), the conclusions drawn from the analysis in Beirut are not statistically significant. However, they complement the results from the randomized controlled trial (RCT) in Medellín.

For more information on the qualitative study design, see Appendix B.

**Selection criteria and process:** On May 1, 2016, SE Factory opened applications for potential participants to the bootcamp, announcing it through various channels, including universities, job boards, social media, information sessions, and mass mailing.

To satisfy the minimum selection criteria, bootcamp applicants were required to: (i) have low income; (ii) have a university degree in computer science or engineering; (iii) have basic English proficiency; (iv) be able to commit to full-time attendance of the bootcamp; and (v) be highly motivated to pursue the bootcamp education (as assessed through interviews). Conformance with these criteria was tested through an online application form, covering the applicant's educational and professional background, including a personal assessment of various software development skills, soft skills (for example, project management), and English language skills. The online application also contained a questionnaire about applicant expectations of the program and confirmed their ability to commit to attending the bootcamp on a full-time basis. Successful applicants who passed the online application round were invited for interview, which were conducted over the phone or in person. The interviews were aimed at assessing the applicants' motivation level.

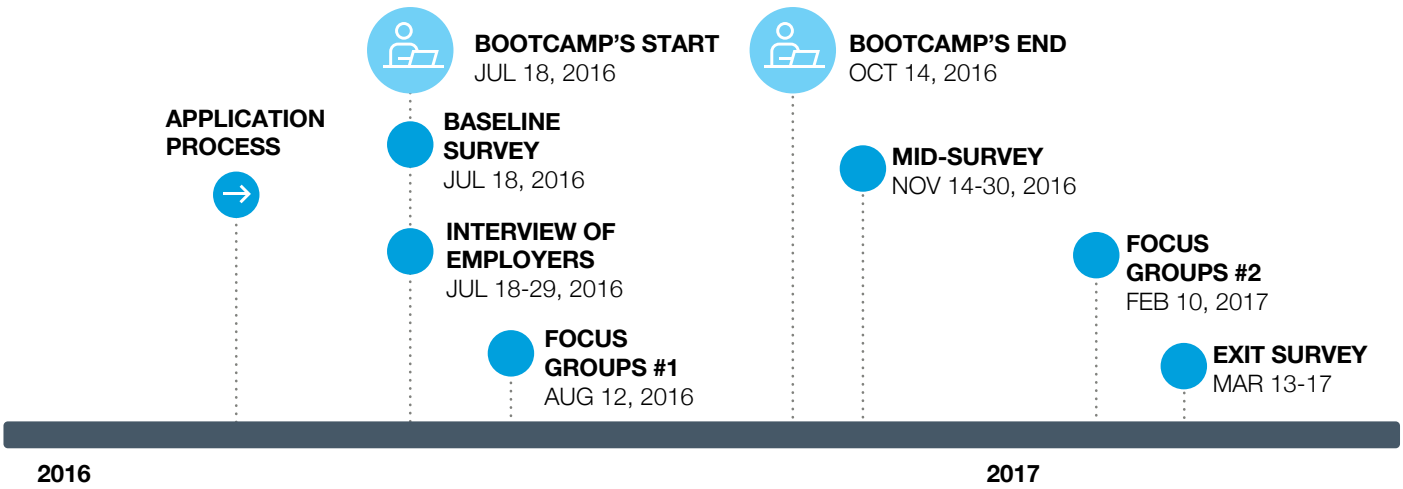
**Curriculum:** The SE Factory curriculum focuses on technical skills (80 percent of the program content), complemented with soft skills necessary for web developers. The curriculum was developed in-house by combining best practice from international bootcamps (for example, Dev Bootcamp, Hack Reactor) with local market demand. The team emphasized the need to adapt the curriculum to the local context rather than simply replicating the approach of U.S. or European bootcamps. For example, SE Factory teaches PHP (server-side programming language for web development, which can also be used in general-purpose programming) rather than Ruby (object-oriented general-purpose programming language) since the demand for PHP programmers is much higher in Lebanon.

The SE Factory bootcamp runs for 12 weeks, Monday to Friday, 10 am–7 pm. Berytech offers free transportation for accepted students. This intensive training schedule requires a full-time commitment to the program, and students typically cannot pursue work or other studies concurrently.

During the last two weeks of the bootcamp, students work on individual projects, in which they develop a web application of their choice. The program ends with a demo day, where students present their projects to partner companies. The bootcamp aims to facilitate students' job search through introductions to potential employers, and partner companies have first-hand access to these graduates.

**Timeline of activities:** Figure 3.1 illustrates the timeline of the pilot's data collection activities.

## **Figure 3.1:** Timeline of pilot activities in Beirut



The pilot activities comprised the following:

4. Baseline survey: This survey included questions about students' backgrounds and motivation for joining the bootcamp. It was administered during the first day of the training.

5. Midline survey: An online midline survey focused on graduates' impressions of the bootcamp. It was administered after the training was completed.

6. Exit survey: This survey measured the impact of the coding bootcamp in terms of students' employment and educational opportunities. It also compared their initial expectations with their progress six months after graduation.

7. Interviews with employers: A Berytech researcher conducted six semistructured interviews with managers of firms who were potentially interested in hiring bootcamp graduates. In addition, four companies were surveyed through an online survey form.

8. Initial Focus Group Discussions (FGDs): The initial round of three FGDs consisted of two-hour long sessions with the following:

    - Bootcamp students: 10 students participated in a FGD to capture what the quantitative survey did not show and to elicit information about how students felt at the beginning of the bootcamp.

    - Interested/prospective students: This session's participants included those who had applied to the bootcamp but were not accepted, those who were interested in applying but for various reasons were unable to join the program, and/or those that were about to attend to an upcoming cohort. The aim was to have the viewpoints of these individuals in comparison to the responses provided by students enrolled in the bootcamp.

    - Mixed session: This FGD was a mix of three students, three interested/prospective students, and six experts/representatives from the ICT industry, academia, and the donor community. The aim was to initiate a dialogue between the different stakeholders from the ICT innovation ecosystem.

9. Final Focus Group Discussions: The final round of three FGDs consisted of similar two-hour long sessions. The only difference in the format of these final FGDs was in the composition of the third grouping:

    - Students: Eight students participated in the FGD, which aimed to gain insight into how such bootcamps could be more effective, and how they could be made a more useful tool for students.

    - Interested/prospective students: As the research aimed to gauge the effectiveness of bootcamps in advancing the careers of students, this discussion was held with six participants who did not go through the bootcamp but were interested in the field.

    - Bootcamp graduates' employers: This FGD consisted of a group discussion with four employers of former bootcamp students. It was aimed at understanding their perspectives of the competencies of bootcamp graduates, as well as understanding if there was a skills gap, and what their needs as employers were.

## SAMPLE

Of 56 applicants to the bootcamp, a total of 15 students who successfully completed the prescreening were invited to participate in the second cohort and were included as participants in the World Bank study. Of the 15 participants, one did not fill out the midline survey and another refused to complete the follow-up survey; thus, this pilot followed the progress of 13 individuals. Throughout the course of the study, and out of the 13 participants, one student dropped out of the program because of family reasons.

The group of respondents was composed of nine male (69.2 percent) and four female students (30.8 percent). All were single and without children. Their average age was 24.5 years, the youngest being 21, and the oldest being 26. At the time of the baseline survey, nine students (69.2 percent) were residents of Beirut (metropolitan area), two lived in another large city (15.4 percent), and two lived in a rural area (15.4 percent). Eight of these students (61.5 percent) grew up in a different area and had moved to Beirut for education or apprenticeship purposes.

Most students had a university degree: nine (69.2 percent) had a Bachelor or Master's degree, three (23.1 percent) were still attending an undergraduate program, and just one had a technical diploma as their highest level of education. In all cases, the students' area of study was related to computer science or computer engineering.

Regarding their employment status, only two students (15.4 percent) were working at the time the bootcamp started,

while eight (61.5 percent) were unemployed (actively looking for a job), and three (23.1 percent) were economically inactive (not working nor looking for a job). Of those not working, three (23.1 percent) had no previous work experience, and for the ten participants (76.9 percent) who had previous work experience, six (46.2 percent) had experience in the IT-related field.

Most students were familiar with Java and HTML, and some had previous knowledge of C++, iOS, Android, and Python. In addition, most of their previous coding knowledge and skills were obtained at university, and only two students (15.4 percent) mentioned MOOCs as the source of obtaining programming skills.

As the group was homogeneous, the research also examined students' households in order to characterize initial endowments. As illustrated in Figure 3.2, almost 50 percent of students' parents had attained some form of higher education (Superior Technical Diploma, Bachelor/Master's degree), but the distribution was uneven by gender as 54 percent of fathers had attained higher education and only 38 percent of mothers had reached this level. In terms of employment status, in most of the households there is at least one member unemployed (see Figure 3.3).

# RESULTS

The following findings emerged from the data collected through the surveys, interviews with employers, and FGDs. The findings are grouped according to the following themes:

## Perception of Bootcamps

**Perspectives of surveyed Lebanese youth:** Both students and interested/prospective students mainly heard about the bootcamp from referrals, in some cases from friends (students that had participated in the previous cohort) or from professors at their respective universities (e-mails were sent from the Dean's Offices and SE Factory organized information sessions), as well as from social networks. Those students referred to SE Factory by universities said that they were excited to apply to the program when they received the e-mail, and about a third of members of their class applied to the bootcamp. Owing to the competitive process, they appeared glad to have been accepted into the program and to have the opportunity to further their technical skills. Those who heard about SE Factory from friends who participated in

**Figure 3.2:** Highest level of education obtained by parents of bootcamp respondents in Beirut

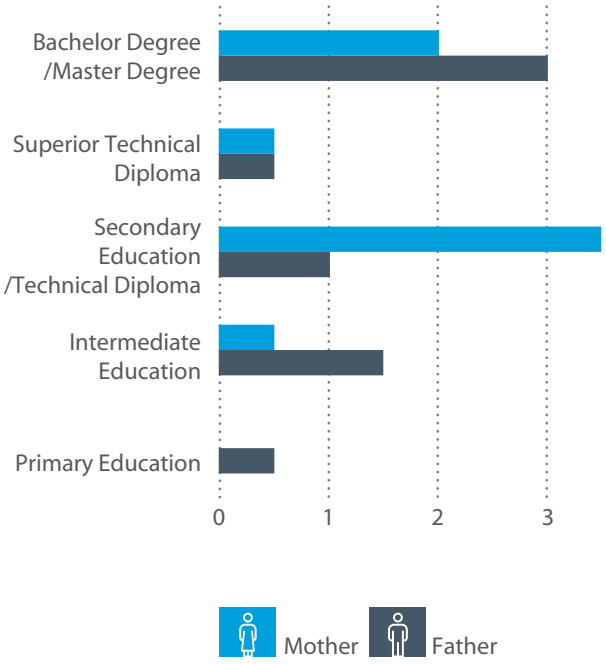
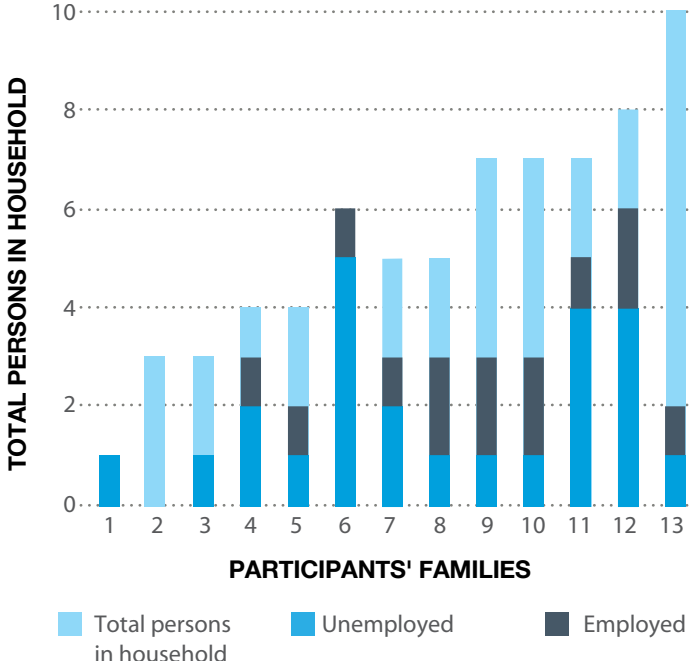



**Figure 3.3:** Work status of family members in Beirut



a previous cohort were encouraged by their experience and their improved job prospects following the training.

Word-of-mouth appears to be the best means of marketing the bootcamp. Young people are increasingly hearing more about bootcamps from managers in programming companies, and being a graduate of the bootcamp is associated with better prospects of being hired.

When joining the bootcamp, students reported mixed reactions from their families and friends, although most were positive and supportive, with some families providing financial support. One of the participants noted that his friends disapproved of him quitting his paid full-time job. Another participant needed more time to explain to his family why he was applying for the training program and not seeking a job instead.

Students felt that an intensive, full-time training could prepare them for the job market. However, some young people did not apply to the bootcamp because of its duration. Given that most of those interested in bootcamps were university students or recent graduates, they either had school commitments or were looking for a job and, therefore, found it difficult to participate in the program.

Of the interested/prospective students, those who were unable to join SE Factory were committed to reapplying to future batches, in some cases because they did not like their current job and wanted to be programmers. Some participants had been using online resources to learn more coding, but they stated that they would like to gain a bootcamp experience. They also saw the intensive training as a way to get two years' worth of experience in three months' time. In general, they considered that if they had attended the bootcamp, they would have different opportunities and been better equipped with technical skills that would have made them more employable.

**Perspectives from the tech industry:** Interviews revealed that potential employers exercise a "wait and see" strategy towards bootcamps as they are still a new method of acquiring coding skills in Beirut. A coding bootcamp that is well connected to the ecosystem usually brings in industry stakeholders to be instructors, mentor the students, or provide sessions on topics of interest for the students. Employers said this is a good opportunity to get a sense of their potential hires as they not only see how skilled the students are in a particular technology but also how interested and passionate they are. Some recruitments have been done through connections like these. Students also get excited when companies visit SE Factory and see the work they have done.

For small companies, it is important to get quality hires as they have less resources to invest in training new employees. Two employers stated that they had to create new positions as they were not able to choose from graduates that applied for one job. In comparison to top graduates from the best universities in Lebanon, which might sooner or later be contacted by leading multinational IT companies, employers feel bootcamp graduates bring a high level of commitment to the company and are looking to work for a purpose.

## Bootcamp experience

The impressions of the students can be summarized by one student's response, who said, "The bootcamp exceeded my expectations because not only did I learn how to code, I learned how to learn by myself."

Most of the students (85 percent) valued technical coding skills as the most important skills imparted during the bootcamp, while the remaining students said socioemotional skills were the most valuable skills they acquired. However, all students agreed that both sets of skills were crucial to their success during and after the bootcamp.

**Technical coding skills:** Students reported that SE Factory had provided them with relevant skills that the IT industry required right now, thus enabling them to get hired in the sector. Students felt that this sets bootcamps apart from universities, which only provide students with a basic level of understanding of how programming languages work.

**Socioemotional skills:** When it comes to socioemotional skills, both industry representatives and students stressed the value of communication skills, teamwork, flexibility, passion, adaptability, and problem solving. Students considered that they gained a lot in this area, and now appreciated that most reputable companies value these skills. Another skill they reportedly gained was related to the way of learning and researching; there are many programming languages in use and every company has its own specific needs, so learning how to learn is important. Students said that they now had a complete and different mindset that gives them the ability to learn anything they want. They did not just learn how to code, but they learned how to solve problems. In addition, the bootcamp reportedly provided students with networking opportunities, exposing them to people such as startup founders, managers, and other top software engineers in Lebanese or foreign companies.

**Job hunting:** Some students noted they had negative and stressful experiences while looking for jobs after graduating from university. By contrast, after the bootcamp, students

began getting job interviews, which also consisted of technical exams, and they were proud of how they faced them. They were interviewed on familiar topics, and this reinforced their confidence in the training provided by SE Factory. At the beginning of the bootcamp, students were told that the bootcamp was going to be a tough and intensive experience, based on the military bootcamp methodology. Now that some of these students have started to work, they appreciate that the bootcamp prepared them for their work lives. Moreover, thanks to the portfolio and CVs they prepared during their training, companies were able to ascertain the students' skills and knowledge. Students also felt that succeeding in the bootcamp required not only persistence and support from the instructors, but also teamwork and dedication.

## Tuition Fees

As the coding bootcamp in Lebanon was highly subsidized (students only paid the equivalent of $100), the topic of tuition costs was not brought into the discussion.

## Employability

The companies that participated in the FGDs noted that when looking for new hires in the programming field, they usually look for soft skills and interpersonal skills as well as an applicant's aptitude and passion for technology. Some companies still prefer university level education. The predominant majority of their hires are young people between the ages of 15 to 35 years. These companies consider the average salary of an entry-level programmer ($1,000–1,500 per month) to be acceptable.

All students except for one (92.3 percent), including the student who dropped out, felt confident about their future employment prospects having completed the bootcamp. They believed that the experience they gained during the training had strengthened their portfolios and equipped them with the skills to problem solve and even learn new languages if need be. In addition, 9 out of 13 respondents (69.2 percent) reported a high level of motivation in terms of looking for a job after the training, and none experienced a drop in this motivation level.

Postbootcamp, 11 out of the 13 respondents (82.6 percent) were currently employed; thus, the bootcamp may have improved the employability of students, given that eight of them (61.5 percent) were unemployed at baseline. However, when analyzing the employability of students, the "diploma effect" should be taken into account as nine of them (69.2 percent) reported university graduation dates between 2016 and 2017, meaning that they would have been entering the job market in the short-term anyway. Other factors should be considered in analyzing whether the current employment situation of students was directly related to the bootcamp training they received. Students reported that they received several job interviews after the training, and six of them (46.1 percent) received job offers at a multinational company in the healthcare sector.

Eight respondents (61.5 percent) used both the coding skills and soft skills acquired in the bootcamp in their current jobs, while three of them (23.1 percent) only used the coding skills. Similarly, nine respondents (69.2 percent) thought they received their current job because of the knowledge acquired in the bootcamp. Beyond that, the quality of employment is relevant here: four former students (30.8 percent) were not satisfied with their current jobs because of the pay, absence of benefits, or long commute to work.

At the beginning of the bootcamp, students expected it would be difficult to find a job as employers usually preferred applicants with experience. When the baseline survey and initial FGDs were conducted, students were asked where they aspired to work after completing the training: five wanted a job in a large private company (38.5 percent), three aspired to a job in a startup (23.1 percent), two wanted to work in a multinational corporation (15.4 percent), and two wanted to start their own businesses (15.4 percent). Students declared that working for a company was the safest path, but that creating a startup was most exciting.

Of the 11 graduates (84.6 percent) who were working at the time of the follow up survey, five were employed in a small private company (38.5 percent), five were working in a large private company (38.5 percent), and only one was working in a startup (7.7 percent). Only four graduates (30.8 percent) were working in a company they aspired to, and two of them (15.4 percent) were not satisfied with their current jobs because of the salary and absence of benefits.

Regarding entrepreneurship, students said that they had been encouraged to create their own startups and that they did have some ideas to start with; however, they still needed some experience before they could embark on becoming entrepreneurs. Though SE Factory gave them a good foundation, they also needed to learn the technical and business aspects involved in starting and running their own companies. Among the difficulties they perceived in terms of becoming an entrepreneur were competition, funding, and marketing requirements.

## Bootcamps versus University Education

Most of the student respondents agreed that universities and bootcamps complement one another. They felt that bootcamps played a role in bridging the gap between finishing university and entering the job market. Also, many felt that university education was not always geared towards market needs; IT languages change a lot, and universities do not adapt as fast. Moreover, the respondents noted that universities did not provide the orientation needed in terms of contextualizing coding, software development, and engineering to the wider market.

## Skills Gap

Employers reported that the software engineering field is currently one of Lebanon's biggest assets, with many companies developing rapidly and jobs being created. Employers and industry experts also stated that even American companies recruit their engineering teams from Beirut because its talent could become world-class and was very affordable. At the same time, demand for software developers in Lebanon is increasing because more startups are emerging and the ecosystem is growing.

The challenge companies face is on the supply side; there are not enough students enrolled in computer science and computer engineering programs to meet the market's needs. However, companies acknowledged that there was more talent available now compared to a few years ago, when it was very scarce.

Employers pointed to the country's brain drain as a challenge. There was no agreement on the numbers though, as some said that about 80 percent of Lebanese universities' graduates were emigrating to neighboring countries (especially in the Gulf) or were being retained by multinational companies. University deans testified that about 20 percent of their graduates leave the country. In any case, brain drain seems to be one of the major challenges on the supply side.

Most interviewed companies that hire entry-level programmers require new hires to go through a lengthy, three to six-month training program in the workplace. In this light, the previous knowledge of the trainee does not matter that much as they are trained for the new position. However, companies are becoming reluctant to pay for this training. They need graduates to commit to the company for a long period and prevent them from moving to competitors after having been trained.

SE Factory is trying to narrow this gap between supply and demand of the available talent. The talent needs to constantly evolve, and the tech industry feels that bootcamps such as SE Factory are making a difference, having already noticed an increase in the quality of their new hires. As opposed to SE Factory, experts believe that other coding schools that train students with no programming background rarely prepare them to be fully professional junior or midlevel programmers. There are many computer science graduates from universities who know the computer science theory but that information is rarely related to the direct needs of the industry, so SE Factory covers this gap.

# QUALITATIVE STUDY IN NAIROBI, KENYA

As in the case of Lebanon, the World Bank carried out a qualitative study in Nairobi. It was framed around focus group discussions with bootcamp students before the program and following their graduation. It was complemented by interviews with graduates' employers in the IT industry, as well as a baseline, midline, and exit surveys that shed light on students' perceptions and employment situation

## CONTEXT

### Why Nairobi?

Kenya's technology sector has been one of the fastest growing in the world over the past decade. It has become a model for technology investment in developing countries, including in Africa. The birthplace of M-Pesa, the highly successful mobile-based money transfer service, and Ushahidi, a crowdsourcing platform to track violence in real time and gather data from the public using SMS text messaging, Kenya's capital city, Nairobi, is recognized as a hub for technology innovation.

Three factors contributed to Kenya's emergence as a technology innovator in Africa. First, the increased recognition that the technology sector can help improve both commerce and civic participation has led to the establishment of facilities to support innovation among Kenyan programmers, entrepreneurs, and civil society professionals. The most distinguishable among them is the iHub, an innovation space and a catalyzer for the tech community in Nairobi. Second, the Government of Kenya has spearheaded a number of political and economic reforms to support the ICT sector and spur technological changes, such as building Kenya's own submarine communication cable (The East African Marine System, TEAMS) in 2009, which boosted bandwidth, increased the number of Internet users, and significantly cut prices for end users. The government has also adopted *Vision 2030*, a strategy which promotes science, technology, and innovation as the main implementation instruments for social development and crosscutting solutions to challenges faced by others sectors of the economy. Third, the groundbreaking success of M-Pesa and Ushahidi further catalyzed Kenya's computer literate (and mostly young) population to leverage technology for the creation of innovative solutions targeting local problems.

However, Nairobi also faces many development challenges, including poverty and youth unemployment, as the most populous county and one of the most expensive cities in Africa. Inhabited by 3.2 million people, Nairobi is home to a quarter of all urban dwellers in the country. Moreover, half of Nairobi residents live in slums and informal settlements (UN Habitat 2014). According to the 2005-2006 Kenya Integrated Household Budget Survey (KIHBS), 22 percent of Nairobi's population lives below the poverty line, which is considered one of the lowest rates in Kenya. However, Nairobi's total number of poor (632,373 people) is significant.

Along with the counties of Garissa and Mandera, Nairobi has one of the highest unemployment rates in the country at 7.6 percent. Among Nairobi's residents, 66.2 percent have attained secondary education or higher, but only 51 percent are employed. To compound the problem, over half of all jobs in the capital city (51.4 percent) are still in the informal sector (UN Habitat 2014). Young people aged 15-34 years old constitute 49 percent of Nairobi's total population (UN Habitat 2014); this can partially be explained by youth migrating from rural areas in search of jobs. This high proportion of youth further contributes to employment challenges in the capital city.

### Nairobi's Startup Ecosystem

Today, Nairobi has a vibrant mobile technology startup ecosystem, which includes over 120 startups (for example, mFarm, Start-up Digital Kenya, Silicon Ridge Tech, Duma Works, and SafePay Solutions), about seven coworking spaces (for example, Nairobi Garage, iHub, Nexus), twelve startup accelerators (for example, 88mph, Merck, GrowthAfrica, and Village Capital), ten business incubators (for example, Nailab, iLab Africa, m:lab, and C4D Lab), and ten IT consulting firms (for example, Bizzlab Kenya Holdings Ltd, UX KENYA, and Intercom Microsystems). Branches and research centers of multinational corporations (for example, Google, Microsoft, GSMA, Nokia, IBM), as well as a host of international donors also participate in supporting this ecosystem. In January 2017, m:lab East Africa and the World Bank initiated Traction Camp, a training and coaching program that aims to help digital and mobile entrepreneurs in the region. In March 2017, Nairobi Tech Week, Sub-Saharan Africa's largest tech event, took place in Nairobi, powered by Moringa School in partnership with Facebook.[1]

About a dozen organizations in this rising tech entrepreneurship scene in Nairobi (also called the "Silicon Savannah") specialize in offering coding training to local tech talent. These programs vary in terms of timeframe, mode of operation, coding languages, curriculum, students' background, mentoring, employment support programs, and so on. Such organizations include AkiraChix, Moringa School, and Andela, which each provide coding training at different skill levels. Akirachix targets young women and girls to develop basic digital skills whereas Moringa offers a coding bootcamp to men and women to become job-ready, entry-level developers in Kenya. Andela's bootcamp model includes a fellowship program through which trainees acquire on-the-job experience with mostly large U.S. companies. It should be noted that reliable data on Kenya's supply of skilled programmers and its growing demand is not currently available.

This chapter aims to offer a qualitative assessment of a coding bootcamp in Nairobi, shedding light on the potential impact of this type of training in the context of Kenya. A qualitative approach, leveraging surveys and focus groups, was applied for the preparation of this chapter, given that the sample size was too limited at the time of the research to conduct a fully-fledged randomized control trial impact evaluation.

# PROGRAM BACKGROUND

In 2016 and the first part of 2017, the World Bank partnered with iHub Research and the Moringa School, a coding bootcamp, to conduct an assessment of a coding bootcamp training program in Nairobi (see Table 4.1). Moringa School was selected because it was the only coding bootcamp provider in Nairobi using the model. The cost of the bootcamp was $2,500 per student and the World Bank provided a subsidy for willing bootcamp students based on a pay-per-survey scheme to collect data for the research, which amounted to up to $250 per student. Since January 2015, Moringa has trained eight full-time cohorts, graduating 216 students. In addition to the 19-week intensive full-time course on which this study did research, the school also offers Moringa Prep, a five-week programming course for beginners, either full-time or part-time. For a detailed profile of Moringa School, see Mulas and others (2017).

# RESEARCH DESIGN

## **Table 4.1:** Decoding Bootcamps Program in Nairobi

| | |
|---|---|
| ***Impact Evaluation*** | |
| Methodology | Qualitative study (surveys, interviews, focus group discussions) |
| ***Coding Bootcamp*** | |
| Bootcamp provider | Moringa School |
| Implementation dates | April–August 2016 |
| Cost to participants | $2,500, with a $250 subsidy for surveys (prices have now changed) |
| Bootcamp structure | Android, Python, UI and UX, HTML and CSS, and JavaScript |
| Number of bootcamps | 1 cohort |
| Final class size | 18 students |
| Final number of study participants | 16 students |
| **Participants' profile** | |
| Age | 20-24: 44 percent<br>25-28: 50 percent<br>29-32: 6 percent |
| Gender | Male: 75 percent<br>Female: 25 percent |
| Socioeconomic standing at baseline | Employed (6 percent); unemployed (44 percent); economically inactive (50 percent).<br>Undergraduate student (25 percent); University graduates (38 percent); University dropouts (31 percent); Vocational training (6 percent). University graduates in IT/ Engineering fields (93 percent). |

Source: Authors.

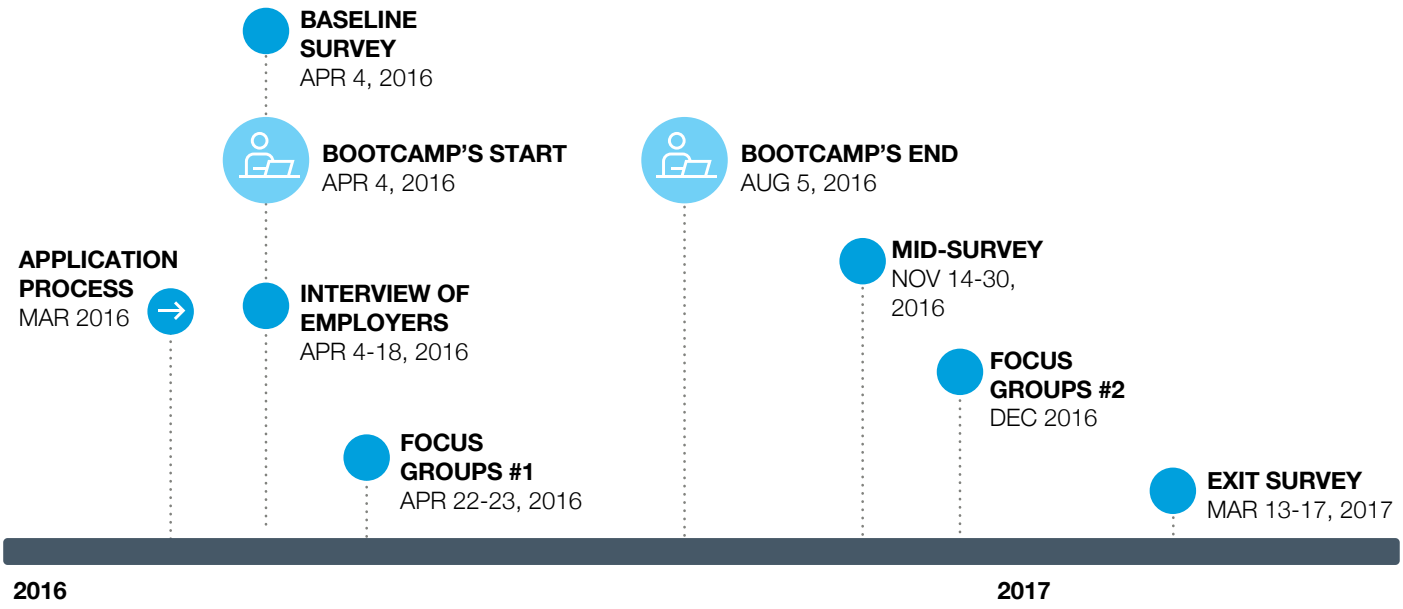
**Methodology:** The qualitative research for the Nairobi pilot was based on focus groups with bootcamp students (at the beginning of the bootcamp and five months after graduation) and interviews with bootcamp graduates' employers in the IT industry. In addition, the qualitative research was complemented with three surveys. All three pilots that are part of this study (Medellín, Beirut, and Nairobi) included the same baseline and exit surveys, and there was also a midline survey administered in Nairobi and Beirut to understand students' perceptions.

Owing to the small sample size (16 participants), the conclusions drawn from the analysis in Nairobi are not statistically significant. However, they complement the results from the randomized controlled trial (RCT) in Medellín.

For more information on the qualitative study design, see Appendix B.

**Timeline of activities:** Figure 4.1 illustrates the timeline of data collection activities:

## **Figure 4.1:** Timeline of pilot activities in Nairobi



The activities comprised the following:

1. **Baseline survey:** This survey included questions about students' backgrounds and motivation for joining the bootcamp. It was administered during the first day of the training.

2. **Midline survey:** An online midline survey focused on graduates' impressions of the bootcamp. It was administered after the training was completed.

3. **Exit survey:** This survey measured the impact of the coding bootcamp in terms of students' employment and educational opportunities. It also compared their initial expectations with their progress six months after graduation.

4. **Interviews with employers:** Over the initial two weeks of training, a researcher conducted five semistructured interviews with managers of IT firms who were potentially interested in hiring bootcamp graduates. These interviews aimed to establish employers' perceptions of the Kenyan IT sector and their opinion of bootcamps.

5. **Initial Focus Group Discussions (FGDs):** The initial round of three FGDs consisted of two-hour long sessions with the following:

   - Bootcamp students: 10 students participated in a FGD to capture what the quantitative survey did not show and to elicit information about how students felt at the beginning of the bootcamp.

   - Interested/prospective students: This session's 10 participants included those who had applied to the bootcamp but were not accepted, those who were interested in applying but were unable to join the program, and/or those who applied and had been accepted into an upcoming cohort. The aim was to compare the viewpoints of these individuals to the responses provided by students enrolled in the bootcamp.

   - Mixed session: This FGD was a mix of five students, five interested/prospective students, and five experts/representatives of the ICT industry, academia, and the donor community. The aim was to initiate a dialogue between the different stakeholders from the ICT innovation ecosystem.

6. **Final Focus Group Discussions:** The final round of three FGDs consisted of similar two-hour long sessions. The only difference in the format of these final focus groups was in the composition of the third grouping:

   - Students: Ten students participated in the FGD, which aimed to gain insight into how bootcamps could be more effective, and how they could be made a more useful tool for students.

   - Interested/prospective students: As the research aimed to gauge the effectiveness of bootcamps in advancing the careers of students, this discussion was held with seven participants who did not go through the bootcamp but who were interested in the field.

   - Bootcamp graduates' employers: This FGD involved five employers of former bootcamp students. It was aimed at understanding their perspectives of the competencies of bootcamp graduates, as well as understanding if there was a skills gap, and what their needs as employers were.

## SAMPLE

In February-March 2016, Moringa School selected 18 applicants to its sixth cohort. The preinterview process was focused on the basics of programming: students had to complete specific tasks on the SoloLearn website, which provides free online programming courses and a certificate of completion to Moringa School. Upon completing this stage, applicants were invited for in-person interviews, which evaluated their personality traits and motivation via behavioral questions, and also included coding challenges to assess applicants' problem-solving skills. Twenty-seven applicants were preselected from a larger pool of applicants (70) and invited to complete a one-month prebootcamp offsite training. This course covered the foundations of major high-level programming languages, and only those who successfully completed their weekly assignments became eligible for the actual bootcamp.

The accepted students formed part of the sixth cohort at Moringa and received the intensive 16-week bootcamp training that ran five days a week from 8:30 am to 8:00 pm. In the first three weeks, the curriculum covered the basics of front-end web development (HTML/CSS), while weeks four to seven were devoted to back-end web development (Python/Django); weeks eight to eleven focused on learning how to build Android applications, and the final five weeks were dedicated to students' individual projects.

A total of 18 students who had successfully completed Moringa School's precoursework were invited to participate

in the sixth cohort and included as participants in the World Bank bootcamp research. During the course of the research, one student dropped out from the training because they had difficulty in keeping up and refused to complete the follow-up survey. The data from another student's baseline survey was lost, so this study ended up following 16 individuals over the training period.

Within the sample of bootcamp participants, 12 were male (75 percent) and four were female (25 percent). The average age of the students was 23 years (the youngest being 20 and the oldest 32). When the baseline survey was implemented, all students, except for one, were residents of Nairobi, although ten grew up in another city and moved to Nairobi for education/training purposes.

Most participants had a university education: six (37.5 percent) were university graduates in the IT or engineering field (two had also attended postgraduate courses), four (25 percent) were about to finish university before the bootcamp started, and five (31.3 percent) attended university but did not graduate. Of the 15 participants that had gone through university education (attended and graduated), 14 (87.5 percent) had studied a subject related to technology, engineering, or mathematics. Only one student had secondary education as their highest level of education.

On their employment status, only one student was working when the bootcamp started (in a field unrelated to technology), while seven (43.8 percent) were unemployed and actively looking for a job, and eight (50 percent) were economically inactive. Ten students (62.5 percent) had prior work experience and, of those, five (31.3 percent) had worked in the IT sector. All students claimed to be able to code in at least one language, which was usually HTML5, Java, or C++.

As the group was homogeneous, the research also examined the students' households in order to characterize initial endowments. As illustrated in Figure 4.2, almost 70 percent of students' parents had attained higher education (vocational, university or postgraduate), but the distribution was uneven by gender as 92 percent of fathers had attained higher education while only 50 percent of mothers had reached this level. In terms of employment status, in 50 percent of households, at least half of the members were unemployed (see Figure 4.3), which could imply a high economic dependency ratio[2] that pressures students to get any job rather than jobs that necessarily draw on their IT qualifications and skill sets.

**Figure 4.2:** Highest level of education obtained by parents of bootcamp students in Nairobi

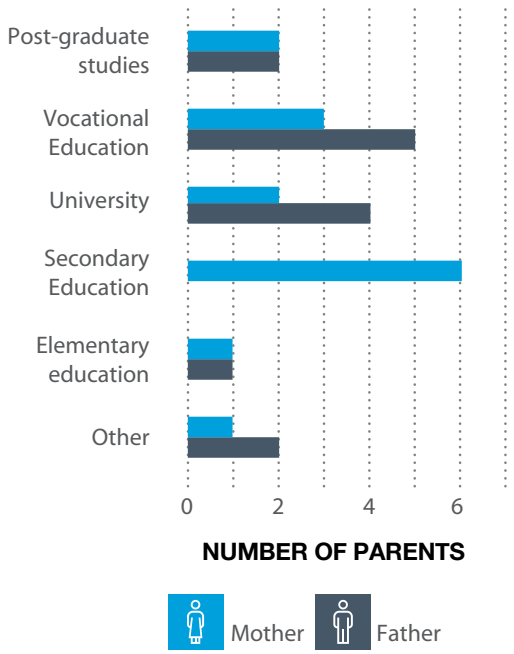
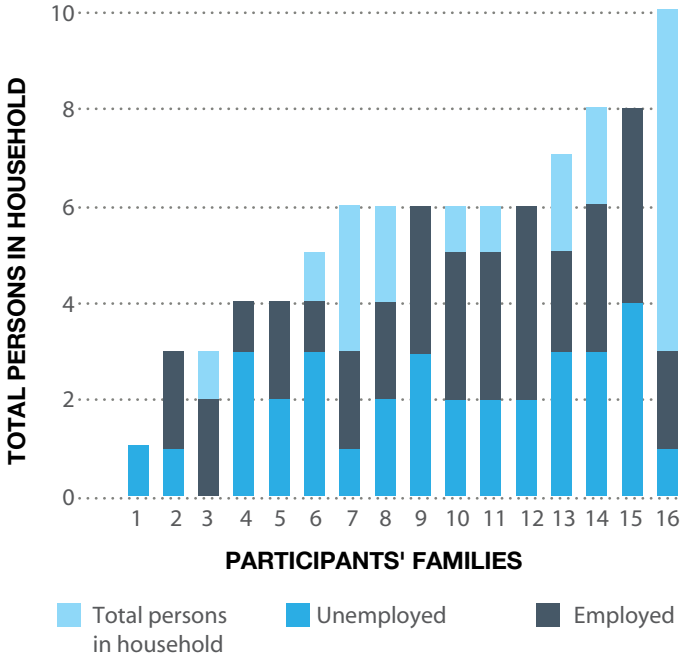



**Figure 4.3:** Work status of family members in Nairobi



# RESULTS

The following findings emerged from the data collected through the surveys, interviews with employers, and FGDs. The findings are grouped according to the following themes:

## Perception of Bootcamps

**Perspectives of Surveyed Kenyan Youth**

Young Kenyans[3] heard about the bootcamp from several sources. Some of the participants in the focus group discussions (FGDs) had attended a short (two-ten day) bootcamps or hackathons, which had aroused their interest in participating in a longer bootcamp. Others found out about the coding bootcamp by referral, through the iHub or the Internet, where Moringa School is well positioned. Students listed job placement opportunities, networking with employers, and the right advertisement as the main reasons why they decided to join the bootcamp.

Young Kenyans see bootcamps as a good way of entering the ICT sector for several reasons. First, as bootcamps are condensed in a short amount of time, they find them attractive, especially given that many have gone through four-year university course already. Second, bootcamps offer practical experience in programming as opposed to some IT masters programs, which are perceived to be mostly theoretical. Third, they feel that bootcamp content is industry-centered, making it dynamic and flexible. Finally, another perceived advantage of bootcamps is that they help graduates in job placement and they create a professional peer network. For those who do not have a background in ICT but are looking to find employment in the growing sector, a bootcamp can be a good option for rapid upskilling and a good entry point to this sector.

However, students who participated in the bootcamp noted that it was not possible to combine bootcamps with any other commitment, including working, because of the steep learning curve and intensity of the program. Some had to quit their jobs or drop other commitments in order to fully concentrate on the bootcamp. Some students also expected that a lot of previous coding knowledge was required to enter such training, which might hinder other young people from applying to such programs.

**Perspectives of Employers**

FGDs and interviews reveal that potential employers have different perceptions about the value of bootcamps compared to students. Bootcamps were not yet on the radar of most IT companies interviewed, and these companies believe that bootcamps will not replace university education. What they look for in new hires is theoretical knowledge, internship experience, aptitude, and soft skills, which for them seem to be demonstrated more through university success than coding bootcamps.

Employers that are aware of bootcamps considered them to be a good way to introduce people to programming. Graduates of bootcamps are not experts, but they gain the tools for continuous learning on their own. These employers noted that the bootcamp's technical training seems to be quite in-depth. Employers also valued the soft-skills training that bootcamps provide (how to send an e-mail, how to structure a conversation, how to solve a problem, and so on). They saw bootcamps as a launchpad for those students with a willingness and curiosity to learn, which helps employers avoid "bad hires." In addition, through bootcamps, students establish networks that are critical for professional development.

The employers interviewed as part of the research stated that they want to be in touch with bootcamp providers in order to have an opportunity to advise them on specific skills needs on an ongoing basis. Bootcamp providers would benefit from such dialogue because they would receive constant input from the sector while companies would benefit from an improved supply of trained employees.

## Bootcamp Experience

The coding bootcamp offered by Moringa School not only includes training on coding skills but also builds students' socioemotional skills and prepares them for job search. According to the data collected, ten of the interviewed students (62.5 percent) valued the bootcamp's coding skills as the most important skills imparted, while five students (31.25 percent) reported that they most valued the networking and soft-skills training offered, while just one participant valued both sets of skills equally (see Figure 4.4).

**Technical coding skills:** Students felt that the learning curve in the bootcamp was steep. They appreciated the teaching methodology whereby bootcamp instructors did not teach the content itself but introduced it to students to work on it independently, nurturing creative and collaborative problem-solving abilities. Students also reported that they preferred bootcamps to university programs because the latter focused primarily on theory and outdated coding languages while bootcamps were perceived to afford students more flexibility and agility to learn the languages employers were looking for. On the other hand, some students seemed to agree that a basic foundation in coding was needed to be successful in the bootcamp.[4]

**Socioemotional skills:** Both industry representatives and students stressed the value of communication skills teamwork, as well as aptitude. Students also valued public speaking and business writing skills, self-discipline, confidence, ability to take criticism, and business ethics as important skills they developed throughout the bootcamp. Students affirmed they were happy to receive this kind of training during the bootcamp, which they had hitherto not received in their prior education, and they realized its importance in preparing them to join the job market. They were also trained on how to communicate through e-mail, the right etiquette to use, and how to speak to a group of people (voice intonation, eye contact, and so on), all of which they valued and thought had made them better professionals.

**Job hunting:** An advantage of the bootcamp offered by Moringa School is that it helps graduates in the job placement process, and this was seen as beneficial for students. Bootcamps help students develop a portfolio to showcase their actual work to potential employers during the last weeks of training at a careers fair.

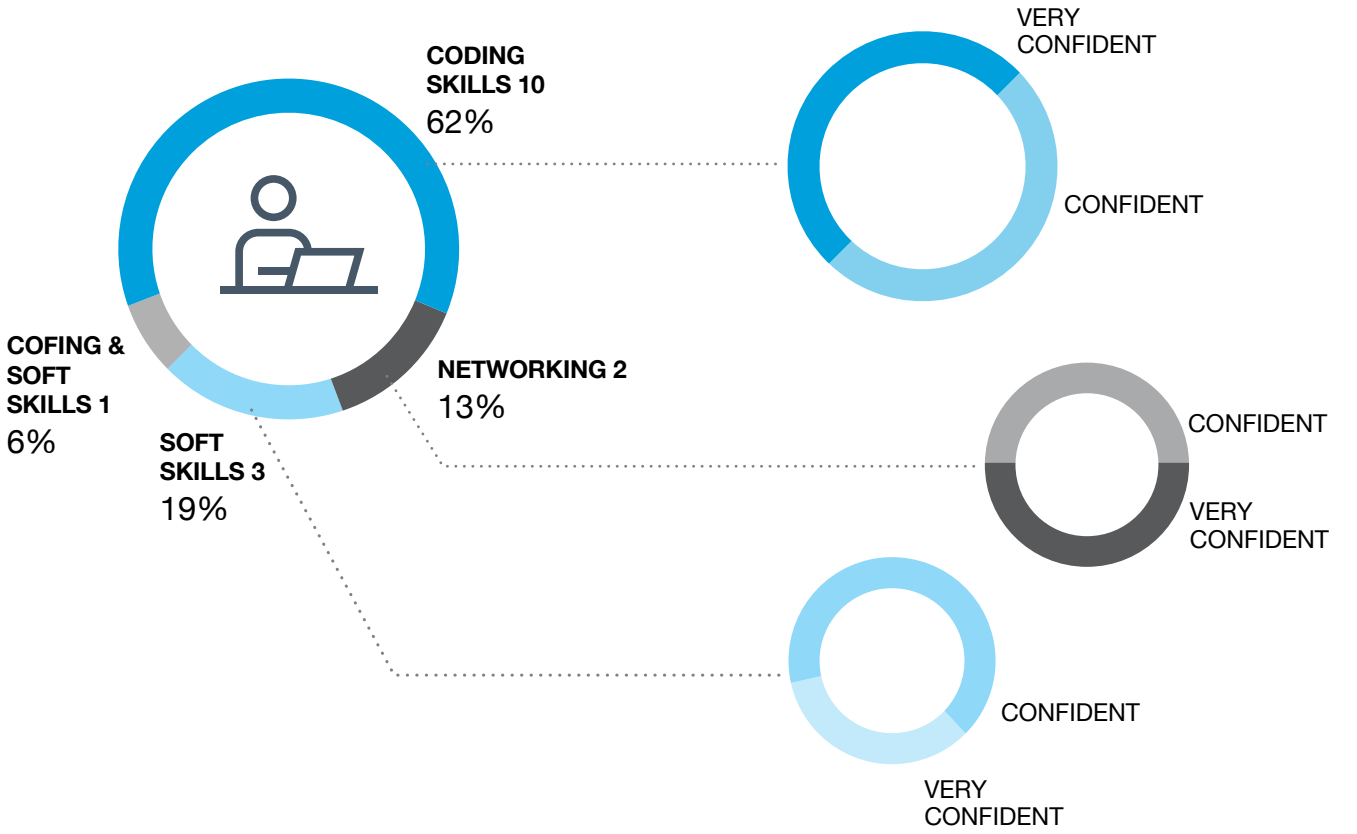
All students bar one felt confident about their future employment prospects after completing the bootcamp. Thirteen respondents (81 percent) reported a high level of motivation when looking for jobs after completing the bootcamp, and only two graduates (13 percent) experienced a drop in their motivation level.

In short, eight (50 percent) of the surveyed students believed that the bootcamp was sufficient to raise their competitiveness in the job market, while three students (19 percent) felt it was insufficient, and five (31 percent) were unsure (see Figure 4.4). This might have to do with the content of the training as half the surveyed students mentioned that they would change the coding languages offered for future students, but this might also be about strengthening job placement support and networking since half the students would also change those aspects of the bootcamp.[5]

## **Figure 4.4:** Nairobi bootcamp experience: skills and employment prospects

Which of the skills acquired in the bootcamp do you value the most?

How confident do you feel about your future employment now that you have completed the training?



## Tuition Fees

Many bootcamp participants and interested students stated that their families had questions and concerns about the cost of the bootcamp. Parents found it difficult to understand why their son or daughter needed the bootcamp training when they should be looking for a job, and they wondered by how much they could raise their income given the short duration of the training.

In FGDs held with students, they declared that the cost of the bootcamp was perceived to be too high at the outset, but after joining the training, most of them believed that the value added was worthwhile. By contrast, a few felt that they could get the same training by paying a private instructor.

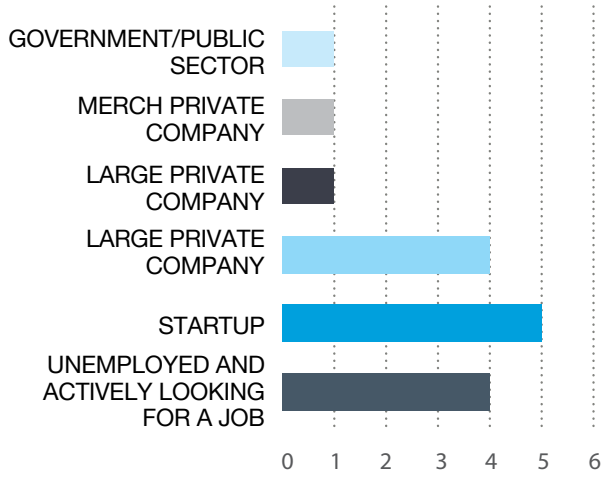
However, with the average salary of a junior developer ranging between $400-500 per month (as per students' estimations), it would take a student over a year to repay the loan with interest as well as the employment placement support fee if they used half their earnings to repay the debt. Potential students therefore need to have a clear understanding of the costs involved. Students were offered financing through Moringa's partner, KIVA, to enable them to pay the commitment fee and obtain financing for the following 24 months.[6]

## Employability

While only one student was working before the bootcamp started,[7] 12 students (75 percent) were employed within six months of graduating from the bootcamp. Nine (56.3 percent) reported using the acquired coding skills in their jobs, while two were not satisfied with their jobs because they were not coding related. The four graduates who were unemployed (25 percent) said they were actively looking for a job where they could apply the skills learned in the bootcamp. However, when analyzing the employability of the participants, the "diploma effect" should be taken into account, as nine students (56.3 percent) were about to finish their formal education programs right before the bootcamp started so they would have been entering the job market in the short term in any case. This means that employment results cannot be directly attributed to the bootcamp itself, and other factors should be considered.

When the baseline survey was conducted, students were asked where they aspired to work after completing the bootcamp (see Figure 4.5): five students wanted a job in a startup (31.3 percent), three wanted to be employed in a large private company (18.8 percent), and three aspired to work in a multinational corporation (18.8 percent). Of the 16 graduates, four (25 percent) were working in the type of company in which they aspired to work.

**Figure 4.5:** Category of current employer of surveyed bootcamp graduates in Nairobi




During FGDs, students were asked about their ideal job after the bootcamp. Some reported that they wanted to work at international corporations, especially in the IT sector, because wages in Kenya were only good if one worked for an international company. Others saw entrepreneurship as an option post-training as it would give them freedom and help them create employment. Some students voiced their aspirations to work as remote developers. A handful of students were also open about working in IT jobs at nontech companies, such as banks or hospitals.

## Bootcamps versus University Education

The debate about the value of IT degrees from Kenyan universities versus the value of coding bootcamps was brought up in most of the FGDs. There was no consensus between the participants, with some arguing that the theoretical education provided by universities was no longer useful, and others reiterating that a university education was still important. The latter agreed that universities and bootcamps could complement each other; being in university placed one in a better position while the bootcamp emulated the real work environment. Students also valued the fact that Moringa School helps connect them to internship opportunities, which most universities do not do.

There was also no consensus on the employers' side. Some thought that it was culturally and socially important to have a university degree in Kenya in order to get a job. Others looked at what candidates could do and how they performed, not just what their CVs said, so the portfolio developed by students during the bootcamp was crucial. Others were adamant that bootcamps could not replace university education because not everybody was prepared to be a programmer in the IT world. As an example, in a university class of 60 students, only 15- 20 students would be interested and good at programming, meaning that the remaining 45 students would be good at other aspects such as design or business development; therefore, bootcamps were only useful for those who wanted to be programmers while other students could still benefit from university education. Some employers also argued that universities build core fundamentals, which bootcamps then go on to refine.

Students perceived that employers sometimes get frustrated with university graduates who have been trained heavily in theory, and are instead looking for employees who could do practical work. These students felt that universities taught old coding languages while employers expected them to know HTML, JavaScript, Angular, and so on. Thus, the only way for them to learn newer languages was by attending bootcamps where they could learn a new language quickly.

## Skills Gap

Employers stated that there was demand in Kenya for skilled IT personnel, programmers, as well as business development and marketing professionals. However, startups, SMEs, and even large companies faced challenges in the supply side. Although there were plenty of potential recruits available, their skills did not match demand. Employers can find people with standard skillsets in terms of software development, but the biggest challenge is to bring on board people who are well conversant with a specific technology. Coding bootcamps like Moringa School tailor their training based on industry demand and graduates come into the job market with adequate technical skills and job-ready soft skills.

Employers also reported that when it comes to recruiting personnel, there are some tradeoffs between expectations and realities. While it may be quite easy to find a good developer, finding a developer with good social skills and one who is flexible is not as easy. It would therefore be optimal if there were more well-rounded professionals.

On the demand side, companies sometimes do not know which technical skills they require, so may hire developers who turn out not to be the right fit for these companies. This highlights an opportunity for bootcamp providers to help better identify and translate employer needs.

## Notes

1. http://moringaschool.com/.
2. Number of employed persons relative to unemployed and inactive family members.
3. Those that participated in the surveys and FGDs, both students and interested/prospective candidates.
4. After the analyzed cohort finished the bootcamp training, Moringa School created Moringa Prep, a one-month prebootcamp that covers the basics of programming and levels the knowledge of students so that they can attend the longer coding bootcamp.
5. Note that Moringa School bases its curriculum on real-time demand and constantly updates the coding language taught in the bootcamp.
6. Students first pay a commitment fee to Moringa, and then Kiva directly pays Moringa the remaining tuition fee on behalf of the students. Students then have 24 months to repay Kiva.
7. This student returned to their previous job in nursing after the bootcamp ended.

# MAIN FINDINGS

The three interventions in Colombia, the Lebanon and Kenya provide a measurement of the impact of bootcamps in a developing country context. The main findings are summarized below:

## A. EMPLOYMENT IMPACT

1. **Bootcamp programs do not seem to have a direct or immediate impact on access to employment.** Despite the high rates of employment reported by coding bootcamps providers in general (60-100 percent), and also the high rates of employment achieved by the analyzed bootcamp students (73 percent in the RCT in Colombia, 75 percent in Kenya and 82.6 percent in Lebanon in the qualitative studies), the RCT evaluation in Medellín (Colombia) showed that undergoing a bootcamp program does not improve the likelihood of being employed. There is no differential in this outcome based on gender, socioeconomic strata, or educational level.

2. **Bootcamps may have an impact on accessing high-quality jobs.** The Medellín RCT results show that participating in a bootcamp program could provide higher chances of accessing high-quality IT jobs. This is highly relevant and warrants further research since these high-quality IT jobs are connected to what are the future jobs as the economy moves towards more tech-related activities across sectors, potentially making coding bootcamps a tool for training (or retraining) potential employees for this type of job through rapid intervention (that is, four to six month courses).

| Employment and Educational Impact | |
|---|---|
| **Employment** | • Bootcamps may have an impact on accessing high-quality jobs.<br>• And… on providing self-employment tools for low income populations.<br>• But… bootcamp programs do not seem to have a direct or immediate impact on access to employment. |
| **Job benefits and satisfaction** | • No significant observable effects in terms of job benefits and job satisfaction within the term of the experiment (6-9 months after graduation) |
| **Gender** | • Women are underrepresented and have fewer opportunities to find high-quality jobs after bootcamp participation. |
| **Education** | • Bootcamps seem to support the completion of current educational programs<br>• But… bootcamp participation does not seem to lead to enrollment in additional formal education within the short term (6-9 months after graduation) |
| **Implementation of Coding Bootcamps** | |
| | • Bootcamps programs can be catalyzed through policy intervention.<br>• But… bootcamp programs are difficult to implement and require links with potential employers.<br>• And… quality of bootcamp provider and type of bootcamp program matters substantially. |

3. **There were no significant observable effects in terms of job benefits and job satisfaction.** We could not determine whether bootcamp programs provide access to jobs with better benefits or job satisfaction, probably because of the short timeframe passed from completion of the program and the data collection. Further research will be needed to explore whether jobs accessed following bootcamp participation result in more formal employment with higher satisfaction.

4. **Bootcamps provide self-employment tools for low-income populations.** For the bootcamp students in the three cities, the entrepreneurship rate increased to 17.4 percent in Medellín and 6.25% in Kenya, but was nonexistent in Lebanon. Although in the RCT no evidence was found that bootcamps had an effect on business (that is, startup) creation in general, it did seem to have a positive effect on the low-income population. **This suggests that bootcamps may be leveraged to provide self-employment, leveraging tech opportunities for those segments of the population that may face structural barriers to employment in developing countries.** Further research would be needed to understand the full potential of this possibility and if large extrapolations are possible.

5. **There are clear signs that gender is a determinant of good quality tech-related employment.** Women are not only generally underrepresented in the tech industry and participation in bootcamp programs is low (about 20 to 30 percent, World Bank (2017)), but they also have fewer opportunities to find a high-quality job following bootcamp participation. **This seems to suggest that there is a need for more female-centered interventions to attract women to the tech sector in general and these kinds of training programs in particular.**

## B. EDUCATIONAL IMPACT

6. **Bootcamps seem to support the completion of current educational programs.** From the Medellín RCT (although with certain sample limitations), it was observed that bootcamp participants were more likely to complete formal tertiary educational programs in which they were already enrolled. **This suggests that bootcamps are a complement to tertiary education, potentially showing a need to incorporate some of its methodologies in existing tertiary educational programs.** Beirut's findings support this interpretation, as most participants saw the skills acquired in bootcamps as a bridge between academic education and practical employment.

7. **However, bootcamp participation does not seem to lead to enrollment in additional formal education.** This suggests that bootcamp participants do see the need to continue their education to attain their short-term employment goals, especially when bootcamp participation leads to high-quality jobs. For instance, in Beirut, most participants (85 percent) placed a premium on the ability to acquire coding skills in a compressed time (gaining two years' worth of experience in only three months). Further research is needed to understand this result and whether it is related to the short timeframe of the evaluation period.

## C. BOOTCAMP PROGRAMS

8. **Bootcamp programs are difficult to implement and require links with potential employers.** Implementing a bootcamp program is not easy. Providers are still maturing and many of them still operate as startups and are learning how to best to implement their programs. Experience from Medellín, Beirut, and Nairobi, shows that the link to local employers is critical in developing the right tech-skills curriculum and high-quality employment for participants.

9. **Not all bootcamps are the same and quality among them matters.** Bootcamps differ in terms of the quality of implementation and this really matters. The bootcamp program implemented in Medellín showed variation in quality of implementation among different UVA locations. Also, there was limited provision of training in socioemotional skills, limiting the potential impact of this program. In contrast, bootcamp programs in Beirut and Nairobi emphasized socioemotional skills and preparation of participants for job hunting and future working environments.

10. **Bootcamp programs can be catalyzed through policy intervention (Mulas and others 2017).** The experience in Medellín shows that bootcamp programs can be catalyzed through government-led policies. The leading role of Ruta N in the tech ecosystem of the city and the connection with potential employees and labor demand played a crucial role in the success of the implementation of the bootcamp program in the city. Appendix D provides a guide for implementing bootcamp programs in developing countries to inform public policy interventions and bootcamp providers.

# LESSONS FOR FUTURE IMPACT EVALUATIONS

Previous chapters highlight the different challenges and lessons from the current evaluations. Table 6.1 summarizes the challenges and expands on the valuable lessons that can be applied to future interventions. Most points make reference to the RCT in Medellín.

## Table 6.1: Lessons for future impact evaluations

| Item | Best practice/ideal | Potential or actual issues | Lessons learned |
|---|---|---|---|
| 1) Study design | | | |
| Location | Locations have conditions for a successful implementation, such as high capacity and ability to achieve the desired sample size | Two locations (Beirut and Nairobi) did not have mature providers, and in Medellín an external supplier had to be brought in | Outside providers are a feasible solution but close implementation supervision and quality control is still required |
| Sample size | Required sample sizes are achievable | Difficulty reaching the desired number of participants. | Early engagement with supplier to incorporate best practices and marketing efforts to reach required sample size. |
| | | Potential cost impacts (see "Integrity of treatment and control groups" below) | See "Integrity of treatment and control groups" below |
| | | Unrealistically high expectations about required coding experience | Align participants' expectations via marketing materials and interviews |
| 2) Integrity of treatment and control groups | | | |
| Baseline data collection | Full baseline data collection for initial randomization | Missing values from respondents because of changes in addresses and telephone numbers, and survey fatigue, resulting in need to hire additional survey company later on | Early engagement in data collection analysis, collection and consistency via survey company or in-the-field person |
| | Completeness for relevant survey fields | Refusal from applicants to report income | When available, use of proxies such as geographical socioeconomic stratification |

| | | | |
|---|---|---|---|
| Attrition | Low attrition and crossovers | Low participation and selection bias because of lack of time for decision to participate (e.g. the initial group of accepted participants were given 10 days to confirm their participation in the bootcamp) | Allow enough time for candidates to decide their participation and make arrangements. Standard company practice when resigning is two weeks' notice and an extra week should be allowed to make arrangements |
| | | Potential cost impact for participation | Clear cost expectations should be provided early on |
| | | | Charge applicants in advance, with non-refundable fees in case they are assigned to the treatment group |
| | | Lower-than-expected enrollment | A case could arise where preannounced incentives for survey participation for those in the control group attracts applicants. This was not so for the cases in this study but it is important to keep in mind for future RCTs |
| | | Dropping out because of location safety concerns and distance | Early selection and evaluation of location (safety, distance from participants and connectivity) |
| | | Unrealistically low expectations about level of effort needed for program completion (e.g., some students had to quit jobs or other activities to fully concentrate on the bootcamp | Ensure applicants are fully aware of program requirements via marketing and interviews |
| Endline data collection | High baseline data collection | Survey fatigue: parallel data-gathering took place as well as a midline survey in Nairobi and Beirut | Discourage additional data collection efforts, monitor implementation and eliminate midline surveys. |
| | | Difficulty to reach out participants (phone lines disconnected after participation). | Ensure participants are aware of follow-up surveys and provide sufficient means to be reached |
| 3) Intervention | | | |
| Consistency | Intervention quality remains consistent across time and participants | Higher-than-expected instructors' rotation (intra and within centers) | Related to previous points, monitor implementation and require assurances such as instructors' certification and contracts (e.g., interviews for instructors) |

| | | | |
|---|---|---|---|
| 4) Impact and results reporting | | | |
| Comparability | Results allow for comparison with similar alternative interventions | Short-term results (six-months) may underestimate the longer-term impact of the intervention | A shorter-term horizon with its respective comparable instruments (e.g., other training) should be sought. It is important to establish that the scope of similar studies can only assess short-term effects |
| 5) Scalability of intervention | | | |
| Scalability potential | The chosen intervention has the potential to be scaled-up | Low participation numbers sent mixed signals about potential demand and scalability | Choose location with local industry demand for technology talent |
| | | | Ensure providers are not niche players and have business models that allow for replication and scaling up |
| Cost-benefit analysis | Costs and benefits are clearly measured and presented. For scalability, costs are lower than benefits | There is partial information on the benefits side | Need to establish benefit measurement and adequate evaluation horizons |

It is important to note that, in addition to the considerations mentioned above, practitioners should first evaluate whether the conditions for an RCT are present before undertaking such task.

Common problems relate to external validity (generalization beyond the evaluation sample), internal validity (degree of comparability between treatment and control groups) and implementation issues (for example, when it is not practical, easy, or ethical to restrict treatment access to some participants). Within this context, one of the main factors for a successful randomized control trial is sample size. In the cases presented in this report, reaching a large sample size was an ongoing implementation concern. Among other reasons, if the sample is too small, statistical tests may not be able to detect treatment impacts, affecting the validity of the results.

As guidance, sample sizes are related to a desired statistical power, which is typically set at 0.80 for most studies. Simply put, the power of a study is the likelihood that it will distinguish an effect of a certain size from a random occurrence. A study might easily detect a large effect from an intervention but detecting a small one is much less likely. Thus, it is important to have a clear idea of the magnitude of the desired effect to be detected: the smaller the variation that needs to be detected, the higher the power needed and consequently the larger the required sample size.

If smaller sample sizes are present, statistical power will be diminished and only large effects will be able to be detected. Thus, it may still be possible to conduct an RCT but, given a restricted sample size, it may be necessary to reduce the power of a test or to entertain just being able to detect large impacts. By the same token, if the sample is small, caveats about limited or niche extrapolation to more general samples should be considered and made explicit.

Similarly, alternative designs such as randomized promotion and qualitative focus groups are to be considered when RCTs are not feasible.

# BIBLIOGRAPHY


Central Administration of Statistics (CAS) and the World Bank. 2015. *Measuring Poverty in Lebanon Using 2011 HSB*, Technical Report, December 8. http://www.cas.gov.lb/images/Excel/Poverty/Measuring percent20poverty percent20in percent20Lebanon percent20using percent202011 percent20HBS_technical percent20report.pdf.

Clavijo, S., A. Vera, E. Cuellar, and A. Rios. 2015. "Costos no Salariales en Colombia Pos-Ley 1607 de 2012", Asociación Nacional de Instituciones Financieras. Bogotá.

El empleo. 2016. "Informe de Tendencias Laborales Segundo Trimestre 2016." http://contenido.elempleo.com/informes/Informe_elempleo-segundo_trimestre_2016.pdf.

Government of the Republic of Kenya. 2007. *Kenya Vision 2030: The Popular Version*. http://www.vision2030.go.ke/531/vision-2030-team-maintains-course-deliver-economic-goals/.

International Monetary Fund. 2015. *IMF Country Report: Colombia*. Report No. 15/143. https://www.imf.org/external/pubs/ft/scr/2015/cr15143.pdf.

ITU. 2016. *Coding Bootcamps: A Strategy for Youth Employment*. International Telecommunications Union. http://www.itu.int/en/ITU-D/Digital-Inclusion/Youth-and-Children/Documents/CodingBootcamps_E.pdf.

Kenya Integrated Household Budget Survey (KIHBS) (2015-2016): "District Poverty Data 2015-2016. Kenya Open Data." https://www.knbs.or.ke/2015-16-kenya-integrated-household-budget-survey-kihbs-progress-report-october-2015.

Medellín Cómo Vamos. 2016. "Informe de Calidad de Vida de Medellín." Medellín: Medellín Cómo Vamos.

Meng, V. 2013. "The Ultimate Guide to Coding Bootcamps: The Most Selective Bootcamps." *SkilledUp*. http://archive.fo/YCwEA#selection-145.0-145.68.

Mulas, V., M. Minges, and E. Allende. 2016. "Tech Start-up Ecosystem: The Case of Lebanon." In *A Geo-Economy of Risks and Reward*, edited by W. Harake and others. Washington, DC: World Bank. http://documents.worldbank.org/curated/en/652591468179100109/A-geo-economy-of-risks-and-reward.

Mulas, V., C. Paradi-Guilford, E. Allende Letona, and Z.V. Dalphond. 2017. *Coding Bootcamps: Building Future-Proof Skills through Rapid Skills Training*. Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/28218.

Ruta N Medellín and others. 2015. "Investigación de Mercado Laboral en el Sector de las Tecnologías de la Información (TI) Medellín."

UN Habitat. 2014. Background Paper. https://unhabitat.org/wp-content/uploads/2014/07/WHD-2014-Background-Paper.pdf.

World Bank and Endeavour Insight. 2015. "The Colombian Tech Ecosystem: A Study of Connections Among Entrepreneurs with Recommendations for Growth."

World Economic Forum. 2016. *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*. Global Challenge Insight Report, accessed at: http://www3.weforum.org/docs/WEF_Future_of_Jobs.pdf.

# APPENDIX A:

## RESEARCH DESIGN: RANDOMIZED CONTROLLED TRIAL IN COLOMBIA

### Research Question

**We are interested in testing the efficacy of coding bootcamps on labor market outcomes in developing countries around the world.**

This research project addressed whether coding bootcamps impact the employment and employability of youth in developing countries, and if so, to what extent.

### Experimental Design and Model

**In order to determine the effects of technology training programs, a group of eligible students were randomly assigned to bootcamps.** In other words, for a sample of participants, some were randomly selected to receive bootcamp training (the treatment group) and the rest were assigned to the control group.

**To achieve this, in qualifying pilot location(s) a group of individuals were first identified who were willing to participate in an experiment tracking job and wage outcomes.** The individuals were willing to participate irrespective of whether or not they received bootcamp training, and were also willing to complete the bootcamp training at the discounted price if randomized into the treatment group.

**The participant group had to meet minimum requirements (speak basic English, read, write, have basic computer skills, be between 18 and 28 years of age and live in the Medellín area) to ensure a sample that was conducive to our experiment in order to limit attrition and contagion effects.** In other words, an initial sample of individuals was identified who showed interest in participating in the bootcamp training. They had to be motivated and less likely to drop out if they receive a discounted fee to enroll in the bootcamp.[1] Choosing participants based on their willingness to complete the bootcamp was indicative of our target population for future intervention – we were interested in the effects of bootcamps on those that would voluntarily participate in a bootcamp and not necessarily the whole population.[2]

The simple framework for our experimental design was thus:

| | Pretreatment | Posttreatment |
|---|---|---|
| Treatment | $X_0$ | $X_1$ |
| Control | $Y_0$ | $Y_1$ |

The treatment effect, $(X_1-X_0)-(Y_1-Y_0)$ represents the causal effect of the intervention (X and Y are sample averages). In other words, the difference between job and wage metrics for the treatment group after treatment were compared with the difference in job and wage metrics for the control group over the same period. Randomization of the individuals participating in the field experiment ensured that the measured effect could be attributed to bootcamp training instead of other correlated variables that plague inference in naturally occurring data (randomization ensured that $X_0=Y_0$).

**Pretreatment levels were measured by conducting an initial assessment of participating individuals for both the treatment and control.** Observing pretreatment levels was important given that there were limitations to our sample size. Pretreatment data was collected through entry surveys (see Appendix C).

**Key to the experimental design was the ability to observe $Y_1$. This required the collection of information from individuals that did not participate in the bootcamp,** and hence participants were recruited based on their willingness to participate in a study on job and wage outcomes more generally, rather than on the promise of receiving bootcamp training. To ensure participation of the control group over the long run, a simple incentive scheme was proposed, but the local government advised against it. The experiment was set up and presented to potential participants as a nine-month study on income and employment. Thus, incentives were not offered for completing an intake survey, but those who completed the follow-up survey were entered into a raffle to win an iPad. By following this structure, all enrolled participants were agreeing to participate in the research over the six months after the end of the training either in return for participation in a bootcamp or receiving valuable incentives. This was done to ensure that data was obtained from individuals regardless of whether they participated in a bootcamp, while also achieving randomization.

**Based on anticipated sample size requirements (see the section below; in Colombia, the requirements were 120 people in the treatment group and 120 people in the control group, including attrition estimates), the research**

**design was only implementable in Colombia.** Other locations, Lebanon and Kenya, were not conducive to experimental design when this activity started, because of the infeasibility of randomization. As a consequence, qualitative studies were particularly important for these locations and helped to provide context to the experimental results in Colombia.

### Sample

*Participating Individuals*

**In order to minimize attrition, a pool of participants was identified that had a minimum acceptable level of motivation.** At the same time, it was a concern that motivated individuals might then choose to attend a different bootcamp if not selected to receive the bootcamp through this study. Control participants were specifically asked in the follow-on surveys whether they took a bootcamp or classes, and this was taken into account in our models. In addition to incentives for partaking in the surveys, one possibility to account for this with the control group participants was to offer the possibility to receive the training at a lower cost once the experiment was over (in about one year's time). This would reduce the incentive for members in the control group to seek another bootcamp in the interim (one not requiring any screening after the final survey) while still providing a treated and a control group during the tracking period. However, this could have had the unfortunate effect of deterring the incentives of the control group to seek job opportunities while they waited to participate in the bootcamp. This effect would have biased our results by invalidating the control group. Given these competing effects, it was decided not to offer the control group a delayed bootcamp and instead deal with the possibility of the control group taking bootcamps elsewhere by quantifying the effect. Although such possibility could have limited the study, it was unlikely to influence it, given the fact that the predominant majority of Medellín's youth would not be able to afford the training, and other bootcamp providers were unlikely to step in for the same reason.

**To better understand sample size considerations, several power calculation tests were conducted.** The goal of a power test is to identify sample sizes required to detect a prespecified treatment effect (also called minimum detectable effect) at specified levels of power and statistical significance. In our case, as is consistent with common practice, samples sizes were considered for a specified power of 0.8 and statistical significance of 0.05.

**The power calculations also require estimates of variances for treated and controlled samples.** Often, these are obtained from pre-existing data or are acquired from pilot studies. Since neither of these data sources was available, additional assumptions were made on reasonable estimates for these values.[3]

**Power tests for a dichotomous outcome variable (employed versus not employed) were conducted.** The results of the power test supported the following conclusion: if 120-150 participants could be recruited into both the treatment and control groups, an effect that represented a 20-35 percent improvement from the baseline rate was likely to be detected. The relatively large minimum detectable effect also took into account potential crossover (control group taking coding bootcamp classes through other sources) of approximately 15 percent.

**Results for other variables in which the sample variances were relatively small were more optimistic**. In either case, the power tests confirmed three important considerations for: 1) at current sample size estimates, the model required the rapid skills training to produce a large treatment effect. Thus, the more participants that could be recruited, the greater chance of detecting an effect because the minimum detectable effect would become smaller; 2) unequal sample sizes between treatment and control groups could be considered to account for differing sample costs. Increasing the size of the control group, without increasing the size of the treatment group could provide more power and minimize the problem of losing control units in different rounds of data collection. This was especially important since bootcamps were capped in size; 3) alternative outcome variables could be considered. Unfortunately, without some pre-existing or pilot data, it was extremely difficult to speculate on how promising this approach could be.

**Initial estimates of samples sizes in Colombia suggested potentially recruiting a sample of 220-240.** This number of participants, given the discussion above, would give the opportunity to detect a relatively large treatment effect. In the event that the treatment effect was small, other statistical methods may have been appropriate. For example, it may have been found that a treatment effect was significant at the 10 percent level. Though this effect was not large enough for conventional standards to attribute the effect as nonrandom, Bayesian methodologies, which incorporate priors, would still consider the information in the study useful. If needed, it is possible to explore this approach as well (see Floyd and List 2016). For outcomes with relatively high autocorrelation, an ANCOVA specification could be used to increase power (McKenzie 2012).

*Importance of Randomization*

**The key element of the sample design was that the individuals were randomized into a treatment and a control group.** This element of the design is what allows us to ensure that the education program, and no other confounding factors, explains the difference in outcomes. Indeed, qualitative results in Kenya and Lebanon are much more interesting having conducted a successful RCT in Colombia.

**To illustrate this, first consider the case in which there is no control group. In this design, a simple comparison is being made between a group of individuals before and after the treatment.** The major risk is that there are omitted variables that change over time that could impact the outcome variable. For example, imagine we were interested in measuring the impact of training on salary levels. To do so, salaries one year before the bootcamp and one year after the bootcamp could be compared. an increase in salaries was found, this could be because of the effect of the bootcamp or any other macroeconomic factors that changed salaries over the time period. A control group would be needed to control for these time effects.

**Second, consider the case in which a control group was incorporated, but the control group was not random.** For example, suppose that the treatment group was chosen based on how motivated they were to complete the bootcamp. If the outcomes of these groups were compared, then inference would be confounded by the fact that the two groups were fundamentally different: one group was highly motivated and the other was not. If this selection effect was correlated with the outcome variable, then the impact of the bootcamp could not be recovered. Continuing with salaries in our example, the experimental design would be equally likely to capture that highly motivated individuals make more money rather than an effect of being in the bootcamp.

### Analysis

*Statistical Model*

The experiment was designed in anticipation of analysis using the following empirical specification:

$$Y_{it}=\alpha+\beta_1 Treat+\beta_2 Post+\beta_3 TreatPost+\sum_{\gamma j} Controls_{it}+\varepsilon_{it} (1)$$

where $Y_{it}$ is the outcome of individual i in time t, Treat is a dummy variable that is equal to 1 if the individual is randomly assigned to participate in the bootcamp and zero otherwise, Post is a time dummy that takes the value of 1 at the endline and zero at the baseline. Equation (1) is a simple difference-in-differences design that captures the effect of the intervention on outcomes by comparing the treated group relative to the control group around the implementation date[4]. The parameter of interest, $\beta_3$, is estimated by comparing the change in outcomes for individuals that received the boot camp over time relative to the control sample. Pooling the three waves of data collection and estimating one single treatment effect maximized power and hence the chance to detect a statistically significant result. Seeking to improve precision, a vector of control variables was added in the specification.

To check whether short and medium run effects of the program were distinct, a fully interactive model was run:

$$Y_{it}=\alpha+\beta_1 Treat+\beta_2 End+\beta_3 TreatEnd+\sum_{\gamma j} Controls_{it}+\varepsilon_{it} (2)$$

where End is a dummy for the endline survey. The parameters of interest are $\beta_3$ and $\beta_5$. In case of imperfect compliance, the parameters of interest in (1) and (2) informed the Intent-to-Treat (ITT) effect, that is, the impact of the training on those randomly assigned to bootcamp regardless actual take-up.

### Identification Concerns

**There were two major concerns with this analysis that were considered (and reiterated).** The first was that the treatment effect might have been driven by a placebo. In other words, if it was the case that those selected by the lottery "felt better" about themselves, then an improvement in outcomes might be because of a placebo effect and not the training per se. This could also be true if the bootcamp provided a certification mechanism. The second major concern was whether those that were randomized into the control group were more likely to seek out other bootcamps *after* the completion of the program. If the pool of participants utilized were those that were actively seeking a bootcamp, then it could be that individuals would make sure they attend a bootcamp *regardless* of whether it was acquired through our experiment. Then the control group would start to look more like the treatment group over time. If all control group individuals eventually received bootcamp training through a different source, then our treatment would only capture the outcome differences between our bootcamp and a bootcamp provided by another source.

## Notes

1. In practice, the minimum requirements to participate in a bootcamp are likely be very low to encourage maximum participation. Nevertheless, participants that do not meet basic requirements were excluded from the randomization sample.

2. This potentially induces a Treatment Specific Selection Bias (Al-Ubaydli and List 2013) and therefore limits the generalizability of our experiment but helps to ensure internal validity was achieved.

3. One way of circumventing this problem is to work with standardized variable. In that case the standard deviation will be 1.

4. Other empirical methodologies, such ANCOVA may be appropriate to use as well. Specifically, ANCOVA may afford more power if the autocorrelation in the variables of interest is low.

# APPENDIX B:

## RESEARCH DESIGN: QUALITATIVE STUDY

### Purpose of the Study

**The main purpose of the qualitative study was to gain deeper understanding of the effects that coding bootcamps have on participants in terms of influencing their quality of life, including employment patterns and salary levels.** The qualitative case studies were used to compare pre-existing attitudes with potential postbootcamp attitude changes among research participants to help determine who is most likely to succeed as a result of attending bootcamp training. As a secondary purpose, the interviews and focus groups also provided insight into the effects of bootcamps on the technological sectors and local economies.

**The study aimed to bring to the attention of governments and wider public sector stakeholders in the developing countries, as well as related donor communities, the potential positive social impact of bootcamps on local communities and related labor market outcomes and youth employment.** In addition, the study aimed to help private sector stakeholders to envision the growth potential of the related industries and local technology ecosystem.

### Research Questions

**The emphasis of the study was on the experiences (emotional, behavioral, and educational adjustments) of bootcamp participants as a result of their exposure to training and post-training employment patterns.** The study helps explain why in some cases the participation in bootcamps becomes a career promoter and a life-changing experience, while in other cases it is not. Within this context, the study addressed the following question and subquestions:

- *How does bootcamp training impact students' ability to compete in the local market?*
- *Which mechanisms explain why specific attitudinal characteristics toward training (causes) result in better post-training employment chances and higher salary levels (effects) for certain participants?*
- *What causes people, and young people in particular, to join a bootcamp?*
- *What are the implications of bootcamp training on the technological sectors and local economies?*

### Methodological Framework

**The current research developed theories of the determinants of positive outcomes of bootcamp training; an observation-focused qualitative case study design was implemented in order to explain the exact mechanisms that improve post-training quality of life outcomes for some students over others.**

**Based on motives, attitudes, and beliefs of training participants and their association with bootcamps, this research identified both the candidate causes for participating in a bootcamp and the effects of participating as modulated by dispositional characteristics.** These causes and effects were framed in general terms into theories so that they could be tested against other evidence in order to eventually create a generalizable model to explain why individuals in countries with similar economic and cultural contexts decide to participate in bootcamps and allow for predictions about which "types" of participants are most likely to benefit from that participation.

**The choice of a case study research methodology is primarily justified by its potential for analytical generalization (linking specific findings from a case to a more generalized theory) and providing an opportunity to understand mechanisms rather than metrics (in other words, answering questions about what is done, how, and why compared to is this done, how much/many and how often?).** The case study methodology provides one of the best approaches to "a first-hand understanding of people and events" (Yin 2004, 3) and "actual, real-life cases" (Yin 2004, 7). Importantly, this methodology does not require a large number of cases, and theories can be constructed from one to a few. Two holistic case studies were selected for this research, namely the pilot bootcamps in Kenya (the Moringa School) and Lebanon (Le Wagon Beirut).

The Delphi method and congruence procedures were used to infer theories from the cases, which involved a two-stage process: first, a group of respondents was given the

opportunity to provide forecasts, then a researcher synthesized and summarized those forecasts and had the group respond to the same kinds of questions in light of the new collective knowledge uncovered by the first round. The Delphi method mined the views of case participants for drawing hypotheses from a triangulated data collection technique that cannot be made from observations alone. The congruence procedures looked for within case correlations between the study variable and other phenomena, such as possible independent variables in the new hypothesis (causes of effects).

## Sampling

**Kenya and Lebanon pilot locations were selected as case studies for this research based on local, but also regional, opportunities provided by these locations and the level of maturity of their bootcamp programs.** In addition, the World Bank research team had close cooperation with local tech ecosystems in Kenya and Lebanon and identified suitable local research partners to assist with the bootcamps study.

**Within each case study, a theoretical (purposeful) sampling approach was used for elaboration and refining variables for hypotheses and eventual theory development**. In terms of the number of participants, it meant that the sample size was determined during the research process depending on which additional data was needed and the diminishing returns of additional information (saturation). In other words, participants were added to the sample until selected variables were saturated and no new data relative to the variable was discovered. In the end this was not needed. In both Kenya and Lebanon, each cohort comprised 18 students.

**Bootcamp participants in each case study were recruited to the bootcamps following the training advertisement.** They had to pass minimum eligibility criteria developed by the bootcamp providers in agreement with local research partners (iHub in Kenya and Berytech in Lebanon) and the World Bank research team. These criteria included basic logic, mathematics, and cognitive skills, as well as minimum computer skills.

**Case studies did not assume the use of control group, bearing in mind that case study researchers should avoid controlling any real-life events (Yin 2004, 8).** For the same reason, any manipulation of treatment group was not acceptable. To help analyze the findings from each case study and help identify opportunity cost for the participants of the bootcamp training, a modest amount of comparative data was needed. This comparative data was identified from information provided by human resources departments of selected industry leaders (two to three local companies, preferably with the highest demand for junior developers. The local research partners in each case study helped to get access to these lead companies and also helped collect objective and measurable demographic comparison data (for example, age, gender, salary level).

## Data Collection

**A triangulation approach was used to gather data from multiple sources: three longitudinal surveys, semistructured interviews with industry leaders and experts, and two focus groups (pre- and post-training) that combined bootcamp participants, industry leaders, and other parties with vested interest in bootcamps.** This raw data helped develop hypotheses and theories that would explain social processes related to bootcamps based on elements of experience of research participants.

Surveys

**Three standardized longitudinal questionnaire surveys were introduced to the bootcamp participants in order to obtain data essential for the study but not available from existing records (see Appendix C for the baseline survey and sample questions to be included in the follow-up surveys).** The surveys were administered before the training for treatment group starts, after the completion of the training (subject to individual bootcamp's length), and six months after the completion of the training. Survey administration was conducted in person or through e-mails or follow-up telephone calls. The survey participants were offered small monetary incentives to complete the questionnaire in full and on time. The surveys measured demographic variables, as well as attitudes, beliefs, and behavior related to bootcamps and employment outcomes and income. The surveys also provided data comparable across all three pilot locations of the World Bank bootcamps study, which included quantitative research based on randomized control trials in Medellín, Colombia, and two qualitative case studies in Kenya and Lebanon. **The administration of surveys was provided by the research partners, iHub in Kenya and Berytech in Lebanon.**

Semistructured Interviews

**Semistructured in-depth interviews were used to allow exploration of "the subjective values, beliefs and thoughts of the individual respondent" (Valentine 1997, 112) on the demand side.** For this purpose, two or more industry leaders and, potentially, public or academic experts in the subject area, were interviewed to obtain the primary data about demand size and type, as well as key features of successful entry-level employees. The local research partners helped

identify these industry leaders and facilitated access to them. The sample semistructured interview questions are shown in Appendix C. Some general open-ended questions were also included to re-engage interviewees if the interviewer noticed that respondents were exhibiting boredom or annoyance with the lengthy interviews (ideally, not less than one-hour long). Interviewers was advised to use "sensitizing concepts," that is, intuitive concepts that are built on the participant's own existing knowledge and interest in the study area, to frame questions that would serve as "ice breakers" during interviews (Charmaz 2006, 16-17). Permission was obtained from interviewees to audio-record each session.

Focus groups

**Focus groups provide access to the perspectives of a greater number of participants compared with interviews.** For the purpose of this study, focus groups were formed taking into account both the needs of the World Bank research team and the interests of the participants. The aim was to bring together a group of people who have a shared understanding of the purpose of bootcamps and were comfortable talking to each other. As such, the study included two focus group sessions in each location. The initial focus group sessions were conducted immediately after the start of the training. The follow-up focus groups were held six months after the completion of the training. The format and composition of focus groups was determined based on cultural issues.

**The focus groups consisted of a series of discussions of different sample sizes and composition throughout a day.** For example, the morning and afternoon sessions included smaller groups of discussants: the morning session comprised 10 bootcamp students and the afternoon session comprised 10 people ("non-students") who expressed interest but never participated in bootcamps for various reasons (for example, high tuition rate, no time for full-time study), including one or two applicants with a similar level of intention but who failed the prescreening. The evening session incorporated a maximum of 15 people from a combination of students (one-third), nonstudents (one-third), and a group of experts (one-third) comprising: one representative of the industry; one representative of the donor community; one representative from an academic institution; one representative of the government; and one representative from civil society (depending on local context and culture). In the final focus group discussions, the third session was formed by representatives of companies that had hired a bootcamp graduate. At least one World Bank researcher played a role as both a participant in all focus group discussions to reply to other participants' questions and as a cofacilitator that could pose additional questions to the participants.

The length of the focus groups sessions varied from one to two hours, with coffee breaks if needed. **The local research partners helped identify locations and other logistics for the focus group sessions. The local research partners also advertised the focus groups and recruited the participants among bootcamp students; that is, those who were interested but never participated in bootcamp trainings, industry lead representatives, academic representatives, donor community representatives, government, and civil society representatives** (depending on local context and culture).

**The local research partners helped the World Bank research team to identify an experienced focus group facilitator and a skilled rapporteur.** The facilitator was in constant dialogue with at least one researcher from the World Bank research team. The rapporteur transcribed the focus group discussions verbatim based on video recordings.

**Most of the focus group participants were provided monetary incentives for taking part in the focus groups.** The incentives were provided by the World Bank and administered by the local research partners.

**Informed consent was also received from participants reflecting their agreement to video recording.** Participants were reassured that recordings would not be shared with the third parties and that their names and affiliations would not be mentioned in the output reports and publications. Rather, data gathered through the focus groups would be presented in aggregated format.

**The content of questions also met the needs of both the World Bank research team and the research participants.** To encourage a livelier discussion dynamic that would lead to active conversation on the study topic, initial questions were oriented toward participants' interests. The sample list of questions for facilitated focus group discussions can be viewed in Appendix C.

## Data Management

**Detailed transcripts followed each interview and focus group meeting.** Once video recordings were transcribed, the World Bank research team used NVivo, a Computer Aided Qualitative Data Analysis Software (CAQDAS) package as a raw data management system and as a tool to validate inferences about the data during analysis. NVivo was combined with manual data management and analysis techniques in order to manually upload meeting memos in NVivo and link them with the transcripts from data collection.

## Bibliography


Charmaz, Kathy. 2006. *Constructing Grounded Theory. A Practical Guide Through Qualitative Analysis.* London: Sage.

George, Alexander and Andrew Bennett. 2005. *Case Studies and Theory Development in the Social Sciences*. Cambridge, MA and London: MIT Press.

King, Gary, Robert Keohane and Sidney Verba. 1994. *Designing Social Inquiry: Scientific Inference in Qualitative Research.* Princeton, NJ: Princeton University Press.

Valentine, Gill. 1997. "Tell Me About …: Using Interviews as a Research Methodology." In *Methods in Human Geography: A Guide for Students Doing Research Projects*, edited by Robin Flowerdew and David Martin, 110-126. Harlow: Longman.

Van Evera, Stephen. 1997. *Guide to Methods for Students of Political Science*. Ithaca and London: Cornel University Press.

Yin, Robert K. 2004. "Case Study Methods." *Complementary Methods for Research in Education*. American Educational Research Association. Washington, DC.

Yin, Robert K. 2014. *Case Study Research: Design and Methods*. 5th Edition. Thousand Oaks, CA: Sage.

# APPENDIX C:

## INSTRUMENTAL VARIABLE REGRESSION TABLES

### Instrumenting with Assignment

The tables below estimate the treatment on the treated instrumenting completion by treatment to account for lack of completion in the treatment group. As stated above, the impact results do not change. Abridged tables are shown to display the relevant impact coefficient but all full regressions include the following variables: age, gender, strata, location type (rural or urban), mother's high-school completion, own completion of high school, tertiary education and previous experience.

### Table E.1. Instrumental variable regressions with program completion only

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Variables** | **Job Status (being employed)** | **Job Benefits** | **Job Satisfaction** | **Business Creation** |
| Instrumented completion | -0.0389 | -0.0109 | 0.0818 | 0.0608 |
| | (0.0676) | (0.0648) | (0.0662) | (0.0541) |
| Observations | 239 | 279 | 279 | 239 |
| R-squared | 0.052 | 0.054 | 0.040 | 0.002 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

### Table E.2. Instrumental variable regressions with program completion and interaction between treatment and strata

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Variables** | **Job Status (being employed)** | **Job Benefits** | **Job Satisfaction** | **Business Creation** |
| Instrumented completion | -0.0364 | -0.0437 | 0.0793 | 0.115* |
| | (0.0867) | (0.0824) | (0.0843) | (0.0695) |
| Treatment*High Strata | -0.00591 | 0.0766 | 0.00584 | -0.130 |
| | (0.126) | (0.116) | (0.118) | (0.101) |
| Observations | 239 | 279 | 279 | 239 |
| R-squared | 0.052 | 0.057 | 0.040 | |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

## Table E.3. Instrumental variable regressions with program completion and interaction among treatment, strata and gender

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Variables** | **Job Status (being employed)** | **Job Benefits** | **Job Satisfaction** | **Business Creation** |
| Instrumented completion | -0.0667 | -0.0488 | 0.0806 | 0.0651 |
| | (0.0710) | (0.0681) | (0.0700) | (0.0570) |
| Treatment*Female*Strata | 0.206 | 0.298* | 0.00949 | -0.0317 |
| | (0.165) | (0.161) | (0.165) | (0.132) |
| Observations | 239 | 279 | 279 | 239 |
| R-squared | 0.060 | 0.067 | 0.040 | 0.002 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

## Table E.4. Instrumental variable regressions with program completion and interaction among treatment, and tertiary education

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Variables** | **Job Status (being employed)** | **Job Benefits** | **Job Satisfaction** | **Business Creation** |
| Instrumented completion | -0.0784 | -0.0126 | 0.0656 | -0.0136 |
| | (0.126) | (0.118) | (0.121) | (0.0998) |
| Treatment*Tertiary Education | 0.0492 | 0.00216 | 0.0202 | 0.0927 |
| | (0.131) | (0.121) | (0.124) | (0.104) |
| Observations | 239 | 279 | 279 | 239 |
| R-squared | 0.055 | 0.054 | 0.041 | 0.019 |

*Note*: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

# APPENDIX D:

# SURVEYS AND QUESTIONNAIRES

## Baseline Survey

Administered to the bootcamp students in Medellín, Beirut and Nairobi, before the beginning of the training. In the case of Medellín, it was administered to the 903 people who applied to the bootcamp (includes treatment and control groups, and those that did not meet the minimum eligibility criteria).

### A Bootcamp Preferences

**A1** **What is your preference for in-person Bootcamp hours? (Times may slightly vary):**

Morning: 8:00 am to 12:00 pm (2 groups)

Afternoon: 2:00 pm to 6:00 pm (2 groups)

Night: 5:00 pm to 9:00 pm (2 groups)

**A2** **What is your motivation to do the Bootcamp?**

### B Personal, Family, and Household Information

**B1** **Full name:**

**B2** **Birth date (day/month/year):**

**B3** **Sex:**

Male (1)
Female (2)

**B4** **Address**

**B5** **Strata**

**B6** **(Mobile and/or home) phone number:**

**B7** **Email:**

**B8** **Describe your current place of residence:**

Metropolitan (capital city) area (1)
Large city (2)
Small town (3)
Rural area (4)

**B9** **Do you live and/or work in the same area where you grew up?**

| | |
|---|---|
| Yes (1) | GO TO A11 |
| No (2) | GO TO A9 |

**B10** **Describe your original place of residence (where you grew up):**

Metropolitan (capital city) area (1)
Large city (2)
Small town (3)
Rural area (4)
Another country (5) Name of the country:_____

**B11** **What was the main reason for moving to your current residence?**

To accompany family (1)
For education/training/apprenticeship (2)
To work/for employment-related reasons (3)
Other reasons (99) Specify reason:_____

**B12** **What is your current marital status?**

| | |
|---|---|
| Never married (1) | GO TO A13 |
| Engaged to be married (2) | GO TO A13 |
| Married (3) | GO TO A12 |
| Separated/divorced (4) | GO TO A13 |
| Widowed (5) | GO TO A13 |

**B13** **What does your spouse currently do (choose the most relevant activity)?**

Attending education/training (1)
Works for salary/wage with an employer (2)
Self-employed (3)
Unemployed & actively looking for job (4)
Does not work (5)
Engaged in home duties (including childcare) (6)
Unable to work due to sickness or disability (7)
Other (99) Specify activity/reason:_____

**B14** **Do you have any children?**

| | |
|---|---|
| Yes (1) | GO TO A14 |
| No (2) | GO TO A15 |

**B15** **How many children do you have?**

**B16 What is the highest level of education obtained by your mother and/or father (circle what applies for each parent)?**

| | Father (A) | Mother (B) |
|---|---|---|
| No schooling/Pre-primary education | 0 | 0 |
| Primary education | 1 | 1 |
| Lower secondary education | 2 | 2 |
| Upper secondary education | 3 | 3 |
| Post-secondary non tertiary education | 4 | 4 |
| First stage of tertiary education | 5 | 5 |
| Second stage of tertiary education | 6 | 6 |
| Other | 7 | 7 |

**B17 What are the occupations of your father and/or mother (select main occupation of each parent)?**

| | Father (A) | Mother (B) |
|---|---|---|
| Professional, technical, and related worker | 1 | 1 |
| Administrative, clerical, or managerial worker | 2 | 2 |
| Clerical worker | 3 | 3 |
| Agricultural worker | 4 | 4 |
| Sales worker | 5 | 5 |
| Government/public sector worker | 6 | 6 |
| Factory/production worker | 7 | 7 |
| Armed forces | 8 | 8 |
| House-based/subcontractor worker | 9 | 9 |
| Other service worker | 10 | 10 |
| Unpaid family worker | 11 | 11 |
| Student | 12 | 12 |
| Unemployed/looking for job | 13 | 13 |
| Retired | 14 | 14 |
| Disabled | 15 | 15 |
| Parent deceased | 16 | 16 |
| Other | 17 | 17 |

**B18 What is the number of persons in your household (including yourself)?**

**B19 On average, what is the total income of your household?**

Per Year:_____

Per Month:_____

**B20 How many persons (including children?) in the household work for a salary/wage?**

**B21 How many persons are in the household who are without work and actively look for work?**

## C Education

**C1 What is your highest level of education?**

| | Father (A) | Mother (B) |
|---|---|---|
| No schooling/Pre-primary education | 0 | 0 |
| Primary education | 1 | 1 |
| Lower secondary education | 2 | 2 |
| Upper secondary education | 3 | 3 |
| Post-secondary non tertiary education | 4 | 4 |
| First stage of tertiary education | 5 | 5 |
| Second stage of tertiary education | 6 | 6 |
| Other | 7 | 7 |

**C2 If you attended University, what was your area of study (major)?**

**C3 When did you finish your latest studies? (approximate time when you plan to complete your studies if you are currently studying)**

Month_____ Year_____

**C4 If you attended a level of schooling but did not graduate, what was the main reason for stopping your education?**

Failed examination (1)

Did not enjoy schooling (2)

Wanted to start working (3)

To get married (4)

Parents did not want me to continue schooling (5)

Economic reasons (could not afford/needed to earn money to support family) (6)

Other (99) Specify other reasons: _____

## D Employment

**D1 Are you currently employed?**

Yes (1) GO TO C2

No (2) GO TO C12

**D2 Please describe your current work:**

Work in public sector (1)

Work in private company (2)

Work in non-profit organization (3)

Work on farm (4)

Work in family business (5)

Work in informal (black) economy (6)

Community volunteer work (7)

Internship/apprenticeship in public sector (8)

Internship/apprenticeship in private company (9)

Self-employed/own your business (10)

Other (99) Please specify:_____

**D3 How many employees are there at your current employer (approximately)?**

<10 employees (1)

10-20 employees (2)

20-100 employees (3)

100-500 employees (4)

500+ employees (4)

**D4 Please provide information about your current employer:**

Company name:_____

Division or Department:_____

**D5 What is the job title for your position at your current job?**

**D6** **How many hours per week do you work?**

5-10 hours (1)

10-20 hours (2)

20-30 hours (3)

40 hours (full-time) (4)

>40 hours (5)

**D7** **Does your work offer benefits (health, paid vacation, education support, pension fund, etc.)?**

Yes (1)

No (2)

**D8** **Is your current work:**

Paid (1) GO TO C9

Unpaid (2) GO TO C10

**D9** **What is your current wage?**

Per Year:_____

Per Month:_____

Per Hour:_____

**D10** **To what extent are you satisfied with your current job?**

Satisfied (1) GO TO C12

Unsatisfied (2) GO TO C11

**D11** **Which of the following best describes why you are unsatisfied with your current job?**

It is temporary (1)

Low salary/wage (2)

Low-level work (3)

Problems with management (4)

Routine, not interesting/challenging enough (5)

Low promotion/salary increase perspective (6)

Absence of benefits or their limit (7)

Long commute to work (8)

Other (99) Please specify:_____

**D12 Are you actively looking for a new job?**

Yes (1) GO TO C13

No (2) GO TO C14

**D13 What is your job seeking strategy?**

Online search (1)

Registering at public employment office (2)

Registering at private employment agency (3)

Attending career fairs (4)

Using personal connections and assistance from friends, relatives, colleagues (5)

Word of mouth (6)

Placing and answering newspaper advertisements (7)

Other (99) Please specify:_____

**D14 Do you have any prior work experience (either paid or unpaid)?**

Yes (1) GO TO C15

No (2) GO TO C16

**D15 Please describe your past work experience:**

Employer // Job Title/Role // Paid/Unpaid // Time period (month/year)

**D16 Which of the following type of work would you prefer if you complete the coding bootcamp training?**

Start your own business (1)

Work for a large private company (2)

Work for a startup (3)

Work for the government/public sector (4)

Work for a bank/financial sector (5)

Work for a multinational corporation (6)

Work for a non-profit organization (7)

Work online/self-employment (8)

Other (99) Please specify:_____

**D20 What would be your ideal salary/wage per month if you complete the coding bootcamp training?**

$200-$500 (1)

$600-1000 (2)

$1100-2000 (3)

$3000-4000 (4)

>4100 (5)

## E Basic Technical Skills

**E1** **What is your typing score (words per minute)? (you can check it at https://www.cursomeca.com/test.php)**

**E2** **Do you know how to code in any of the following languages?**

| Coding Language | Yes | No |
|---|---|---|
| Ruby (1) | | |
| Python (2) | | |
| Java (3) | | |
| HTML5 (4) | | |
| Android (5) | | |
| iOS (6) | | |
| C++ (7) | | |
| Other (99) | | |
| Please specify:_____ | | |

**E4** **Where did you learn these coding languages?**

at secondary/high school (1)

at university (2)

at vocation school (3)

from Massive Open Online Course (MOOC) (Lynda, Coursera, Udemy, Udacity, edX, iTunes U, etc.) (4)

from a friend (5)

Other (99) Please specify:_____

**E5** **What is your English language proficiency (reading and writing)?**

Fluent (1)

Intermediary (2)

Fair (3)

None (4)

# MID- SURVEY (END OF TRAINING)

**Qualitative survey only applied in Beirut and Nairobi.**

Name:

Email:

1. **Do you think the bootcamp training you just received will be sufficient for you to become competitive in the job market?**
    A. Yes
    B. No
    C. Not sure
2. **What do you value about what you learnt at the bootcamp? (Check all that applies)**
    A. Coding skills
    B. Soft skills (communication, presentation, teamwork, adaptability, problem solving)
    C. Jobs placement support
    D. Network with other students
    E. Network/meeting with professionals in the industry
    F. Other (Please specify)_____
3. **Which of the values learnt in the bootcamp you value the most:**
    A. Coding skills
    B. Soft skills (communication, presentation, teamwork, adaptability, problem solving)
    C. Jobs placement support
    D. Network with other students
    E. Network/meeting with professionals in the industry
    F. Other (Please specify)_____
4. **Has the bootcamp met your expectations?**
    A. Yes
    B. No
    C. Unsure (Please specify more)_____

5. **What was your motivation level before the training and now, after the training, for looking for jobs?**

   A. High before the training and high after the training

   B. High before the training and medium (ok) after the training

   C. High before the training and low after the training

   D. Low before the training and high after the training

   E. Low before the training and medium (ok) after the training

   F. Low before the training and low after the training

   G. Medium (ok) before the training and high after the training

   H. Medium (ok) before the training and medium (ok) after the training

   I. Medium (ok) before the training and low after the training

6. **How confident you feel now about your future employment after you have completed the training?**

   A. Very confident

   B. Confident

   C. Not so sure (Please specify more)_____

   D. Not confident (Please specify why)_____

7. **What would you have changed in the training if you could?**

8. **What did you like in the training the most?**

9. **What did you dislike in the training the most?**

10. **Was it worth your time, money, and other efforts?**

    A. Yes

    B. No

    C. Not sure (Please specify more)_____

11. **What was painful/too hard (Please check all that applies)?**

    A. Learning coding languages

    B. Learning soft skills (communication, presentation, teamwork, adaptability, problem solving)

    C. Jobs placement support

    D. Networking with other students

    E. Networking/meeting with professionals in the industry

    F. Other (Please specify)_____

**12. It was painful/too hard due to what reason (check all that applies)?**

A. Fatigue

B. Long commute

C. Shortage of time

D. Shortage of money because you did not work

E. Too hard to study

F. Other (Please specify)_____

**13. What was easy? (Please check all that applies)?**

A. Learning coding languages

B. Learning soft skills (communication, presentation, teamwork, adaptability, problem solving)

C. Jobs placement support

D. Networking with other students

E. Networking/meeting with professionals in the industry

F. Other (Please specify)_____

**14. It was easy due to what reason (Please check all that applies)?**

A. I was very motivated/inspired with the opportunities it brings

B. I like learning new things

C. Instructors were great

D. The study ambience/environment was great

E. The study materials were very explanatory

F. Homework assignments helped solidify the knowledge gained in class

G. I am just good at it

H. Other (Please specify)_____

**15. What would you change in the bootcamp for future students (Please check all that applies)?**

A. Coding languages (Please specify)_____

B. Soft skills (communication, presentation, teamwork, adaptability, problem solving) (Please specify)_____

C. Jobs placement support (Please specify)_____

D. Networking with other students (Please specify)_____

E. Networking/meeting with professionals in the industry (Please specify)_____

F. Other (Please specify)_____

# FINAL SURVEY

**Administered in the three cities, 6 months after the end of the bootcamp.**

## A Personal, Family, and Household Information

**A1** **Full name:**

**A2** **Address:**

**A3** **Mobile and/or home phone number:**

**A4** **Email:**

**A5** **Did you move during the last 6 months?**

| | |
|---|---|
| Yes (1) | GO TO A6 |
| No (2) | GO TO A8 |

**A6** **Where did you move (from which location -city, village, etc.- to which city, village, etc.)?**

**A7** **What was the main reason of your move?**

To accompany the family (1)

For education/training/apprenticeship purposes (2)

To work/for employment-related reasons (3)

Other (99) Please specify: _____

**A8** **Has you marital status changed since May 2016?**

| | |
|---|---|
| Yes (1) | GO TO A9 |
| No (2) | GO TO A12 |

**A9** **What is your current marital status?**

| | |
|---|---|
| Never married (1) | GO TO A12 |
| Engaged to be married (2) | GO TO A13 |
| Married (3) | GO TO A12 |
| Separated/divorced (4) | GO TO A13 |
| Widowed (5) | GO TO A13 |

**A10** **Has the employment status of your spouse changed since May 2016?**

| | |
|---|---|
| Yes (1) | GO TO A11 |
| No (2) | GO TO A12 |

**A11** **What does your spouse currently do? (Choose the most relevant activity)**

Attending education/training (1)

Works for salary/wage with an employer (2)

Self-employed (3)

Unemployed & actively looking for job (4)

Does not work (5)

Engaged in home duties (including childcare) (6)

Unable to work due to sickness or disability (7)

Other (99) Specify activity/reason: _____

**A12** **Have the number of children in your household changed since May 2016?**

Yes (1) GO TO A13

No (2) GO TO A14

**A13** **How many children do you currently have?**

**A14** **Have the number of persons in your household (including yourself) changed since May 2016?**

Yes (1) GO TO A15

No (2) GO TO A16

**A15** **How many persons are currently in your household (including yourself)?**

**A16** **Have the total income of your household changed since May 2016?**

Yes (1) GO TO A14

No (2) GO TO A15

**A17** **On average, what is the total income of your household?**

Per Year: _____

Per Month: _____

**A18** **Have the number of persons in your household who currently work for a salary/wage changed since May 2016?**

Yes (1) GO TO A19

No (2) GO TO A20

**A19** **Currently, how many persons in your household currently work for a salary/wage?**

**A20** **Have the number of persons in your household who are without work and actively looking for work changed since May** 2016?

Yes (1) GO TO A21

No (2) GO TO B1

**A21** **Currently, how many persons in your household who are without work and actively look for work?**

## B Education

**B1** **Since May 2016, have you completed any education program?**

Yes (1) GO TO B2

No (2) GO TO B3

**B2** **Which education program you have completed since May 2016?**

~~No schooling/Pre-primary education (0)~~

~~Primary education (1)~~

Lower secondary education (2)

Upper secondary education (3)

Post-secondary non-tertiary education (4)

First stage of tertiary education (5)

Second stage of tertiary education (6)

Other (99) Specify which one: _____

**B3** **Since May 2016 have you applied to any new education program?**

Yes (1) GO TO B4

No (2) GO TO B5

**B4** **Which new education program you have applied for since May 2016?**

~~No schooling/Pre-primary education (0)~~

~~Primary education (1)~~

Lower secondary education (2)

Upper secondary education (3)

Post-secondary non-tertiary education (4)

First stage of tertiary education (5)

Second stage of tertiary education (6)

Other (99) Specify which one: _____

**B5** **Since May 2016 have you dropped out of an education program?**

Yes (1) GO TO B6

No (2) GO TO B7

**B6** **If since May 2016 you dropped out of an educational program, what was the main reason for stopping your education?**

Failed examination (1)

Did not enjoy schooling (2)

Wanted to start working (3)

To get married (4)

Parents did not want me to continue schooling (5)

Economic reasons (could not afford/needed to earn money to support family) (6)

Other (99) Specify other reasons: _____

**B7** **If since May 2016 you are studying at university, what is your area of study (major)?**

**B8** **If you have started your latest education after May 2016, what was the start day?**

**B9** **If you are not working or studying, are you looking for a job? What are you planning to do for the next 6 months?**

## [for Treatment Group ONLY]

**B10** **If after the completion of a bootcamp training you had applied and got accepted to a university program, do you think the bootcamp training contributed to your acceptance to a university program?**

Yes (1) GO TO B11

No (2) GO TO B13

I did not apply to any university program

**B11** **The contribution of the bootcamp training to your acceptance to a university program was:**

Essential (5)

Very significant (4)

Significant (3)

Somehow significant (2)

Of little significance (1)

**B12** **What was the most contributing factor of the bootcamp training that contributed to your acceptance to a university program?**

Coding skills (1)

Soft skills (2)

Increased self-confidence due to the completion of the bootcamp program (3)

Getting a job that allows you to finance your education (4)

Getting a merit-based scholarship thanks to the coding skills (5)

Other (99) Please specify: ____

## C Employment

**C1 Are you currently employed?**

Yes (1) GO TO C2

No (2) GO TO C13

**C2 Please describe your current work:**

Work for the government/public sector (1)

Work in a large private company (2)

Work in a small private company (3)

Work in a startup (4)

Work in non-profit organization (5)

Work on a farm (6)

Work in a family business (7)

Work in informal (black) economy (8)

Community volunteer work (9)

Internship/apprenticeship in public sector (10)

Internship/apprenticeship in private company (11)

Self-employed/own your business (12)

Other (99) Please specify: _____

**C3 How many employees are there at your current employer (approximately)?**

<10 employees (1)

10-20 employees (2)

21-100 employees (3)

101-500 employees (4)

500+ employees (4)

**C4 Please provide information about your current employer:**

Company name: _____

Division or Department: _____

**C5 What is the job title for your position at your current job?**

**C6 How many hours per week do you work?**

Less than 24 hours (1)

24 hours (2)

25-48 hours (3)

48 hours (4)

>48 hours (5)

**C7** **Does your work offer benefits (health, paid vacation, education support, pension fund, etc.)?**

Yes (1)

No (2)

**C8** **Is your current work:**

Paid (1) GO TO C9

Unpaid (2) GO TO C10

**C9** **What is your current wage per month?**

Less than a SMLV[1] (1)

1 SMLV (2)

Between 1 and 2 SMLV (3)

Between 2 and 4 SMLV (4)

Between 4 and 6 SMLV (5)

More than 8 SMLV (6)

**C10** **Which of the following skills do you use at your current job (indicate all that apply):**

Coding skills (1)

Soft skills (communication, presentation, teamwork, adaptability, problem solving…) (2)

Others (99) Please specify: _____

None (0)

**C11** **To what extent are you satisfied with your current job?**

Satisfied (1) GO TO C13

Unsatisfied (2) GO TO C12

**C12** **Which of the following best describes why you are unsatisfied with your current job?**

It is temporary (1)

Low salary/wage (2)

Low-level work (3)

Problems with management (4)

Routine, not interesting/challenging enough (5)

Low promotion/salary increase perspective (6)

Absence of benefits or their limit (7)

Long commute to work (8)

Other (99) Please specify: _____

1 SMLV stands for minimum salary in Colombia. The SMLV was:
- 2016: 689.455 COP (240 USD)
- 2017: 737.717 COP (257 USD)

**C13 Are you actively looking for a new job?**

Yes (1) GO TO C14

No (2) GO TO C15

**C14 What is your job seeking strategy?**

Online search (1)

Registering at public employment office (2)

Registering at private employment agency (3)

Attending career fairs (4)

Using personal connections and assistance from friends, relatives, colleagues (5)

Word of mouth (6)

Placing and answering newspaper advertisements (7)

Other (99) Please specify:_____

**C15 Since May 2016, have you created your own business?**

Yes (1) GO TO C16

No (2) GO TO D1

**C16 Can you provide a description of your own business?**

**C17 Including you, how many employees are there at your own business?**

1 employee (1)

2-3 employees (2)

4-6 employees (3)

+6 employees (4)

## D Bootcamp Experience

**[For Control Group Only]:**

**D1 Since May 2016, have you taken any technical skills training or coding bootcamp?**

Yes (1) GO TO D2

No (2) GO TO D3

**D2 What kind of technical or bootcamp training have you attended since May 2016?**

Full-time and intensive 2-4 months long bootcamp (1)

Short-term bootcamp (2)

Online bootcamp (3)

Short programming courses (4)

Other (99) Please specify: _____

**[For Treatment Group Only]:**

**ONLY IF YOU ARE CURRENTLY WORKING**

**D1 Do you use the skills you learned in the bootcamp at your current job?**

Yes (1) GO TO D2

No (2) GO TO D4

**D2 Do you think you got your current job because you had the knowledge acquired in the bootcamp?**

Yes (1)

No (2)

Please explain: _____

**D3 Are you planning to get a job where you can apply the skills acquired in the bootcamp?**

Yes (1)

No (2)

Please explain: _____

# COMPLEMENTARY SURVEY II

Only administered in Medellín, to get additional data on employment and type of job.

## A Basic Information

**A1** **Nombre completo:**

**A3** **Número de celular:**

**Número de teléfono fijo:**

**A4** **Email:**

## B Basic Information

**B1** **¿Usted se encuentra actualmente laborando? Puede ser por cuenta ajena o por cuenta propia.**

| | |
|---|---|
| í (1) | VAYA A C4 |
| No (2) | VAYA A D0 (TRATAMIENTO) O FIN |

**B4** **¿Cuál es el nombre de la entidad para la cual trabaja?**

**B5** **¿Cuál es el nombre del cargo que usted desempeña en esa entidad?**

*Queremos analizar si es un trabajo relacionado con el bootcamp*

**B9** **¿Cuál es su salario por mes? (en pesos colombianos)**

*El Salario Mínimo Legal Vigente para el año 2017 está en $737.717 COP (Pesos Colombianos)*

**[SÓLO grupo de tratamiento]**

**C0** **¿Cada cuánto practica las habilidades aprendidas durante el bootcamp, tanto en casa como en su empleo (si tiene un empleo)?**

Varias veces por semana (1)

Una vez por semana (2)

Una vez por mes (3)

Nunca (4)

# SEMI-STRUCTURED INTERVIEWS SAMPLE QUESTIONS

Only administered for the qualitative studies in Beirut and Nairobi.

These items focus on the CONTENT of the questions; based on the cultural expertise of the professionals conducting the interviews, the specific language of the questions and prompts might be changed considerably.

## Questions for everyone:

1. Tell me a little about the local landscape in terms of tech jobs – demand and opportunity.
2. What would you say are the main reasons someone would apply for (one of these jobs)?
3. What do people do today to help improve their chances of getting these jobs?
4. What are some failed strategies people employ to get these jobs? Why do they try them?
5. How did you first learn about the bootcamp program? What was your initial reaction when you heard about it?
6. What do your peers think about the bootcamp program? Do you talk about it much with friends, coworkers, or peers? Does the media or online ads cover it? [*How salient is the program.*]
7. If you had to make a list of people who have a vested interest in the bootcamp program, whom (all) would you include in that list?
8. What is your prediction for the overall outcome of this pilot bootcamp program? What reasons do you have for this prediction? What are you basing this prediction on?
9. What would you say the general feelings of people in your community are about the bootcamp program – the average across the citizens near you, across all social classes? [*If not specified – do they have particular expectations for the program in terms of local tech and economic growth?*]
10. When you think about the effects of a bootcamp program, how wide-ranging do you think it will be geographically? Citywide, regional, countrywide, or worldwide?
11. When you think about the effects of these programs, how broad do you think they will be in terms of social spheres? Will it just affect the tech industry? Will it improve or worsen things more broadly, so all citizens will benefit? Somewhere in between?
12. What would you say is the number one positive effect you foresee from this program?
13. What would you say is the number one negative effect you foresee from this program?
14. Would you encourage a friend or family member to participate in a bootcamp? Would it depend on their personality or…?

15. What percentage of the participants in the bootcamp do you think will have an easier time finding employment after? What percentage do you think will have higher incomes?

16. If you had to guess, what would you think would distinguish someone who "succeeds" in a bootcamp over someone who fails?

17. What are some of the unique challenges you predict for running a bootcamp here in [location] compared to another place? [*A possible follow up: right now, the World Bank study includes pilot programs in Kenya, Lebanon, and Colombia. Do you think there is anything different about your location compared to the others that will make a difference in the effectiveness of the program? For example, local conditions, local cultures, specific differences in the types of people who hire or go to one of these programs?*]

## For firms if they do hiring at all:

18. What characteristics do you look for when hiring an entry-level tech employee?

19. If you had to pick, what is the #1 thing you consider as the highest priority, all else being equal?

20. How much weight do you think you would give to having done a bootcamp in making your hiring decisions?

## For managers, HR experts, or just experts in industry:

21. What distinguishes an "ok" employee from an "outstanding" employee in an entry-level position?

22. What is the most typical pattern for a new hire, in terms of career progression and wages?

# FOCUS GROUP SAMPLE QUESTIONS

Only administered for the qualitative studies in Beirut and Nairobi.

[*Note: if there is a sizeable female population of participants, make sure at least one focus group is all-woman.]*

A large portion of the focus group prompts will be created from the one-on-one interviews. Other questions will be based on patterns drawn from the questionnaires, particularly in post-training focus groups. These will be the strongest questions or topics for discussion, including those at the end of the list.

These items focus on the CONTENT of the questions; based on the cultural expertise of the professionals conducting the focus groups, the specific language of the questions and prompts might be changed considerably.

## Pre-training focus groups:

1. How did you hear about the bootcamp? [*Might be better in a questionnaire*.]
2. [*Going around the room, in one or two words*] What was your feeling when you realized you would be able to be part of this bootcamp? [*Look for words like "optimistic," "relieved," or "stressed," "worried," etc. Also, see if it is uniformly positive, or if some people have negative reactions*]. Was anyone surprised to hear any of those reactions? [*Try to get a conversation between two people who had opposing reactions*.]

   [*This could be complicated a bit because some of the people are bootcamp peers and the others – who did not get to do a bootcamp. Assuming that this is before they do a bootcamp training but after the selection of participants from a larger pool of applicants*.]
3. If you hadn't been able to get into this bootcamp, what would you have done instead? [*Possible directed follow up: anything you would have done to help you get a better job or more income?] [If they just say they would be doing all kinds of applications, or staying at home, etc. Basically… what alternate paths do they say people take to get ahead in the market?*]
4. What are some of the experiences you are looking forward to as part of the bootcamp?
5. What personal changes do you expect to result from this experience?
6. What are some examples of changes in your schedule or daily life you are going to have to make to attend the bootcamp?
7. Tell us a bit about what your friends and family think about you attending the bootcamp.
8. Describe the type of person you think would be most likely to do well in the future because he/she has participated in this bootcamp.
9. Describe the type of person you think would do awfully in the job market even after he/she has completed this bootcamp.
10. Is there any kind of person you think would not benefit from this at all – something that makes them a success (or failure) no matter what?

    [*If they are only focused on attitudes or personal qualities, propose the following: Let's take a step back. What are some of the things you think affect how well a person does when trying to get a job or a higher salary that are important – but have nothing to do with their personality?]*
11. Share with us some examples of the kinds of jobs you hope to get after completing this bootcamp.
12. What has it been like looking for a job/working where you work up to now?

13. Is there anything you feel has already changed for you now that you have been selected to participate in the bootcamp?
14. Why do you think (this location) was chosen as the place to run a pilot program?
15. Are your friends jealous that you are able to do something like this?
16. What are some of the things you had to do to get enough money to enter a training program like this one? Would any or all of you actually have done all that?
17. These bootcamps take a lot of time and energy. What is the main inspiration you are going to use to make it through the program?

## Post-training focus groups:

1. What is most different about you now, compared to before you took the training?
2. Do you look at anything differently now that you have gone through the training?
3. What were the hardest things about the training?
4. What was your favorite part about the training?
5. What was it like working with the bootcamp (leader/trainer/life coach/classmate)?
6. Have you made any "industry" connections as a result of the bootcamp training?
7. Do you think you have a better job now that you had have gotten if you had not taken the bootcamp?
8. What new opportunities do you think you have now that you would not have had if you hadn't done the bootcamp?
9. What did you do/are you doing now to build off of the bootcamp?
10. How hard/easy it was to get into a job after the bootcamp? How long it took?
11. For those employed after the bootcamp: what is one thing you like in you job the most? What do you like the least?
12. What is your future career plans? [*if we are curious if it involves moving out of the country*.]
13. Do you feel like others treat you any differently now that you have completed the bootcamp?
14. What are some of the changes you have seen in your location in the past year? [*does not matter whether they choose a city- or countrywide reference point – just see what they say.*]
15. Who here has experienced a significant increase in their earnings over the past six months? What has changed in your lives now that you have more money?
16. What is one positive thing that happened after you attended boot camp that you never would have predicted beforehand?
17. What is your most memorable experience from participating in the bootcamp?
18. What was the best thing about bootcamp overall?
19. What was the worst thing about bootcamp overall?
20. Was there any negative consequence to you doing the bootcamp?
21. Do you feel like you are smarter after having done the bootcamp?

22. Had participating in the bootcamp affected your confidence at all? What experiences did you have that made you a more confident person?

23. [*Around the room*] Would you say generally that the bootcamp was a success for you, a disappointment for you, or something in between? What would you say was the biggest reason you think that this was the case? Was it something about you, or about the bootcamp?

24. What would you say is the most important quality a person should have to do well DURING the bootcamp?

25. What would you say is the most important quality a person should have to do well become successful AFTER the bootcamp?

26. What would be the worst quality for a person to have as a bootcamp participant - something that would make sure they do not do well during the training? [*This question is tricky and sensitive because it might be insulting to people who did not do well in the bootcamp, to hear other people say XYZ about them.*]

27. As part of this research, we have interviewed experts in your field, such as [*general description of who they were*]. We woud like to tell you what THEY thought about bootcamps, and see if you guys agree with them or disagree with them [*here, take some of the consensus items from the interviews*].

28. Sometimes the people we interviewed disagreed with each other. We would like to present you with their opinions, and you tell us which perspectives you agree with and why – or if you disagree with all the opinions!

# SOCIOEMOTIONAL QUESTIONNAIRE

The following are the measurement scales for the prioritized non-cognitive variables. All scales in this annex are psychometric instruments that have been validated.

## A. Review of Personal Effectiveness and Locus of Control (ROPELOC) (Richards, et al. 2000)

| | | NOT LIKE ME | | | | | | | LIKE ME |
|---|---|---|---|---|---|---|---|---|---|
| 01. | When I have spare time I always use it to paint. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 02. | I like cooperating in a team. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 03. | No matter what the situation is I can handle it | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 04. | I can be a good leader. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 05. | My own efforts and actions are what will determine my future. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 06. | I prefer to be actively involved in things. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 07. | I am open to different thinking if there is a better idea. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 08. | In everything I do I try my best to get the details right. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 09. | Luck, other people and events control most of my life. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 10. | I am confident that I have the ability to succeed in anything I want to do. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 11. | I am effective in social situations. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 12. | I am calm in stressful situations. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 13. | My overall effectiveness in life is very high. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 14. | I plan and use my time efficiently. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 15. | I cope well with changing situations. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 16. | I cooperate well when working in a team. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 17. | I prefer things that taste sweet instead of bitter. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 18. | No matter what happens I can handle it. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 19. | I am capable of being a good leader. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 20. | I like being active and energetic. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| | | |
|---|---|---|
| 21. | What I do and how I do it will determine my successes in life. | 1 2 3 4 5 6 7 8 |
| 22. | I am open to new thoughts and ideas. | 1 2 3 4 5 6 7 8 |
| 23. | I try to get the best possible results when I do things. | 1 2 3 4 5 6 7 8 |
| 24. | When I apply myself to something I am confident I will succeed. | 1 2 3 4 5 6 7 8 |
| 25. | My future is mostly in the hands of other people. | 1 2 3 4 5 6 7 8 |
| 26. | I am competent and effective in social situations. | 1 2 3 4 5 6 7 8 |
| 27. | I can stay calm and overcome anxiety in almost all situations. | 1 2 3 4 5 6 7 8 |
| 28. | I am efficient and do not waste time. | 1 2 3 4 5 6 7 8 |
| 29. | Overall, in all things in life, I am effective. | 1 2 3 4 5 6 7 8 |
| 30. | When things around me change I cope well. | 1 2 3 4 5 6 7 8 |
| 31. | I am good at cooperating with team members. | 1 2 3 4 5 6 7 8 |
| 32. | I can handle things no matter what happens. | 1 2 3 4 5 6 7 8 |
| 33. | I solve all mathematics problems easily. | 1 2 3 4 5 6 7 8 |
| 34. | I am seen as a capable leader. | 1 2 3 4 5 6 7 8 |
| 35. | I like to get into things and make action. | 1 2 3 4 5 6 7 8 |
| 36. | I can adapt my thinking and ideas. | 1 2 3 4 5 6 7 8 |
| 37. | If I succeed in life it will be because of my efforts. | 1 2 3 4 5 6 7 8 |
| 38. | I try to get the very best results in everything I do. | 1 2 3 4 5 6 7 8 |
| 39. | I am confident in my ability to be successful. | 1 2 3 4 5 6 7 8 |
| 40. | I communicate effectively in social situations. | 1 2 3 4 5 6 7 8 |
| 41. | My life is mostly controlled by external things. | 1 2 3 4 5 6 7 8 |
| 42. | I am calm when things go wrong. | 1 2 3 4 5 6 7 8 |
| 43. | I am efficient in the way I use my time. | 1 2 3 4 5 6 7 8 |
| 44. | I cope well when things change. | 1 2 3 4 5 6 7 8 |
| 45. | Overall, in my life I am a very effective person. | 1 2 3 4 5 6 7 8 |

## B. Escala Grit de Duckworth (Duckworth et al., 2007) (Duckworth and Quinn, 2009)

0- **Not like me at all**

1- **Not much like me**

2- **Somewhat like me**

3- **Mostly like me**

4- **Very much like me**

| | | |
|---|---|---|
| 1. | New ideas and projects sometimes distract me from previous ones.* | 0 1 2 3 4 |
| 2. | Setbacks don't discourage me. | 0 1 2 3 4 |
| 3. | I have been obsessed with a certain idea or project for a short time but later lost interest.* | 0 1 2 3 4 |
| 4. | I am a hard worker. | 0 1 2 3 4 |
| 5. | I often set a goal but later choose to pursue a different one.* | 0 1 2 3 4 |
| 6. | I have difficulty maintaining my focus on projects that take more than a few months to complete.* | 0 1 2 3 4 |
| 7. | I finish whatever I begin. | 0 1 2 3 4 |
| 8. | I am diligent. | 0 1 2 3 4 |

***Scoring:***

**For questions 2, 4, 7 and 8 assign the following points:**

5 = Very much like me

4 = Mostly like me

3 = Somewhat like me

2 = Not much like me

1 = Not like me at all

**For questions 1, 3, 5 and 6 assign the following points:**

1 = Very much like me

2 = Mostly like me

3 = Somewhat like me

4 = Not much like me

5 = Not like me at all

Add up all the points and divide by 8. The maximum score on this scale is 5 (extremely gritty), and the lowest score on this scale is 1 (not at all gritty).

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