Signaling and Migrant Labor Market Integration: Experimental evidence from Colombia

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Abstract

Labor market signaling plays a crucial role in the job-matching process by reducing information frictions faced by employers. In this paper, we analyze whether the returns to signaling vary based on the accuracy of ex-ante signals. We estimate the heterogeneous returns to signaling by comparing locals and migrants, who differ in the accuracy of their available education and prior experience signals. Our analysis employs data from a skill certification program in Colombia that provides both locals and migrants with a common credible signal within the labor market. Selection into the program was randomized, with 30 percent of spots allocated to migrants. Our estimation strategy leverages this random assignment to estimate the heterogeneous returns to signaling for both locals and migrants. Our findings offer valuable insights for policy improvements aimed at enhancing the labor market integration of migrants by assessing the heterogeneous returns of labor market signaling.

Keywords: Signaling, Skills, Migration, Labor Market Integration, Colombia

JEL codes: J24, J61, J64, I26, O15, D82.

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1 Introduction

Employers often face difficulties when screening candidates because the candidates' skills are not easily observable. To address these information gaps, the job search process is often mediated by signals such as academic and technical degrees, university reputation, completed courses, and grade point averages, among others (Spence, 1973). Access to these signals has proven to yield strong positive returns for job seekers (Abebe et al., 2021; Bassi and Nansamba, 2022; Carranza et al., 2022; Heller and Kessler, 2021; Pallais, 2014; Landaud et al., 2024; MacLeod et al., 2017; Eble and Hu, 2022), and these returns tend to be larger among populations with reduced access to accurate signals (Busso et al., 2023).

Migrants represent a group of job seekers who often lack access to accurate signals, making it harder for local employers to assess them. Employers often struggle to interpret the signals used by migrants in the job-seeking process due to limited familiarity with the educational systems and professional standards of the migrants' countries of origin. As a result, migrants frequently end up in jobs that require significantly lower qualifications than they possess, leading to a mismatch between their skills and the demands of the roles they occupy, a phenomenon known as skill downgrading.

This inefficient allocation of talent has been well-documented across migrant populations in different contexts (Dustmann et al., 2012; Eckstein and Weiss, 2004; Dustmann et al., 2016; Lebow, 2023). Skill downgrading is particularly concerning, as evidence suggests that it decreases migrants' wages and exacerbates the negative pressure on the wage of the most vulnerable local workers, contributing to increased wage inequality and reduced overall productivity (Lebow, 2023). These dynamics highlight the broader economic implications of inefficient migrant skill integration, making it a pressing issue for labor market policies.

Recent surges in immigration across developing countries have prompted governments to implement policies aimed at facilitating the labor market integration of migrants. For instance, countries like Colombia have responded to the influx of migrants with extraordinary regularization processes, contributing to the more than 41 such initiatives launched recently across Latin America and the Caribbean (Bahar et al., 2021; Acosta and Harris, 2022). Nevertheless, existing evidence suggests that regularization processes have only had small effects on migrants' insertion into formal labor markets (Ibáñez et al., 2024; Bahar et al., 2021).

Traditional approaches, such as providing training or enhancing job search skills, have also been implemented to promote the labor market integration of migrants (Carranza and McKenzie, 2024; Foged et al., 2022, 2024; Joona and Nekby, 2012; Dahlberg et al., 2024; Battisti et al., 2019). However, many of these programs have high implementation costs and require migrants to temporarily leave the workforce, imposing significant financial burdens given their often limited resources. Furthermore, none of these policies specifically target information frictions in the job-matching process, which can significantly affect the migrant population.

This study aims to fill the existing knowledge gap by analyzing whether labor

market signaling improves the labor market integration of migrants in the recipient economy. We examine skill certifications as a measure of signaling and estimate their heterogeneous returns for locals and migrants. Skill certification programs offer a potentially low-cost policy solution that can equip migrants with recognized credentials, providing clear and reliable signals of their qualifications to local employers. These certifications do not provide training; instead, they assess individuals' skill levels for specific competencies in a short period of time. Previous evidence has found that skill certifications significantly improve labor market outcomes for job seekers (Abebe et al., 2021; Bassi and Nansamba, 2022; Carranza et al., 2022; Heller and Kessler, 2021; Pallais, 2014; Busso et al., 2023), constituting a promising policy to decrease skill downgrading and inefficient talent allocation among migrants.

We leverage variation from a randomized control trial that provides skill certifications issued by a local public agency to both locals and migrants in Colombia. This program, named *Saber Hacer Vale*, is a free skill certification initiative offered by the Colombian Ministry of Labor. Participants in the program are assessed by qualified assessors from SENA (Colombian Vocational Training Agency), a highly regarded institution among employers in Colombia. If approved, participants receive a publicly recognized certification in a predetermined competency. The program also provides participants with guidance to join a job search platform and financial assistance during their participation. It is designed to be completed within two months and assigns 30 percent of the available spots to migrants.

In 2024, *Saber Hacer Vale* will be implemented from late September to late November in the Pacific region of Colombia. Access to the program will be assigned randomly. A total of 2,160 individuals registered, with 855 spots to be randomly assigned, including 250 reserved for migrants. Candidates assigned to the treatment group will be evaluated in specific competencies, and those deemed qualified will receive the skill certification. Those who fail the test will enter a short-term training program that allows them to retake the exam. Non-assigned candidates will be included in the control group. Both treatment and control groups will be measured three, six, nine, and twelve months after certification issuance. After one year, the control group will receive timely information to apply for the 2025 cohort, minimizing potential spillover effects.

Our empirical design compares treated and control groups of locals and migrants to assess the returns to labor market signaling (measured through skill certifications) for populations with different access to ex-ante signals. The sample size of this evaluation allows for the detection of minimum effects of approximately 0.15 standard deviations for locals and 0.26 for migrants. Based on previous related studies, these effect sizes are close to the lower bound of the impact that a skill certification program typically has on earnings. Prior research has reported effects ranging from 0.18 to 1.24 standard deviations, which strengthens our confidence in the robustness of our empirical design. For locals, the lower bound is well above the minimum detectable effect. For migrants, although the lower bound is slightly below the minimum detectable effect, the treatment effect is expected to be considerably larger among them, as returns to signaling tend to be greater in populations with less reliable signals, such as migrants (Busso et al., 2023).

Our study contributes to two broad bodies of literature. First, it adds to the growing body of research on how credible signals can enhance the occupational outcomes of job seekers. Several studies have conducted interventions in which certificates were randomly awarded to groups of evaluated candidates across various contexts. These studies consistently show that providing more reliable information about workers' skills leads to improved labor market outcomes. For instance, Abebe et al. (2021) provided skill certificates to young job seekers in Ethiopia.[1] Similarly, Bassi and Nansamba (2022) varied the availability of information about job seekers' non-cognitive skills in Uganda, making this information accessible to employers during interviews. Carranza et al. (2022) randomly distributed assessment results to young job seekers in South Africa, which they could then share with potential employers. Furthermore, Heller and Kessler (2021) studied how a signal based on supervisor feedback increased the employability of young people in New York. Pallais (2014) provided job seekers with information about candidates' performance in previous jobs. These studies are complemented by non-random evidence taken on a national scale; for example, Busso et al. (2023) analyzed how public signals about job seekers' skills in Colombia increase wages and how the effect varies by the reputation of the college of graduation.

By examining the impact of skill certificates on the labor market outcomes of both migrant and native populations, our study provides new experimental evidence on the heterogeneous effects of labor market signaling for groups with varying levels of ex-ante access to signals. Additionally, our analysis offers insights that could inform policy aimed at improving labor market outcomes for vulnerable populations, with the goal of enhancing social mobility and equity among disadvantaged individuals who have limited access to networks and credible signals, such as diplomas, honors degrees, and college reputation (Carranza and McKenzie, 2024).

Second, this study adds to the literature on migrant labor market integration in host countries. Numerous studies have examined the effects of various programs and subsidies aimed at facilitating migrants' entry into the labor market. For instance, Battisti et al. (2019) conducted a field experiment in Italy, demonstrating that job search assistance interventions significantly enhance employment prospects for migrants. Similarly, Joona and Nekby (2012) explored intensive coaching programs in Sweden, finding that such initiatives improve participants' chances of securing employment, especially in the long term. In Denmark, Dahlberg et al. (2024) and Foged et al. (2024) evaluated wage subsidies, training, and initial placement policies, showing positive impacts on both employment rates and income levels for migrants. In the U.S., evidence indicates that providing vouchers to cover citizenship application fees greatly aids the legalization process for low-income migrants (Hainmueller et al., 2018). Mentorship programs have also proven effective in fostering the social integration of immigrants in host countries (Philipp Jaschke and Schacht, 2022). Additionally, Loiacono and Silva-Vargas (2023) evaluated the impact of matching programs for refugees and firms on local employment outcomes in Uganda. Importantly, Bahar et al. (2021) and Ibáñez et al. (2024) address the Colombian case by analyzing the effects of a massive

[1] The certificates were awarded in two stages. In the first stage, certificates were delivered based on standardized personnel selection exams. In the second stage, participants received guidance through workshops on how to signal their skills.

regularization policy that granted permits to Venezuelans. Their results suggest that the permits are a first step toward labor market integration, but the effects, especially among low-skilled immigrants, were negligible.

Our study complements this body of literature by examining the labor market impacts of providing migrants with certifications that serve as signaling mechanisms. Skill certifications offer a valuable, low-cost policy option for migrants who struggle to effectively communicate their skills to local employers. This approach has the potential to reduce skill downgrading by improving the quality of job matches, which in turn can decrease turnover and increase productivity. Many other labor market integration policies fail to address the information frictions that migrants face. Additionally, alternative forms of certification, such as recognizing foreign academic degrees or professional credentials, are often costly and time-consuming. In the absence of efficient skill certification programs, migrants may be forced to undergo additional retraining, leading to significant productivity losses (Carranza and McKenzie, 2024). Therefore, the findings of this study could have important policy implications, particularly in improving the integration of migrants into host economies.

2 Conceptual Framework

2.1 Certifications and the Labor Market Integration of Migrants

Recent literature has demonstrated that skill certification programs serve as valuable labor market signals in various contexts (Abebe et al., 2021; Bassi and Nansamba, 2022; Carranza et al., 2022; Heller and Kessler, 2021; Pallais, 2014) and the effects are larger among populations with less accurate signals (Busso et al., 2023). Therefore, a key question is whether credible skill certifications have a stronger impacts on migrants compared to locals and whether these signals can improve the job matching capacity of migrants and decrease skill downgrading.

Three potential mechanisms can explain the differential returns of skill certification programs between migrants and locals:

1. *Signaling:* The signals available to migrants (such as education level and previous work experience) may be less accurate than those of locals when assessed by local employers. For instance, education diplomas issued within the local economy can be easier for employers to interpret, conveying more reliable information than foreign degrees. Consequently, a common signal for both migrants and locals could hold additional value for migrants, whose outside options may rely heavily on foreign-issued credentials.

2. *Reservation wage:* Skill certifications can influence job search behavior by modifying reservation wages. Certifications may serve as a self-assessment mechanism for workers regarding their skill levels in relation to the local economy. As a result, skill certifications could raise the reservation wages of migrants by helping them recognize their qualifications for higher-paying positions. This increased awareness may lead to more selective job search behavior, with migrants opting for jobs that better align with their certified skills and offer improved compensation.

3. *Education:* Skill certifications can also provide migrants with valuable information about the returns to education in the host economy. This additional insight may encourage migrants to pursue further studies, potentially enhancing their labor market outcomes in the future.

2.2 Research Questions

This paper studies whether access to labor market signaling enhances the labor market integration of populations facing greater information restrictions, such as migrants. Specifically, we aim to address the following related research questions:

1. Do skill certifications positively affect labor market outcomes?
2. Are the effects different for migrants compared to locals?
3. Can employment policies be improved to promote the labor market integration of migrants by implementing skill certification programs?

2.3 Hypothesis

Our primary hypotheses relate to the positive effects of labor market signals among groups with less capacity to transmit accurate information to employers, such as migrants. In line with the theories discussed in Section 2.1, we believe that skill certifications can work as labor market signals allowing employers to better screen candidates. These effects should be heavily concentrated among groups with less signaling capacity (i.e., migrants).

In particular, we hypothesize that labor market signaling (measured as accessing skill certifications):

- Hypothesis 1: has a positive effect on the likelihood of employment and salary;
- Hypothesis 2: has a differentiated differentiated effect between groups with different ex-ante signaling capacity (i.e., locals versus migrants);
- Hypothesis 3: improves the labor migrant allocation of migrants by decreasing skill downgrading;
- Hypothesis 4: allows employers to better screen candidates, increasing labor demand for migrants;
- Hypothesis 5: changes the job-search behavior by allowing workers to accept offers from better paying firms.
- Hypothesis 6: induces migrants into additional education or training.

3 Background

3.1 Venezuelan Migration to Colombia

The global migrant population has grown significantly in recent years, reaching approximately 281 million in 2020 (United Nations Department of Economic and Social Affairs, 2023b). A substantial portion of this migration occurred within Latin America, increasing from 5.5 million in 2015 to 11.3 million in 2020 (United Nations Department of Economic and Social Affairs, 2023a). More than half of these migrants are Venezuelans (approximately 6.1 million) fleeing political instability and economic hardship in their home country (R4V, 2023).

Colombia has emerged as the primary destination for these Venezuelan migrants due to its geographical and cultural proximity (Bahar et al., 2021).[2] It is estimated that Colombia currently hosts around three million Venezuelan migrants, representing about six percent of the country's population (R4V, 2023). This means that one-third of all recently established Venezuelan migrants are in Colombia, posing significant challenges to the Colombian labor market (Delgado-Prieto, 2024; Caruso et al., 2019).

In response to this situation, Colombia implemented a large-scale regularization process that has granted permits to more than half of the Venezuelan migrants (Bahar et al., 2021; Ibáñez et al., 2024).[3] These permits allow migrants to participate legally in the local labor market and access health and education services. Although these permits are a first step toward integration into the local economy, Venezuelan migrants—especially low-skilled ones—continue to face challenges in securing employment, leading to issues of poverty and skill downgrading (Bahar et al., 2021; Lebow, 2023). Consequently, the Colombian government has implemented additional employment aid programs to provide migrants with tools for better integration into the local economy.

3.2 Skill Certification Program

Since 2003, the Colombian government has implemented a free skill certification program for all adults with minimal work experience.[4] The program aims to provide participants with a streamlined process to validate their skills through publicly recognized certifications. It does not offer training but instead recognizes existing skills in specific competencies. The assessments are conducted by the National Learning Service, a public institution dedicated to vocational training (known as SENA in Spanish). SENA is well regarded by Colombian employers, making its certificates a credible signal of skills.

The program currently offers assessments in 2405 competencies, covering skills used in areas such as manufacturing, agriculture, retail, and service occupations. It is

[2] Colombia and Venezuela share a border of over 2,000 kilometers and the same native language.

[3] As of August 2024, Colombia had issued nearly 1,161,175 permits to Venezuelan migrants under the *Permiso Especial de Permanencia* program (Migración Colombia, 2024).

[4] The program is named, in Spanish, "Programa de Evaluación y Certificación de Competencias Laborales", which was regulated by Decree 933 of 2003.

open to both employed individuals and job seekers who register by selecting a competency for certification. A qualified SENA assessor then empirically evaluates the participant's skill level in that competency, and if approved, issues the certification. The assessment includes both a knowledge and a practical test. Candidates who approve both tests are immediately awarded the certificate, while those who do not are eligible to enroll in a gap-closure program designed to enhance their skills and help them eventually earn the certificate. Only a small share (less than 10 percent) of participants have historically fail the exam.

All Colombian nationals are eligible to participate in the skills certification program. In addition, participants are required to: 1) have a valid identification; 2) have been employed for at least six months; 3) register on the website; and 4) accept the legal terms.

3.3 Saber Hacer Vale

Since 2021, in response to the migrant crisis –and to the National Development Plan 2018-2022 – the skills certification program has enabled foreign migrants to participate in the initiative known as *Saber Hacer Vale*.[5] This program, implemented by SENA and the Colombian Ministry of Labor, retains all the features of the original skills certification program while also providing participants with: 1) guidance on the Ministry's job search platform; and 2) financial assistance during their participation.

Saber Hacer Vale targets Colombians and foreign individuals classified as vulnerable. To be eligible for its additional benefits, participants must demonstrate that they meet at least one of the following vulnerability criteria:

- Household heads or report having people under care;
- Ages between 18 and 28 or over 60;
- Member of an ethnic group or the LGBTIQ+ community;
- Migrant;
- Colombian citizen who returned to the country;[6]
- Low income.[7]

The goal is to promote access for vulnerable populations who may benefit from a public signal to enter the job market. Importantly, at least 30 percent of the available spots are reserved for migrants with regular permit status.

[5]The National Development Plan 2018-2022 (or *Plan Nacional de Desarrollo 2018-2022: Pacto Por la Equidad*, in Spanish) was a governmental strategy intended to promote social inclusion and productivity. *Saber Hacer Vale* was one among other strategies included in this strategy.

[6]Participants must be registered in the public list known as *Registro Único de Retornados*.

[7]Colombia classifies its population based on a score used to target social aid programs, known as SISBEN (Sistema de Identificación de Potenciales Beneficiarios de Programas Sociales). The first three categories in the SISBEN score are considered low income and eligible for social aid.

All beneficiaries of *Saber Hacer Vale* receive food and connectivity subsidies totaling approximately $82 USD. Additionally, some beneficiaries qualify for further support, including: $75 USD for those with dependents, a $30 USD transportation subsidy if the test is conducted in person, and a $30 USD subsidy for those enrolled in the gap-closure program. Participants can receive up to $217 USD in total support, which is equivalent to 70 percent of the minimum salary. Notably, the program includes strong completion incentives, as beneficiaries receive the cash benefits upon program completion.

The program is implemented in four stages. First, the Ministry defines a set of competencies to be certified and identifies a geographic location for the program.[8] Second, the number of participants is determined according to the available budget. Third, the call for applications is launched, and candidates fill out an enrollment form available on the Ministry's website. Finally, the documentation is reviewed and verified to determine eligibility for the program.

Before 2024, selection into the program was assigned in a first-come, first-served mechanism. Around 12,000 individuals have been certified through *Saber Hacer Vale* during the past four years, including 4,000 migrants. These rounds of the program were implemented nationwide, certifying 38 different competencies.

4 Research design

4.1 Intervention

Our experimental intervention is integrated into the fifth round of *Saber Hacer Vale*, which is currently taking place during 2024.[9] It is targeted to Colombian and foreigners living in the Colombian Pacific region, specifically in the states of Valle del Cauca, Cauca, and Nariño, which are located in the southwest of Colombia. A total of 855 spots are being offered, distributed across the following competencies: 1) Health Services; 2) Food Processing; 3) Tourism; 4) Design and Tailoring; and 5) Handcrafts.[10] Beneficiaries of this round will receive the full benefits of the program, including skills certification, financial aid, and guidance using the job search platform.

Timeline of the Evaluation:- Figure 1 summarizes the 2024 implementation and evaluation timeline for *Saber Hacer Vale*, which began with a media campaign in May and June 2024. Multiple dissemination channels were put in place, including social media, radio, and television, and on-site agents were hired to facilitate enrollment. Interested

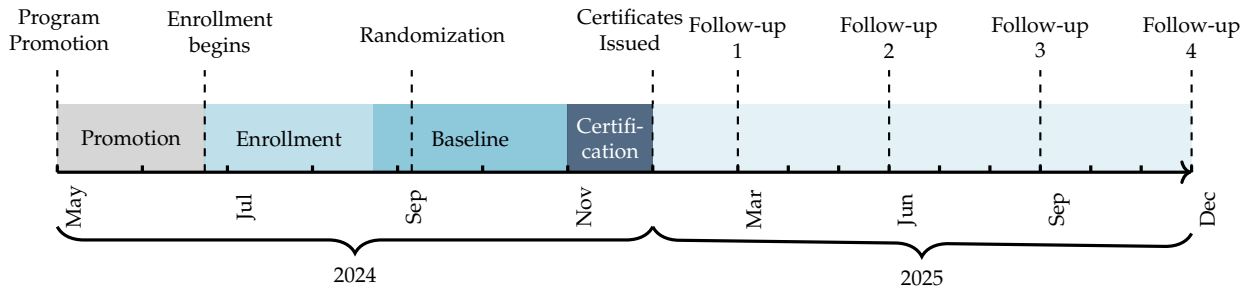
[8]The competencies evaluated are typically selected based on labor demand data and the historical success of technical certifications.

[9]If the budget allows, we plan to additionally include the 2025 round of *Saber Hacer Vale* in the evaluation. This second round will follow the same procedures as the 2024 round described herein.

[10]Health service competencies were defined as nursing individuals according to protocols for basic daily activities and their degree of autonomy. Food processing competencies involved food manipulation according to technical procedures and regulations. Tourism competencies included food preparation based on production orders and standard recipes. Design and tailoring competencies focused on modifications according to tailoring and dressmaking techniques. Finally, handcrafts competencies were defined as conditioning recovered materials according to technical requirements.

individuals could register for the program between June and August 2024. A total of 2,736 individuals registered by completing the online application form. Of these, 2,160 met the program's eligibility criteria by the end of the application period.[11]

Figure 1: Timeline of the Intervention (2024-2025)



Random Assignment:- In accordance with the Ministry of Labor, and given the excess demand, access to this round of *Saber Hacer Vale* shifted from a first-come, first-served method to a random assignment process. On September 6th, 2024, the 855 available spots were randomly allocated among the 2,160 eligible applicants, creating the treatment group of the evaluation. The randomization was stratified by competencies and migrant status.[12] This process ensured a sufficient number of beneficiaries within each competency and allocated 30 percent of the spots (i.e., 250) to migrants. Eligible individuals who were not randomly selected formed the control group for the evaluation. Table 1 presents the sample sizes by treatment status, competency, and whether the participant is a migrant or a local.

Table 1: Sample sizes by Competencies and Treatment Status

Competency	Local		Migrant	
	Treatment	Control	Treatment	Control
Handcrafts	44	71	16	14
Health Services	294	459	36	34
Food processing	153	300	132	122
Design and tailoring	42	111	18	23
Tourism	72	130	48	41
Total	605	1071	250	234

Certifications:- Individuals randomly selected to the treatment group will first be assessed by a qualified SENA assessor, who will determine if the participant possesses the necessary skill level to perform the competency for which she registered. If approved, the participant will receive a certification issued by SENA along with financial incentives for completing the program. If not approved, the participant will be offered the opportunity to take a gap-closure program. Upon completion of this program, the

[11] Submitted documents were analyzed between August 1st and September 3rd to determine eligibility for the program.

[12] Additionally, the benefits of the selected sample of beneficiaries had to comply with the budget set by the Ministry.

participant can retake the exam; if successful, the certification will be issued and financial incentives provided.

The skill evaluation performed by SENA is scheduled to take place during October and November 2024. Skill certificates are to be issued starting November 15th, when all the participants are believed to have been fully assessed.

4.2 Data Collection

Individuals in both treatment and control groups are intended to be measured across multiple data collections, before and after the intervention. Baseline information of the candidates was originally gathered at the moment of registration. The enrollment form collected demographic, socioeconomic, educational, and employment information about the participants. Furthermore, if the registrants provided their consent on the form, they were administered a survey that serves as a complementary baseline, capturing additional baseline characteristics. Participants were additionally contacted during September 2024 by telephone gathering information about labor market outcomes, mental health, and measures of poverty.

Four additional rounds of data gathering are planned to occur at three, six, nine, and 12 months after the program concludes. Participants will be recontacted by phone asking them to participate in a survey that gathers similar information as the baseline. Namely, the surveys will focus on information about employment, mental health, poverty, and perspectives about *Saber Hacer Vale*.[13]

4.3 Outcomes

The main outcomes of the evaluation correspond to labor market measures that quantify the level of integration to the local economy. The surveys include two distinct sections based on whether the participant in currently employed or unemployed.[14] These main outcomes correspond to:

- Extensive (employment status) and intensive (hours worked) measures of employment;
- Salary.

In addition, a series of related secondary outcomes will be collected depending on the response rate in every round. If the length of the questionnaire risks to increase attrition rates, then the information gathered will focus on the primary outcomes. These secondary outcomes include measures of additional labor market outcomes, mental health, poverty and perceptions about the program:

a) Labor Market:

- Probability of further educational attainments (after program finished);

[13] Appendix Table A.1 presents details about the information gathered in the baseline and follow-up surveys.

[14] The detailed outcomes refer to the current job for those who are employed, and to the last job held for those who are unemployed.

- Probability of formal employment;
- Size of employer (only for employed);
- Economic sector of the employer;
- Type of occupation (support staff, administrative, operator, etc.);
- Probability of wanting to have a different job (only for employed);
- Job satisfaction;
- Duration of unemployment (only for unemployed);
- Minimum acceptable salary to change (if employed) or accept (if unemployed) a job (i.e., measures of reservation wage);
- Maximum expected salary

b) Mental Health:

- Anxiety and nervousness questions (PHQ-9)

c) Measures of Poverty:

- Probability of skipping a meal during the day due to lack of economic resources.

d) Perceptions about the program:

- Willingness to pay for the skills certification;
- Willingness to participate in the certification program in the absence of subsidies;
- Impact of the subsidies on the perception of the certification program.

4.4 Non-Response and Attrition

Our design has associated risks of non-response and attrition. Non-response can exist if participants refuse to answer follow-up telephone surveys or if we are unable to track them. To mitigate this risk, we offer a payment of $7 for each completed survey as an incentive for continued participation. Additionally, we provide a monetary incentive of up to $30 USD for completing all four rounds of data collection. These incentives are significant for the population under study as they correspond to 10 percent of the monthly minimum wage in Colombia.

In addition, treatment assignment can induce non-response in both the treatment and control groups, implying the existence of attrition. Two sources of attrition may arise in the evaluation. First, some individuals may not complete the certification process. If selected participants fail the evaluation, the treatment and control groups will become non-comparable. However, this has historically not been an issue, as participants have strong incentives to finish; subsidies are provided only upon program completion. Additionally, *Saber Hacer Vale* offers the gap-closure program that allows those who fail to retake the evaluation and eventually obtain certification.

Second, not being assigned to the treatment may discourage some individuals from participating in the study. However, the incentives for completing the surveys are offered independently of treatment status. Given their size, we believe these incentives provide strong motivation for participants to engage and complete all four rounds of data collection even if they are not selected into treatment.

Based on the approval rates of *Saber Hacer Vale* in previous years and response rates to follow-ups in similar studies, we expect overall non-response to be around 10 percent. While we believe the incentives are sufficient to motivate participants in both groups, there may still be additional issues leading to considerable non-response that might lead to differential attrition between treatment and control groups. To minimize this risk, we will implement a systematic monitoring system. For each data collection phase, we will daily track the data collection process to assess whether attrition occurs and if it relates to participants' observable characteristics. If it does, we will offer additional incentives and enhance our efforts to locate missing individuals.

If attrition rates between the experimental groups remain constant—both among Colombians and migrants—we can disregard this issue, as our estimates will still be unbiased. However, if we encounter attrition issues by the end of the each data collection, we will follow Blattman et al. (2020) and randomly sample a group of the unfound individuals and heavily invest in tracking them. Given that this is a random sample of difficult-to-find individuals we can give them a bigger weight to recover a consistent intend-to-treat estimate. This approach will be coupled with the approaches outlined by Lee (2009) and Angrist et al. (2006) to estimate bounds on the treatment effects in the presence of differential attrition.

5 Empirical strategy

The random allocation of the program ensures that, in the presence of no differential attrition, the treatment and control groups are comparable. A simple regression comparing both groups is enough to estimate the unbiased treatment effects of the program. Two important margins, however, have to be considered in our empirical approach. First, as described in Section 2, we expect that the returns to the certifications are heterogeneous between locals and migrants. Second, our research design captures potential dynamic effects of the program. Therefore, we suggest two complementary approaches that capture both margins.

First, we plan on estimating a time-invariant specification that pools the effect into one coefficient. Formally, the specification takes the form:

$$y_{ijt} = \alpha_0 + \alpha_1 D_i + \alpha_2 M_i D_i + \alpha_3 M_i + \mu_j + \mu_t + \varepsilon_{ijt}, \tag{1}$$

where y_{ijt} represents an outcome for individual i, enrolled in the certification area j, at a time t, D_i is a binary variable that equals one if the individual is a beneficiary of the program and zero otherwise, M_i is a binary indicator that equals one for migrants and zero otherwise, and μ_j and μ_t corresponds to competency and survey-wave fixed effects. We additionally include an interaction term, $M_i D_i$, to capture hetereogeneous

effects. The error term, ε_{ijt}, is heteroskedasticity-consistent. The coefficient α_1 estimates the average impact of the skill certification program on locals, while α_2 captures the heterogeneous effect of the certification program between migrants and locals.

Second, we plan to estimate a time-variant specification that estimates the dynamic effects of the program. This dynamic specification allow us to capture short-, medium-, and long-term effects of the certification program. Formally, this specification takes the form:

$$y_{ijt} = \beta_0 + \sum_{t>T_0}^{T} \beta_{1t} \left(D_i \times T_t\right) + \sum_{t>T_0}^{T} \beta_{2t} \left(D_i \times M_i \times T_t\right) + \beta_3 M_i + \mu_j + \mu_t + \varepsilon_{ijt}, \quad (2)$$

where all the terms are the same as in Equation 1. However, the treatment effects for locals (β_{1t}) and migrants ($\beta_{1t} + \beta_{2t}$) are allowed to vary in time by interacting the treatment dummies with survey-waves fixed effects, T_t, which take the value of one if $t = t_0$, where $t_0 \in \{-1, 3, 6, 9, 12\}$ corresponds to the number of months before and after the intervention, and 0 otherwise. The coefficient β_{2t} tests if the effects between locals and migrants are different during each survey-wave.

5.1 Internal validity

The point estimates of our empirical strategy are unbiased and consistent if there is no selection into participation to *Saber Hacer Vale*. The random assignment guarantees that treatment status is exogenous and uncorrelated with observed and unobserved characteristics of the participants. We employ the baseline data to verify if this assumption is satisfied. Table 2 presents descriptive statistics separately by local and migrant participants assigned to the treatment and control groups.[15] We present p-values of the null hypothesis of the characteristics being equal between the treatment and control groups in columns (3) and (6).[16] Notably, our analysis indicates that the randomization was successful, resulting in a balanced sample across both treatment and control groups. We only observed an imbalance among locals on the likelihood of never being employed, but this expected given our level of significance.

5.2 Statistical Power

Our empirical design allow us to estimate a minimum detectable effect of 0.14 standard deviations for the group of locals and of 0.26 for the group of migrants.[17] Given that we expect a 10 percent attrition rate, then the minimum detectable effects will increase to 0.15 standard deviations for locals and to 0.27 standard deviations for immigrants. Using the pooled sample between two groups implies a minimum detectable effect of 0.123 standard deviations.

[15] Appendix Table A.2 presents pooled estimates between locals and migrants, with and without controlling for migrant status.

[16] These p-values are estimated by regressing the outcome on the treatment indicator, including competency-level fixed effects, using robust standard errors and were conducted separately for locals and migrants.

[17] We assume a statistical power of 80 percent and a significance value of 5 percent.

These minimum detectable effects are reassuring because they are smaller than those previously found in other related studies. Appendix Table A.3 presents a summary of the treatment effects detected in four related randomized control trials using labor income as outcome.[18] We express the effects in these studies in percentage terms with respect to the mean of the controls. We take a conservative approach and use the study with the smallest magnitude in the treatment effects as benchmark. This corresponds to Bassi and Nansamba (2022), who conducted an assessment of a non-cognitive skills signal on 676 job applicants in Uganda. In this study the treatment effects corresponds to a 7.9 percent salary increase with respect to the control mean. Using data specific for Venezuelan migrants in Colombia, we find that a 7.9 percent in income corresponds to a 0.18 standard deviations increase in income, which is close to the lowest minimum detectable effect using our sample sizes.[19]

5.3 Multiple Hypothesis Testing

Our study may involve multiple outcomes, which could lead to erroneous inferences due to the potential for overrejecting multiple null hypotheses by chance. To address this issue, we plan to adopt a multiple hypothesis correction method based on the false discovery rate approach. Our p-values will be adjusted following the methodology outlined by Anderson (2008) to account for multiple inferences. Additionally, we will report q-values that control for the proportion of incorrectly rejected null hypotheses across outcomes.

5.4 Mechanisms

Based on the discussion in Section 2.1, we specify direct tests to understand the underlying mechanisms behind the potentially significant treatment effects. Skill certifications could impact labor supply or labor demand, and empirical tests for each of these will be reflected in the timing of the treatment effects. If labor supply is affected, we would expect that certifications induce individuals to postpone their entry into the labor market, either due to the *reservation wage* effect or the *education* effect. Conversely, if labor demand is affected, we would anticipate observing shorter-term effects driven by the *signaling* effect, which enhances employers' screening capacities. All of these mechanisms lead to improved labor market outcomes and are empirically testable within our data.

The *reservation wage* mechanism can be directly examined by analyzing the job search behavior of individuals in the study. In our follow-up rounds, we will collect information about salary expectations, the number of job offers, and the time to the first offer. These data will enable us to quantify any changes in job search behavior induced by the certifications. Specifically, salary expectations serve as a proxy for the

[18] We include the effects found in Bassi and Nansamba (2022), Carranza et al. (2022), Pallais (2014) and Abebe et al. (2021).

[19] We employ the Pulse of Migration Survey, administered by the Colombian census (i.e., *Departamento Administrativo Nacional de Estadistica*), and focus on migrants over 18 to 60 years of age from Venezuela who entered the country in the last five years and worked in the last month. The mean labor income among this population was COP 866,854 and the standard deviation was COP 381,280. This implies that a 7.9 percent income increase translates into a 0.18 standard deviations.

reservation wage. Therefore, we plan to estimate Equation 1 and compute the treatment effect using salary expectations as the outcome. A significant point estimate will indicate that the treatment alters individuals' reservation wages, potentially leading to a shift in their job search strategies. Coupled with a differentiated job starting time and higher salaries in the longer term, these results could suggest that certifications influence how individuals search for jobs, ultimately leading to enhanced labor market outcomes.

The *education* mechanism can also be directly tested by observing whether skill certifications lead to additional training or the pursuit of educational degrees. We plan to use Equation 1 to estimate the effect of certification on pursuing further training. While this behavior could postpone employment, it may lead to better job market prospects also in the longer term.

The *education* mechanism can be also directly tested by observing if skill certifications lead to additional training or to pursue educational degrees. We plan to use Equation 1 to estimate the effect of the certification on pursuing additional training. This behavior could postpone employment but lead to better job market prospects in the future.

Finally, if certifications effectively work as labor market signals, they will influence labor demand by improving employers' screening mechanisms. This *signaling* mechanism can also be empirically tested in our data by observing sizable treatment effects in the short term. If these effects are evident, it would provide evidence that the signal is effective in conveying information to employers without altering job search strategies or inducing additional training. Furthermore, if the effect is significantly larger for migrants, this would strongly support our main hypothesis, indicating that workers with weaker signals benefit most when they can convincingly demonstrate their skills.

Table 2: Balance within Migrants and Locals

Variable	Local			Migrant		
	Treatment (1)	Control (2)	*p-value* (3)	Treatment (4)	Control (5)	*p-value* (6)
Panel A: General characteristics						
Demographics						
Age (28-60 years)	0.70	0.73	0.19	0.79	0.76	0.36
Age (18-28 years)	0.17	0.16	0.49	0.19	0.22	0.36
Age (60 years or older)	0.13	0.12	0.30	0.02	0.02	0.94
Male	0.12	0.12	0.91	0.18	0.14	0.24
Has dependents (young or elderly)	0.53	0.55	0.11	0.46	0.45	0.81
No children under 5 years	0.59	0.57	0.54	0.43	0.47	0.35
1-3 children under 5 years	0.23	0.24	0.90	0.40	0.37	0.41
4 or more children under 5 years	0.01	0.02	0.71	0.02	0.01	0.44
Head of household	0.54	0.53	0.93	0.63	0.68	0.21
Identifies as LGBTIQ	0.08	0.08	1.00	0.12	0.13	0.78
Disability (mental or physical)	0.06	0.06	1.00	0.03	0.06	0.10
Victim of conflict	0.44	0.47	0.31	0.02	0.03	0.51
Ethnic minority	0.33	0.37	0.10	0.03	0.03	0.89
Eligible for government assistance	0.62	0.61	0.71	0.55	0.57	0.64
Receives government or NGO assistance	0.14	0.14	0.78	0.01	0.01	0.91
Education						
Primary education or less	0.19	0.18	0.65	0.08	0.05	0.21
Secondary or technical education	0.70	0.72	0.41	0.74	0.76	0.68
University or postgraduate education	0.08	0.08	0.70	0.18	0.19	0.72
Labor						
Employed	0.32	0.33	0.93	0.54	0.50	0.40
Less than 1 year of work experience	0.15	0.13	0.35	0.10	0.09	0.85
3-5 years of work experience	0.20	0.19	0.51	0.27	0.30	0.49
6-10 years of work experience	0.16	0.17	0.47	0.18	0.14	0.31
More than 10 years of work experience	0.31	0.33	0.38	0.20	0.19	0.79
N (Sample Size)	605	1071		250	234	
Panel B: Employed						
Current monthly salary (USD)	144.34	145.44	0.89	156.39	186.53	0.27
Has written employment contract	0.05	0.04	0.93	0.04	0.04	0.98
Contributes to pension fund	0.06	0.06	0.81	0.04	0.05	0.68
Full-time job	0.17	0.15	0.25	0.24	0.25	0.73
Part-time job	0.10	0.11	0.68	0.16	0.15	0.67
Quarter-time job	0.06	0.08	0.33	0.14	0.11	0.21
N (Sample Size)	196	356		135	118	
Panel C: Unemployed						
Previous job monthly salary (USD)	192.89	182.55	0.68	185.47	186.36	0.99
Never been employed	0.02	0.00	0.04**	0.01	0.00	0.75
Actively seeking job (last 4 weeks)	0.23	0.20	0.16	0.17	0.21	0.22
Job search intensity: 1-4 hrs/day	0.14	0.12	0.22	0.11	0.10	0.83
Job search intensity: 5-10 hrs/day	0.073	0.06	0.62	0.04	0.08	0.14
Job search intensity: Over 10 hrs/day	0.02	0.02	0.79	0.01	0.03	0.16
N (Sample Size)	409	715		115	116	

Note: Panel A describes the sample of all eligible persons, while panels B and C only include employed and unemployed persons, respectively. Columns (1), (2), (4) and (5) present the means of the variables by treatment condition within each group. The p-values are estimated by regressing the outcome on the treatment indicator, including competency-level fixed effects, using robust standard errors and were conducted separately for locals and migrants.

6 Ethics and IRB Approval

Due to the randomization of program participation in the experiment, ethical concerns arise because some eligible candidates will not receive treatment due to the Ministry's budget constraints. Additionally, the study involves collecting personal information and tracking individuals over time. Consequently, the study was submitted to the Social Sciences Ethics Committee of Universidad del Rosario for approval. On April 18, 2024, our application was approved and deemed to pose minimal risk by the IRB, with case number DVO005 891 - CS520.

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Appendices:

A Additional Figures and Tables

Appendix Table A.1: Content by survey

Section	Enrollment Form (Baseline)	Complementary Baseline	Follow-ups
Identification and contact information	X	Reduced	Reduced
Education	X		
Work experience and employability difficulties	X		
Employed (salary, formality, job intensity, job satisfaction, size of firm, type of job, economic sector of the employer)	Reduced	X	X
Unemployed (job salary, type of job and economic sector of previous job, job search intensity, job seeking behaviour, unemployment duration)	Reduced	X	X
Salary expectations (reservation wage and maximum expected salary)		X	X
Mental health (PHQ-9)		X	X
Food security		X	X
Further training/education outside the program			X
Participants' perspectives on the program (willingness to pay for the skills certification, willingness to participate in the absence of the subsidies)			X
Authorization for future contact	X	X	X

Appendix Table A.2: Balance with and without controlling by migrant status

Variable	All			All (control by migrant)		
	Treatment (1)	Control (2)	*p-value* (3)	Treatment (4)	Control (5)	*p-value* (6)
Panel A: General characteristics						
Demographics						
Age (28-60 years)	0.73	0.73	0.76	0.73	0.73	0.44
Age (18-28 years)	0.18	0.17	0.83	0.18	0.17	0.90
Age (60 years or older)	0.10	0.10	0.85	0.10	0.10	0.31
Male	0.14	0.12	0.41	0.14	0.12	0.48
Has dependents (young or elderly)	0.51	0.53	0.18	0.51	0.53	0.22
No children under 5 years	0.54	0.55	0.69	0.54	0.55	0.95
1-3 children under 5 years	0.28	0.26	0.28	0.28	0.26	0.73
4 or more children under 5 years	0.01	0.02	0.99	0.01	0.02	0.97
Head of household	0.57	0.56	0.88	0.57	0.56	0.60
Identifies as LGBTIQ	0.10	0.09	0.74	0.10	0.09	0.89
Disability (mental or physical)	0.05	0.06	0.37	0.05	0.06	0.47
Victim of conflict	0.32	0.39	0.00***	0.32	0.39	0.26
Ethnic minority	0.24	0.31	0.00***	0.24	0.31	0.11
Eligible for government assistance	0.60	0.61	0.78	0.60	0.61	0.95
Receives government or NGO assistance	0.10	0.12	0.37	0.10	0.12	0.81
Education						
Primary education or less	0.16	0.16	0.99	0.16	0.16	0.39
Secondary or technical education	0.71	0.73	0.48	0.71	0.73	0.37
University or postgraduate education	0.11	0.10	0.73	0.11	0.10	0.57
Labor variables						
Employed	0.39	0.36	0.20	0.39	0.36	0.62
Less than 1 year of work experience	0.13	0.12	0.45	0.13	0.12	0.33
3-5 years of work experience	0.22	0.21	0.54	0.22	0.21	0.83
6-10 years of work experience	0.16	0.16	0.81	0.16	0.16	0.87
More than 10 years of work experience	0.28	0.30	0.23	0.28	0.30	0.48
N (Sample Size)	855	1305		855	1305	
Panel B: Employed						
Current monthly job income (USD)	149.26	155.70	0.52	149.26	155.70	0.37
Has written employment contract	0.04	0.04	0.96	0.04	0.04	0.92
Contributes to pension fund	0.05	0.06	0.52	0.05	0.06	0.69
Full-time job	0.19	0.17	0.24	0.19	0.17	0.44
Part-time job	0.12	0.11	0.86	0.12	0.11	0.94
Quarter-time job	0.09	0.08	0.67	0.09	0.08	0.93
N (Sample Size)	331	474		331	474	
Panel C: Unemployed						
Previous monthly job income (USD)	191.18	183.26	0.77	191.18	183.26	0.76
Never been employed	0.02	0.01	0.04**	0.02	0.01	0.04**
Actively seeking employment (last 4 weeks)	0.21	0.20	0.64	0.21	0.20	0.53
Job search intensity: 1-4 hrs/day	0.13	0.11	0.30	0.13	0.11	0.24
Job search intensity: 5-10 hrs/day	0.06	0.07	0.72	0.06	0.07	0.77
Job search intensity: Over 10 hrs/day	0.02	0.02	0.64	0.02	0.02	0.64
N (Sample Size)	524	831		524	831	

Note: Panel A describes the sample of all eligible persons, while panels B and C only include employed and unemployed persons, respectively. Columns (1), (2), (4) and (5) present the means of the variables by treatment condition within each group. The p-values are estimated by regressing the outcome on the treatment indicator, including competency-level fixed effects, using robust standard errors and controlled by migrant status in column (6).

Appendix Table A.3: Effects Documented in Previous Related literature

Paper	Effects (% control mean)	Effects (standard deviations)
Pallais (2014)	54.9%†	1.24
	96%‡	2.18
Carranza et al. (2022)	33.7%	0.77
Abebe et al. (2020)	24.6%	0.56
Bassi and Nansamba (2022)	11.2%†	0.25
	7.9%††	0.18

Note: effects were converted in terms of standard deviations using as control mean COP 866,854 and as a standard deviation COP 381,280. † effect in workers with experience. ‡ effect in workers without experience. †† unconditional effect