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## The short-term labor market impact of Venezuelan immigration in Peru

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# The Short-Term Labor Market Impact of Venezuelan Immigration in Peru

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# The short-term labor market impact of Venezuelan Immigration in Peru\*

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## Abstract

Peru is the second-largest recipient of Venezuelans worldwide. We combine newly available data on Venezuelans living in Peru and the Peruvian Household Survey to assess the impact of Venezuelan migration on natives' wages and employment. The initial regression analysis exploits the variation in supply shifts across education-experience groups over time. It indicates that immigration in Peru had no adverse impact on native wages. However, the paper highlights that in Peru immigrants and natives with similar education and experience are likely to work in different occupations. The subsequent analysis based on occupational clustering confirms the null effect on wages and indicates that a 20% increase in immigrants decreases formal employment by 6%. We do not find evidence for changes in employment composition toward informality so that migration operates through the extensive margin of employment. We report evidence in favor of immigrants being a close substitute to the least productive natives, suggesting that firms substitute native formal labor for low-cost immigrant informal labor.

**Keywords:** Immigration, education-experience cells, occupation cells, informality

**JEL Classification:** J24, J31, J46.

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# 1 Introduction

Based on official records, the International Organization for Migration (IOM) and the United Nations High Commissioner for Refugees (UNHCR) estimate that over 5 million Venezuelans now live abroad, making the Venezuelan migrant crisis one of the largest displacement crises in the world and the largest external displacement crisis in Latin America's recent history. These agencies also estimate that the vast majority of Venezuelan migrants have chosen Latin American countries as their destination and that Peru constitutes the second largest Venezuelan migrant hosting nation, with 1 million Venezuelans as of the end of 2020, representing about 3.7% of Peru's urban population and 8% of the urban labor force.<sup>1</sup> In this paper, we inquire whether the Venezuelan migration has had adverse short-term effects on the Peruvian labor market. Our results indicate that the inflow of Venezuelan migrants leads to the displacement of Peruvian workers out of formality without resulting in increases in informal employment.

Economic theory predicts that an increase in the number of immigrants will decrease wages and displace natives from employment when workers are perfect substitutes. The more inelastic the supply and demand relationships are, the greater the decline in native wages will be, due to a given amount of immigration. The displacement effect will increase when the labor supply is more elastic and when the demand for labor is less elastic. Native workers who are gross complements with immigrant labor, on the other hand, should experience a rise in both wages and employment because of immigration.<sup>2</sup>

A key issue in the literature on the economic impacts of migration is identifying and isolating native labor markets that are most likely to be affected by the migrant shock. Two approaches have been taken. The spatial approach estimates regional effects by defining local markets geographically and exploiting the variation in the number of immigrants across regions. Card (1990) seminal article on the labor market impact of the Mariel boatlift supply shock stands as a landmark in this literature. The Card study finds that the Mariel flow had little effect on the labor market opportunities of native workers. Other studies using the same approach seem to confirm

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<sup>1</sup>Calculations by the authors using data by the Peruvian Household Survey and the Inter-Agency Coordination Platform for Refugees and Migrants from Venezuela (<https://r4v.info/en/situations/platform>)

<sup>2</sup>See, among others, Borjas (1994) and Greenwood and McDowell (1986) Greenwood and McDowell (1986).

the lack of a discernable effect on wages or employment rates of natives.<sup>3</sup>

This approach has since been criticized most notably by Borjas (1994), Borjas et al. (1992), and Borjas et al. (1996), who pointed out that immigration's impact will not be observable along the geographic dimension because any incipient local effects will be diffused by the migration of native workers out of the high-immigration cities, by capital inflows into them, or by intercity trade.

In light of these problems, a growing body of literature adopted the skill-cell approach, which identifies the impact of immigration at the national level on the basis of qualification groups. This approach, pioneered by Borjas (2003), uses education and labor market experience as indicators of skills and assumes that immigrants and natives belonging to the same education and experience groups are perfect substitutes. Borjas (2003) finds that higher immigrant inflows between education and experience groups are negatively associated with wages of male natives, particularly for workers who did not attend college. More recent studies moved away from the education-experience group in view of the evidence of imperfect substitutability between immigrants and natives within education groups (Card 2009; Dustmann et al. 2012; Dustmann and Preston 2012; Manacorda et al. 2012; Ottaviano and Peri 2012). Alternative criteria to define labor markets are occupations (Cohen-Goldner and Paserman 2011; Friedberg 2001; Orrenius and Zavodny 2007; Steinhardt 2011)<sup>4</sup> and combinations of occupations with district of residence and industry (Cohen-Goldner and Paserman 2011) and with experience (Sharpe and Bollinger 2020).

This study estimates the short-term effect of Venezuelan immigration inflows on the Peruvians' labor market outcomes using the novel Survey for Venezuelans Living in Peru (henceforth, ENPOVE) and Peru's National Household Survey (henceforth, ENAHO). We adopt a skill-cell approach and argue that immigration does not adversely affect natives' earnings but displaces natives in the formal sector. We develop our conclusion in three stages. First, we use the variation of Venezuelan workers' shares within education-experience cells over time and find no significant effects of immigration on wages. Second, the analysis is extended to the level of occupations based on the observation that in Peru, immigrants and natives work in different occu-

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<sup>3</sup>See Altonji and Card (1991), Borjas (1987), Goldin et al. (1994), Grossman (1982), LaLonde and Topel (2007), and Schoeni (1997).

<sup>4</sup>While the works by Cohen-Goldner and Paserman (2011), Orrenius and Zavodny (2007), and Steinhardt (2011) use the occupation criteria because they observe that migrants and natives are not substitutable at the education level, Friedberg (2001) uses occupation to exploit a novel instrumental variable in her data: immigrants' occupations in their country of origin.

pational segments despite having similar education and experience. We rely on information about immigrants' former occupations, as in Friedberg (2001), to address the endogeneity in occupational choice. This analysis confirms the null effect on wages. Third, we inquire whether the local labor market adjusted through changes in employment and find that a 1% increase in immigration decreases formal employment by 0.3% without resulting in increases in informal employment. Thus, we do not find evidence of a change in employment composition in Peruvian employment towards informality, suggesting that migration operates in the extensive margin of employment. These results are robust to alternative measures of the immigrant shock and they cannot be replicated by placebo experiments. This argues for a causal interpretation of our findings.

Our study offers several contributions to the literature. First, no study has used ENPOVE data even though these data have several advantages. As discussed below, the ENPOVE collected data about both regular and irregular migrants, contrasting with earlier studies that mostly relied on documented migrants.<sup>5</sup> Restricting the foreign sample to only regular migrants might not capture the full extent of competition in the labor market. Irregular migrants not only work, but they also do so in low-paying jobs, which raises concern about potential displacement effects for the most vulnerable natives.<sup>6</sup>

Second, we add to the scarce literature on the effects of migration in developing countries, which usually have weaker labor markets and institutions. Empirical evidence reports mixed results. Research on the Syrian migration to Turkey and on migration in Spain find null effect on wages (Carrasco et al. 2008; Ceritoglu et al. 2017; Del Carpio and Wagner 2016; Tumen 2016) while evidence for migration in South Africa reports negative wage effects (Broussard 2017). While Carrasco et al. (2008) find no effects on employment, works by Del Carpio and Wagner (2016) and Broussard (2017), looking at immigrants from Syria to Turkey and from African countries to South Africa, respectively, find displacements from informal jobs toward formal jobs.

To date, there has been little agreement on the effects of Venezuelan migration on

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<sup>5</sup>Orrenius and Zavodny (2007) and Carrasco et al. (2008) use data describing only legal migrants while Steinhardt (2011) data only include migrants covered by social security; Broussard (2017) uses census data that do not certify the full count of illegal migrants. An exception is Sharpe and Bollinger (2020), whose data contain information about both legal and illegal immigrants.

<sup>6</sup>See Böhme and Kups (2017) and Kossoudji and Cobb-Clark (2002) for literature on the effect of legal requirements on immigrants' access to jobs.

labor markets in the hosting economies. For Colombia, most studies have identified negative effect (Bahar et al. 2021; Delgado-Prieto 2022; Lebow 2022b; Lebow et al. 2021). One exception in this literature is the work by Santamaria (2020) who finds null effect on both Colombians’ wages and employment. For Ecuador, Olivieri et al. (2020) do not find any effect on natives’ labor market outcomes but identify deterioration of employment quality and earnings among young and low-educated natives in high immigration regions. For Peru, Boruchowicz et al. (2021) report negligible labor market effects, Groeger et al. (2022) evidence that increased immigration from Venezuela has a positive impact on labor market outcomes for Peruvians, whereas Morales and Pierola (2020) and Asencios and Castellares (2020) report small decreases in employment rates and earnings of low skilled Peruvians workers in the informal sector. Unlike this body of work, we find that inflows of Venezuelans to Peru do not adversely affect wages but decrease formal employment.

The case under study differs from other migration episodes both in the structure of the hosting economy and in the institutional response toward migration. Specifically, Peru has a larger informal sector than some other host countries and also implemented measures to facilitate migrants’ economic integration.<sup>7</sup> Whether migrant workers exert pressure in the formal or informal sector does not have a straightforward answer. On one hand, migrants can displace informal workers from jobs and push wages down. On the other hand, migrants can displace formal workers if firms substitute native formal labor for low-cost immigrant informal labor. Our results align with the latter.

The rest of the paper is organized as follows. The next Section provides background on the Venezuelan immigration in Peru. Section 3 describes the data and Section 4 presents some descriptive results. In Section 5, we outline our identification strategy. Section 6 presents our main results, Section 7 provides an economic interpretation of our findings and Section 8 concludes.

## 2 Venezuelan Immigration in Peru

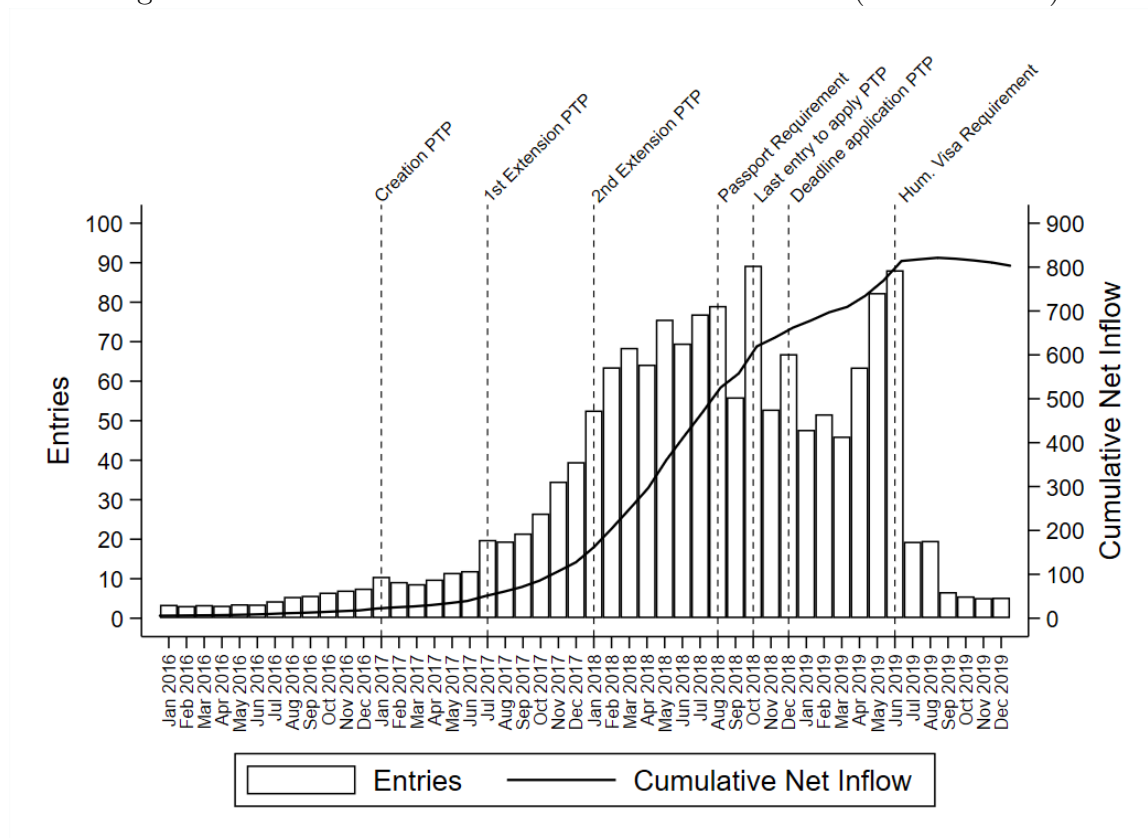
The pattern of Venezuelan migration to Peru over the period 2016-2019 is presented in Figure 1. Since 2016, immigration has risen sharply as a result of the economic, social, and political crisis facing Venezuela. At the peak of the wave, 90 000 Venezuelans

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<sup>7</sup>Informality in Turkey during Syrian migration was around 35% (Del Carpio and Wagner (2016), Table 1, p.50; Ceritoglu et al. (2017), p.4). Informality for males and females in South Africa was 25% and 41%, respectively, during the migration period (Broussard 2017), Table 4, p.401). Informality in Peru in 2018, the peak of the migration period, was 72% (INEI, Estadísticas).

immigrated to Peru in a single month. Figure 1 shows that, as conditions in Venezuela deteriorated, Venezuelan migrants settled in Peru instead of just passing through the country. Taking December 2016 as a benchmark, the accumulated migratory balance increased tenfold in December 2017; and multiplied by a factor of 54 and 66 in December 2018 and 2019, respectively.

Figure 1: Venezuelan Cumulative Net Inflows to Peru (in Thousands)



Source: Superintendencia Nacional de Migraciones in Peru.

The migration patterns in Figure 1 reflect the reactions to Peru’s institutional response, which had two well-defined stages. Until the end of 2018, Peru implemented an open-door policy. Peru not only allowed Venezuelans to enter the country with either identity cards or (expired) passports but also was the first country in the region to create a specific permit that regularized their migration status: the Temporary Residence Permit (PTP). This document granted Venezuelans the right to live and legally be employed in Peru for one year, with the option to renew the permit. The sudden increase in the number of entries in January 2017, July 2017, and January



2018 respond, respectively, to the PTP's creation and its two extensions.

As migration intensified, Peru made a stark restrictive shift. The first measure was the introduction of the passport requirement for anyone entering Peru from August 2018 on, which explains the drastic decrease in Venezuelan entries observed in the following month. This measure, however, was the subject of a lawsuit brought by the National Human Rights Coordinator, was initially revoked in October 2018, and then became effective again in the same month, in response to an appeal filed by the government. The second measure was establishing earlier deadlines for applying for the PTP and for entering the country in order to be eligible for the PTP, i.e. December 2018 and October 2018, respectively.<sup>8</sup> Thus, the abrupt increase of entries in October 2018 responds to both the revoking of the passport requirement and the setting of the end of that month as the entry deadline to be eligible for the PTP. Finally, in June 2019, Peru announced the implementation of a humanitarian visa as an entry requirement. As a result of these changes in institutional arrangements, the accumulated migratory balance grew by 904% between 2016 and 2017, 438% between 2017 and 2018, and only by 22% by 2018 and 2019. This paper considers Venezuelans who arrived in the period 2016-2018, in which Peru exhibited a lenient policy towards Venezuelan immigration.

The Venezuelan migration is distinct from other episodes studied in the literature in that the profile of migrants varied across receiving countries, as well as over time within countries. The reports of the IOM Displacement Tracking Matrix (DTM) for countries in Latin America and the Caribbean indicate that Venezuelans who migrate to the Andean countries (including Peru) are less educated than those who migrate to Central America and the Southern Cone of America. It follows that, due to their socioeconomic profile, the first group make part of their trip by bus, boat, and/or foot, while the latter group were able to make all or part of the trip by plane.<sup>9</sup>

Our data exhibits such variation in the period of analysis. Whereas 31% of Venezuelan migrants who entered in the first quarter of 2016 hold a bachelor's degree, that percentage drops to 23% and 18% for those who entered Peru in the last quarter of 2017 and 2018, respectively. Consistent with this pattern, travel by air was far more common among Venezuelan migrants arriving in Peru in 2016 relative to their peers arriving in 2018 (32% and 4%, respectively). Almost nine out of ten migrants

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<sup>8</sup>The previous PTP application deadline was June 2019, and the deadline for entering the country was December 2018 (Supreme Decree 007-2018-IN).

<sup>9</sup>The Displacement Tracking Matrix (DTM) are surveys of people over 18 years old that are carried out at border points and destination cities. See Reports in <https://dtm.iom.int/reports>

arriving in 2018 traveled by bus, whereas among those arriving in 2016, only half did so. In Section 6, we rely on this variation of migrant profiles to identify the causal effect of migration flows on native labor market outcomes.

### 3 Data

Our data are drawn from two different surveys. First, the 2016, 2017 and 2018 ENAHO Surveys, divided into quarterly subsamples.<sup>10</sup> Second, the ENPOVE Survey, which was implemented in the last quarter of 2018 and captures information about a random sample of 9,847 Venezuelan immigrants living in the cities with the largest numbers of immigrants (Lima and Callao, Tumbes, Trujillo, Cusco, and Arequipa). Taken together, these cities host 85% of all Venezuelan immigrants in Peru, and thus, this survey is representative of Venezuelan immigrants in the country (INEI 2019).

We limit the sample to men aged 17-64 who are employed with positive wages in urban labor markets and who have 1-40 years of experience, although we also provide results for samples that include women.<sup>11</sup> We further restrict the native sample to individuals born in Peru, and we calculate the number of natives and immigrants by expanding the ENAHO and ENPOVE with their sampling weights.

ENPOVE data offer several advantages compared with data used in other migration studies. First, the data consist of both documented and undocumented Venezuelans. The inclusion of undocumented migrants is relevant in developing economies where informal employment is widespread and represents an available alternative to avoid institutional barriers to formal employment (Blouin 2019).<sup>12</sup> In this context, irregular migrants are inclined toward informal employment and thus increase the risk of displacement for natives employed in that sector. Second, ENPOVE data capture information about Venezuelans who stayed in Peru at least until the last quarter of 2018. Thus, we arrive at a more precise count of migrants than do studies relying on data on Venezuelan migration flows, which could skew the actual counts due to

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<sup>10</sup>Our quarterly subsamples were prepared by INEI on request. They differ from the downloadable files at INEI’s microdata library in two aspects. First, they include variables for informality and imputed earning as well as work hours. Second, they include missing records that were recovered throughout the year. For robustness analysis, we also use ENAHO 2015.

<sup>11</sup>Women are excluded in the main sample because they face more periods of inactivity or unemployment, such that the correspondence between their potential and effective experience tends to collapse.

<sup>12</sup>In our data, only 2.2% of Venezuelans report not having registered at an official entry point (undocumented migrants). However, we believe this figure is underestimated because of fear of deportation.

multiple entries and exits as well as the overlooking of migrants who enter through unofficial points. Third, ENPOVE data capture the former occupation migrants had in Venezuela, which allows us to account for the endogeneity of occupational choices in Peru in our analysis based on occupations. Finally, Venezuelans captured in ENPOVE represent the early stage of the Venezuelan migration in Peru. Most of them arrived between 2016 and 2018, a period in which Peru had a receptive response toward migrants in terms of entry and work permits (PTP). Thus, our immigrant sample represents a labor supply shock composed of an immigrant population equally eligible for work permits.

However, our data are not exempt from limitations. ENPOVE data capture information about Venezuelans in Peru at just a single point of time: the last quarter of 2018. Ideally, we would have repeated cross-sections for both locals and migrants, as most studies using the skill-cell approach do. These ideal data allow researchers to obtain counts of locals and migrants at different points of time. We use date of arrival to assign migrants to quarters between 2016 and 2018 to circumvent that limitation. Counts in every quarter are then obtained from the created cross-section samples.<sup>13</sup> Date of birth is used to calculate migrants' ages at every quarter, and we assume that the educational level they report at the Survey time is the same educational level they had at the time of their arrival in Peru.<sup>14</sup> Thus, the variability in immigration across cells and time in the analysis based on education and experience is given by changes in the population and age structure of migrants.

The single-cross section nature of ENPOVE data imposes more restrictions in the analysis based on occupations. The assumption that immigrants' occupations remain time-invariant after arriving in Peru is implausible. The prevalence of informal employment in the Peruvian labor market, as well as Peruvians and Venezuelans sharing the same language, facilitate occupational mobility. Thus, we follow Friedberg (2001) and adopt a first difference approach by setting the first quarter of 2016 as the baseline period (in which migration is set to zero) and the last quarter of 2018 as the evaluation period.<sup>15</sup>

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<sup>13</sup>In Appendix A, we compare the number of migrants in every quarter calculated with ENPOVE and the administrative data on net migration flows provided by the Superintendencia Nacional de Migraciones. We find that the trends are similar, and we take this as a proof that our migrant counts are a close approximation of the stock of migrants living in Peru at different quarters.

<sup>14</sup>Raw data indicate that less than 1% of Venezuelans are enrolled in the Peruvian education system, which makes realistic our assumption that immigrants' education level has remained invariant between their arrival time and the Survey time.

<sup>15</sup>The presence of immigrants in Peru was negligible at the beginning of 2016. In our sample, less

Logs of deflated gross monthly wages for all workers with positive wages are used to measure earnings. We deflate earnings using the Consumer Price Index with the base period being 2009. Informal employment is defined following INEI's criteria as described in *Cuenta Satélite de Economía informal 2007-2016*. Employers and self-employed workers whose business units belong to the informal sector, wage earners without employer-financed social security, and unpaid family workers are all labeled as informal workers.

For the analysis based on education and experience, we classify persons into four education groups and 5-year experience groups. Each combination of education and experience represents a skill group so that we end up with 32 skill groups in every quarter, resulting in 384 observations (4 education groups, 8 experience groups and 12 quarters). We consider four education groups: persons who are high school dropouts, high school graduates and persons with some technical education, technical education graduates and persons with some college, and college graduates.<sup>16</sup> As is customary in this literature, we calculate potential experience based on educational attainment. It is assumed that workers without a high school diploma enter the labor market at 14, high school graduates and persons with some technical education enter the labor market at 17, technical education graduates and persons with some college enter the labor market at 19, and those with a college degree enter the labor market at 23.<sup>17</sup> The immigration variable is constructed combining ENAHO and ENPOVE data, and is defined as the ratio of immigrants to total employment.

The analysis based on occupations relies on the civilian sample that is employed with positive wages and a valid occupational code. Owing to the data limitations described above, we only use the 2016-I and 2018-IV periods. We define occupations by using a two-digit code, based on the 1988 International Standard Classification of Occupations (ISCO88). These occupational groups capture the set of occupations for which immigrants who report working in a particular occupation are likely to be substitutable for natives, and thus these groups address bias arising from the possibility that natives change occupations in response to immigration<sup>18</sup> In this analysis,

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than 4% of Venezuelans had arrived in Peru by that date.

<sup>16</sup>Educational degrees in Peru and Venezuela do not share the same denominations. In Appendix B we present the recoding of Peruvian and Venezuelan educational categories.

<sup>17</sup>We use ENAHO 2018 to calculate the age of labor market entrance in a sample of recent graduate individuals younger than 40 and who live in urban areas.

<sup>18</sup>Alternative aggregations may not accurately capture competition between workers in a cell. For instance, if we define cells using 3-digit occupational codes, we would be assuming that metallurgical engineers (224) and mining engineers (225) do not compete. Using 1-digit occupational codes

we rely only on ENPOVE data to construct our immigration variable, which is given by the log of the number of migrants employed in each occupation.<sup>19</sup> We have valid data for 60 occupations in both periods.

## 4 Descriptive Results

Table 1 describes the native sample, extracted from ENAHO, and the immigrant sample, extracted from ENPOVE.

Table 1: Descriptive Statistics

	Peruvians	Venezuelans
Age	37.52 (11.22)	30.83 (8.18)
Years of experience	19.73 (11.34)	12.51 (8.32)
Monthly wages	981.17 (986.79)	878.75 (433.78)
% who at least finished high school	78.80	83.11
% Some years post- secondary education	45.27	54.38
% Informality to Workforce ratio	60.12	87.53
Observations	4,062	3,790

Note: The table shows sample means (standard deviations). Monthly wages are workers' gross income expressed in 2009 PEN (local currency). Informality in ENPOVE is calculated only for salaried workers. A Venezuelan worker is an informal worker if she is a salaried employee without a contract. Samples include individuals in the last quarter of 2018 and in the education-experience analysis.

The average immigrant is younger and therefore has less labor market experience than the average native. The most notable characteristic of the Venezuelan immigrants is their high level of education. Over 83 percent of male Venezuelan immigrants had completed high school, and 54 percent had at least some years of postsecondary education. The share of Peruvian high school graduates, on the other hand, is 79

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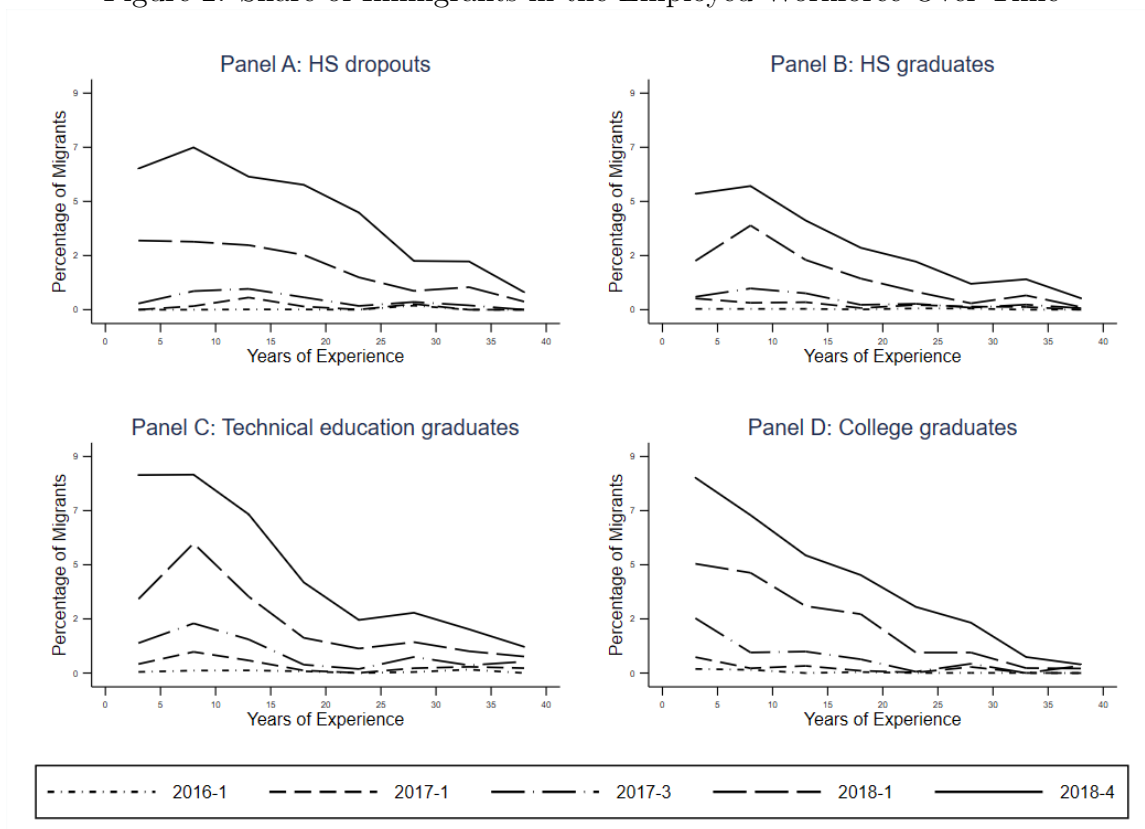
assumes that physicians and accountants compete as both are in the same major group, number 2. Two-digit codes aggregate both kinds of engineers under code 22 but separate physicians (code 23) from accountants (code 25).

<sup>19</sup>Using a ratio to measure immigration requires relying on two different data to construct both the endogenous and instrument variables (ENPOVE for numerator and ENAHO for denominator). We did not find the instrument to be relevant when the immigration variable is defined as a ratio. On the other hand, the instrument is relevant when the immigration variable is measured in (log) levels.

percent, and only 45 percent of Peruvians had some years of postsecondary education. Furthermore, despite immigrants being more educated than natives, they have worse labor market outcomes. For example, the share of workers with an informal job is higher for the group of Venezuelans compared to that of natives. Accordingly, monthly wages are lower within the group of Venezuelans.

Figure 2 illustrates the evolution of immigrant labor supply shocks over time for different groups of education-experience and selected quarters between 2016 and 2018. Each panel within Figure 2 corresponds to a group of education and experience classification described above. Panel A presents data for the lowest educational group. As we progress through Panels B-D, the level of education increases.

Figure 2: Share of Immigrants in the Employed Workforce Over Time



Note: Each panel presents the average male immigrant share across potential experience groups in the corresponding education group. Panel titles have been simplified to facilitate visibility (Panel B includes persons with some technical education and Panel C includes persons with some college). Selected quarters are shown for the period 2016-2018. We use the midpoint of each potential experience group to illustrate the trends in immigrant shares across groups

In 2016 and the first quarter of 2017, the immigrant share was similar across

experience groups. In 2018, immigrant share was high for less experienced skill groups but low for groups with more experience. There is one notable difference across the four panels: immigrants comprise a significantly larger share of highly educated workers, particularly within younger groups. In Panels C and D, immigrants made up 8% of the overall labor supply for workers with less than 5 years of experience. While younger workers appear to compete the most with immigrants regardless of education group, immigrants comprise only 6% and 5% of inexperienced high school dropouts (Panel A) and high school graduates (Panel B), respectively. Another difference across the four panels is that, as workers age, the share of migrants diminishes consistently for the least educated (Panels A and B). However, the share of migrants for the most educated workers has a shift among the oldest workers within these groups (Panels C and D). The shift occurs for workers within 25 and 30 years of experience for both groups.

The validity of using education and experience to define labor markets hinges on the assumption that for a given education group, immigrants and natives with similar levels of experience are closer substitutes than immigrants and natives who differ in their experience. One way to test this assumption is by investigating whether natives and immigrants with similar education levels work in different occupational segments, an approach also taken, for example, by Borjas (2003), Manacorda et al. (2012), and Steinhardt (2011).

We use the Duncan index Duncan and Duncan (1955) of dissimilarity to compare native and migrant occupational distributions, holding education constant. This index captures the proportion of either group that would need to change occupations to make the two distributions equal. The index goes from 0 to 1, taking the value of 0 when immigrants and natives have identical occupational distributions, and taking the value of 1 when the two groups are segregated in completely different occupations. Thus, the smaller the index, the more similar the occupational distributions and the higher the substitutability.

We classify workers into 2-digit occupation codes, aggregate workers into ten-year experience bands, and restrict the analysis to workers in nonmilitary occupations. Table 2 reports the calculated index for each of the education groups.

For all education-experience cells, the indices are in the region 0.32-0.89, implying that between 32% and 89% of immigrants (or natives) would have to change jobs to equalize the occupational distribution of employment. These values are much higher than those reported in studies concluding that migrants and natives are substitutes

Table 2: Duncan Index of Dissimilarity for Peruvians and Venezuelans

Education-experience of native groups	Experience of corresponding immigrant group			
	1-10 years	11-20 years	21-30 years	31-40 years
High school dropouts				
1-10 years	0.525	0.443	0.485	0.607
11-20 years	0.505	0.399	0.488	0.598
21-30 years	0.56	0.437	0.468	0.565
31-40 years	0.547	0.394	0.418	0.500
High school graduates				
1-10 years	0.366	0.325	0.356	0.618
11-20 years	0.461	0.324	0.346	0.596
21-30 years	0.484	0.335	0.346	0.608
31-40 years	0.422	0.341	0.336	0.589
Technical education graduates				
1-10 years	0.446	0.538	0.478	0.742
11-20 years	0.527	0.61	0.557	0.672
21-30 years	0.443	0.533	0.495	0.677
31-40 years	0.545	0.602	0.563	0.675
College graduates				
1-10 years	0.741	0.724	0.769	0.854
11-20 years	0.681	0.663	0.704	0.764
21-30 years	0.769	0.726	0.772	0.899
31-40 years	0.765	0.695	0.734	0.826

Note: The index is calculated separately for each pair of native and immigrant groups. Panel titles have been simplified to facilitate visibility (Panel B includes persons with some technical education and Panel C includes persons with some college)

Source: ENAHO (2018-IV) and ENPOVE.



within education and experience cells Breunig et al. (2017) and within education and age cells (Manacorda et al. 2012), suggesting that it is plausible to think of Peruvians and Venezuelans as being imperfect substitutes within education-experience cells.

Consider the group of native workers who are high school dropouts and have fewer than ten years of experience. The index of dissimilarity with immigrants who have the same experience is 0.525. This index decreases to 0.44 for immigrants who have 11 to 20 years of experience, and to 0.485 for immigrants with 21 to 30 years. Similarly, consider the native workers who have technical education or some years of university education and have 31 to 40 years of experience. The index of dissimilarity with immigrants who have the same experience is 0.675, but this index falls to 0.60 for immigrants who have 11 to 20 years of experience, to 0.563 for immigrants who have 21-30 years, and to 0.545 for immigrants who have less than 10 years. In sum, the occupation distributions of immigrants and natives with different experience levels are generally more similar than the distributions of immigrants and natives with the same levels of experience.

Table 2 thus suggests a degree of imperfect substitutability between immigrants and natives within education-experience skill groups. One factor that may prevent immigrants from finding jobs that match their qualifications is the inadequate transferability of their educational attainment in the host country (Brücker et al. 2021; Pecoraro and Wanner 2019). In our data, only 3.5% of Venezuelans with a college degree have had their credentials recognized in Peru. The prevalence of informality also plays a role in education being an imperfect proxy for overall skill level. This sector generally does not require high levels of qualifications, which makes over-education incidence more severe among informal workers (Chua and Chun 2016; Vivatsurakit and Vechbanyongratana 2021). In our case study, an informal job seems to be a desirable option for Venezuelans as a means to gain work schedule flexibility and avoid payroll taxes in formal employment (Blouin 2019; Blouin and Freier 2019; Cabrera et al. 2019).

Based on the lack of substitutability between natives and migrants presented in Table 2, we join the literature that uses alternative ways to define labor markets and adopt the skill cell approach using occupation groups.<sup>20</sup> In doing so, we create a

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<sup>20</sup>The inadequacy of the classic skill-cell approach in developed economies has already been documented (Sharpe and Bollinger 2020; Steinhardt 2011). These studies argue that an identification strategy based on formal education leads to biased results in labor markets characterized by a high relevance of formal qualifications combined with low rates of recognition of foreign qualifications, discrimination against migrants, and downgrading for immigrants upon arrival.

more homogenous market, in which natives and immigrants are more substitutable. Lebow (2022a) documents high migrant-native substitutability along the occupation dimension and low substitutability across education groups for Venezuelan migrants in Colombia, supporting our analysis based on occupations. Table 3 reports the one-digit occupational distribution of native and immigrant workers.

Table 3: Occupational Distribution of Peruvians and Venezuelans

	Peruvians	Venezuelans
Managers	0.82	0.0
Professionals	10.10	1.22
Technicians and Associate Professionals	13.84	7.31
Administrative Workers and Chiefs	7.90	4.83
Services and Sales Workers	11.73	21.11
Skilled Agricultural, Forestry, and Fishery Workers	4.08	0.01
Craft and Related Trades Workers	9.42	15.39
Plant and Machine Operators and Assemblers	19.31	14.61
Elementary Occupations	22.80	35.56
Observations	4,007	3,789

Note: Distributions for Peruvians and Venezuelans come from the last quarter of 2018 in ENAHO and ENPOVE, respectively. Samples come from the analysis of cells based on occupation groups.

The figures demonstrate huge disparities between Venezuelans and Peruvians in the occupational distribution. While 10% of male Peruvians work in professional occupations, only 1% of the Venezuelan workers have a professional job. Immigrants tend to be highly represented in service and sales as well as elementary occupations, with 57% of Venezuelans working in these occupations, whereas 35% of Peruvians do so.

Table 3 presents a different sorting of migrants among occupations from that of empirical findings in migration studies in developed economies. Specifically, previous research for Germany, Spain, the U.K., and the U.S. show that immigrants are highly represented in jobs with manual tasks as opposed to service jobs that require interaction and communicative skills (Amuedo-Dorantes and Rica 2011; Manacorda et al. 2012; Peri and Sparber 2009; Steinhardt 2011). In this case study, migrants and natives share the same language, which facilitates their job placement in occupations related to services, as presented in Table 3.<sup>21</sup> The occupational distribution of

<sup>21</sup>The service group includes occupations as waiters, waitresses, bartenders, cooks, housekeepers,

migrants observed in Table 3 sheds light on the potential response of native workers to a supply shock. Venezuelans are concentrated in occupations in which informality is particularly high.<sup>22</sup> Thus, they directly compete with Peruvian workers in the informal sector. This feature leads to expect a displacement of natives in the informal sector. However, the coexistence of formality and informality within firms and industries in the Peruvian labor market (Cisneros-Acevedo 2021; Galarza and Requejo 2019) opens up another possible channel. Migration could displace formal workers employed at the margin. Whether this displacement leads to a change in the Peruvian employment composition is the key question in this paper.

As mentioned above, an important advantage of ENPOVE data is that they include the occupation migrants had in Venezuela prior to migration. This variable represents the exogenous source of variation for occupations in Peru in our analysis based on occupations.

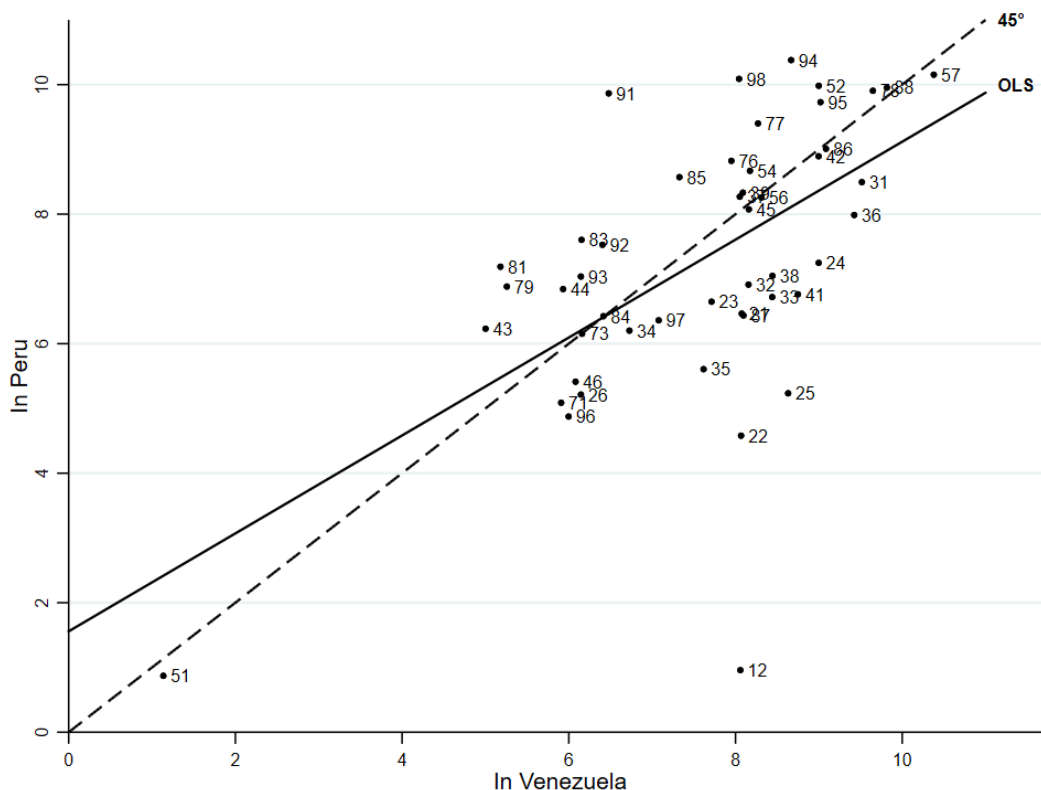
Figure 3 shows the distribution of Venezuelan immigrants across occupations in Peru in 2018 and across occupations in Venezuela preceding immigration. Specifically, it graphs the log of the number of Venezuelans employed in an occupation in Peru in 2018,  $\ln(p)$ , against the log of the number of Venezuelans formerly employed in the same occupation back in Venezuela,  $\ln(r)$ , scaled to have the same total. Logs are displayed rather than absolute values because of the very large relative size of the largest occupations. The solid line on the graph plots the fitted values from an OLS regression of  $\ln(p)$  on  $\ln(r)$ , which yields a coefficient of 0.95 (standard error .032). This coefficient evidences a very strong relation between immigrants' former and current occupations. Namely, for every 1% increase in the number of Venezuelans who worked in a particular occupation in Venezuela, the expected number of immigrants working in that same occupation in Peru increases by 0.95%, almost by the exact same magnitude.

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hairdressers, barbers, beauticians, child-care workers, home-based personal care workers, transport conductors, and salespersons.

<sup>22</sup>Venezuelans are concentrated in elementary occupations, service and sales occupations, craft and trade work, and plant and machine operation and assembly (Table 3) . Between 75% and 98% of workers in these sectors are employed informally. This contrasts with informality shares in the remaining occupational groups (in which Venezuelans are rarely employed), with informality shares lower than 40% (ENAH0, last quarter of 2018).

Figure 3: Number of Migrants in each Occupation in Venezuela and Peru



If no Venezuelans switched occupations following migration, all points will lie along the 45-degree line. The points above the 45-degree line represent occupations to which Venezuelans disproportionately switched, whereas the points below the 45-degree line represent occupations from which Venezuelans disproportionately switched. Figure 3 shows that Venezuelans have mostly switched from medium or high skilled occupations to low-skilled occupations.<sup>23</sup> That is, Peruvians in the low-skilled occu-

<sup>23</sup>ISCO-88 uses four skill levels to define the broad structure of the classification at the major groups level (first digit occupation). These four skill levels are partly operationalized in terms of the International Standard Classification of Education (ISCED) and partly in terms of the job-related formal training which may be used to develop the skill level of persons who will carry out such jobs. Occupations with major group 9 are classified under the first skill level (primary education). Occupations with major groups 4-8 belong to the second skill level (secondary education plus on-the-job training). Occupations with major group 3 are classified under the third skill level (post-secondary education that leads to an award not equivalent to a university degree). Occupations with major group 2 belong to the fourth skill level (post-secondary education that leads to a university or postgraduate degree).

pations end up competing with more educated and experienced Venezuelans. This is in line with Table 2 which illustrates migrants are natives with similar education and experience are not comparable in the labor market, and supports our analysis based on occupations.

The most frequent former occupations of Venezuelans were salespersons, drivers and mobile plant operators, and metal, machinery and related trades workers. These occupations also represent a high share among current occupations of Venezuelans in Peru (the corresponding points lie around the 45-degree line). On the other hand, the most frequent occupations of Venezuelans in Peru are street vendors, domestic helpers and cleaners, housekeeping and restaurant service workers, and salespersons. These occupations also represent a high share among the former occupations for Venezuelans. Overall, the graph shows that the most representative former occupations of Venezuelans did not have the most outflows, and that the most representative current occupations of Venezuelans did not have the most inflows. This finding supports the use of Venezuelan’s former occupations as an instrument.

## 5 Empirical Methodology

This study analyses the immigration effect at the national level using the skill-cell approach. The labor market is divided into skill groups where the membership of an individual in a skill group is defined with two different criteria: (i) education and experience and (ii) occupations. The subsequent empirical analysis is based on a reduced-form labor demand function that links wages of native workers to the share of immigrants in their corresponding skill group.

### Education-Experience cells

Define a group of workers who have educational attainment  $i$ , labor market experience level  $j$ , and are observed in quarter  $t$ . The  $(i, j, t)$  cell determines a skill group at time  $t$ . The impact of immigration on the wage level of skill groups is estimated by the following equation:

$$Y_{ijt} = \alpha + \theta p_{it} + s_i + x_j + \phi_t + (s_i \times x_j) + (s_i \times \phi_t) + (x_j \times \phi_t) + \sigma_{ijt} \quad (1)$$

Where  $Y_{ijt}$  denotes the average log monthly wage of natives with education  $i$  and

experience  $j$  being observed at quarter  $t$ , and  $p_{ijt}$  denotes the share of immigrant workers in the overall employed workforce in education group  $i$  and experience group  $j$  at time  $t$ , making  $\theta$  the coefficient of interest. The remaining controls are vectors of linear fixed effects for education group ( $s_i$ ), experience group ( $x_j$ ), and quarter ( $\phi_t$ ) to control for differences in average wages across education groups, experience groups, and over time. The interaction of education fixed effects with time ( $s_i \times \phi_t$ ) and experience group fixed effects with time ( $x_j \times \phi_t$ ) control for the changing impact of education or experience over time. Lastly, the interaction of education fixed effect and experience group fixed effect ( $s_i \times x_j$ ) controls for any differences in the impact of experience on average wages across education groups. Thus, the impact of immigration on native wages is identified by variation in immigrant shares within education groups and experience groups over time.

Equation 1 is estimated via OLS. Regressions are weighted by the sample size used to calculate  $Y_{ijt}$ , and the standard errors are clustered by education-experience cells to adjust for possible serial correlation. The estimated coefficient of the immigrant share variable indicates the average percent change in wages corresponding to a 1 percentage point increase in new immigrants as a share of all workers.

## Occupation cells

We extend the analysis to the level of occupations based on the observation that in Peru, immigrants and natives work in different occupational segments despite having similar education and experience (Table 2). In this case, the use of the classical skill group approach based on formal education might lead to biased results, as already reported by Sharpe and Bollinger (2020) and Steinhardt (2011). By stratifying labor markets based on occupations, we make sure to match immigrants and natives who are most likely to compete in the same cell.

As noted earlier, since we only observe occupations of Venezuelans at a single point in time (last quarter of 2018), we follow Friedberg (2001) and adopt a first difference identification strategy by setting the first quarter of 2016 as our baseline period and the last quarter of 2018 as our evaluation period. The impact of immigration on natives' labor market outcomes is estimated by regressing the change in the outcome variable in an occupation group on the inflow of employed immigrants in that group over time:

$$(Y_{o,t} - Y_{o,t-k}) = (\alpha_t - \alpha_{t-k}) + \theta(p_{o,t} - p_{o,t-k}) + (X_{o,t} - X_{o,t-k})'\phi + (v_{o,t} - v_{o,t-k}) \quad (2)$$

In Equation 2  $o$  denotes occupation and  $k$  the number of quarters between the baseline and evaluation periods. In this analysis, the outcomes of interest are native wages, informal, formal and total employment<sup>24</sup>. Immigration occurs between 2016-I and 2018-IV, so that  $p_{o,t-k}$  equals zero and  $p_{o,t}$  is the same as in a single cross-section specification.  $X_{o,t}$  is a vector of control variables that captures the average ages of workers and the average years of education in occupation  $o$  at time  $t$ , and  $v_{o,t}$  is an error term.

We use levels instead of a ratio variable to measure immigration. In each regression, both the dependent and migration variables are measured in logs so that  $p_{o,t}$  is defined as the log number of employed Venezuelans in occupation  $o$  and in period  $t$ , and the estimated value of  $\theta$  can be interpreted as an elasticity.

Slicing the labor market into occupations imposes the threat of endogeneity bias.  $p_{o,t}$  may be positively correlated with the error term because both native and immigrant workers are drawn to occupations with good characteristics. The resulting endogeneity would lead to an underestimation of immigration's adverse employment impact. Alternatively,  $p_{o,t}$  may be negatively correlated with the error term if Venezuelans can only find work in occupations with undesirable characteristics. To get around this bias, we use immigrants' former occupations in Venezuela as a source of exogenous variation for their occupations in Peru.

Immigrants will tend to seek work in their former occupations because their earnings will tend to be highest in the occupation in which they have the most training and experience. Therefore, we expect the labor supply shock to a certain occupation in Peru to be large (relative to the shock to other occupations) if the immigrant wave contained a large number of Venezuelans who held that occupation before migration. This source of variation is independent of the occupational wages in Peru, since an immigrant's previous occupation in Venezuela was chosen based on labor market conditions in Venezuela and her individual preferences. Descriptive evidence of the relevance of this instrument is presented in Figure 3. Formal evidence is presented in

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<sup>24</sup>Since the immigrant shock in 8 out of our 60 occupation cells takes the value of 0. We define its log transformation as follows:  $p_{o,t} = \log(1 + P_{o,t})$ . Where  $P_{o,t}$  is the raw number of immigrants in occupation  $o$  at time  $t$  and can be equal to zero. For consistency, we apply the same transformation to natives' employment levels.

the next section.

Formally, Equation 3 is estimated as the first stage for Equation 2:

$$(p_{o,t} - p_{o,t-k}) = \alpha(r_{o,t} - r_{o,t-k}) + \beta(x_{o,t} - x_{o,t-k})' + (\epsilon_{o,t} - \epsilon_{o,t-k}) \quad (3)$$

Where  $\epsilon_{o,t}$  represents an error term,  $p_{o,t}$  and  $x_{o,t}$  inherit their meaning from Equation 2, and  $r_{ot}$  denotes the log number of Venezuelans who worked in occupation  $o$  in Venezuela before migrating.<sup>25</sup>

## 6 Empirical Results

We first present the estimation results for the effect of immigration on natives' log monthly wages based on education-experience cells. We then present the results from estimations relying on cells being defined by occupations.

### Education-Experience Cells

Table 4 reports the OLS estimates of the  $\theta$  coefficient in Equation 1. Each row/column represents a different specification of Equation 1. The columns differ by the migrant variable specification. Columns (1) and (2) report the impact of a gender-specific shock on log wages of natives. That is, male migrants compete with male natives. This specification addresses the issue that women have breaks in their employment histories but has the downside of potential measurement error in cells with small sample sizes.<sup>26</sup> Columns (3) and (4) report the impact of a migrant shock composed of both male and female migrants. While this specification has the advantage of increasing the sample size in cells, it might misclassify women in experience groups.

Panel A reports our preferred specification, where the regression is weighted by the number of observations used to calculate the average wage within a cell. We also present several robustness checks. Panel B presents the same regression as in A, but unweighted. Panel C presents estimates when we include native labor force as an explanatory variable. Panel D redefines the measure of the immigrant shock  $p_{ijt}$  to the (log) number of Venezuelan migrants. In each panel, we also report the standard errors in brackets.

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<sup>25</sup>As with  $p_{o,t-k}$ , we set  $r_{o,t-k} = 0$  following Friedberg (2001).

<sup>26</sup>A small sample size per skill cell tends to attenuate the impact of immigration because of sampling error in the measure of the immigrant supply shift (Aydemir and Borjas 2011).



Table 4: Effect of Immigration on Native Wages using Education and Experience Cells

	Gender-specific shock		No gender-specific Shock	
	Migrant variable (1)	SE (2)	Migrant variable (3)	SE (4)
Panel A: Weighted regression	-0.0115	(0.0212)	-0.0103	(0.0195)
Panel B: Unweighted regression	-0.0054	(0.0240)	-0.0010	(0.0213)
Panel C: Includes native labor force	-0.0101	(0.0200)	-0.0092	(0.0189)
Panel D: Numerical immigration variable	-0.0084	(0.0051)	-0.0024	(0.0062)
Observations	384	384	384	384

Note: Each panel represents a unique specification. For all specifications, the sample is limited to only men with 1–40 years of potential experience, and the dependent variable is the mean of log native monthly wages in a given cell, unless otherwise noted. Robust standard errors are reported in parentheses:  $p < 0.01$  \*\*\*,  $p < 0.05$  \*\*,  $p < 0.1$  \*. Panel A presents the preferred estimates using the counts of native workers in each cell as weights. Panel B presents unweighted estimates. Panel C presents estimates from the weighted regression when native labor supply is included as a control variable. Panel D presents estimates from the weighted regression when women are included in the migration variable.

We start by discussing our preferred estimates in Panel A. The coefficient of 0.0115 is not statistically significant at standard levels. The result therefore indicates that immigration has no adverse effect on wages of natives. In column (3), we present the estimates when the migrant variable is composed of both male and female migrants. This coefficient remains negative and has a similar value to that presented in column (1), suggesting that measurement error due to small sample size or misclassification of women into experience cells is not an issue.

The remaining rows of Table 4 conduct a variety of specification tests to determine the sensitivity of the results. The coefficient in Panel B, for example, indicates that the results are similar when the regressions are not weighted by the sample size of the skill group. In both columns, the coefficient remains negative, although smaller, and statistically not significant. In Panel C, we include native labor force as an explanatory variable. Since  $p_{ijt}$  is the immigrant share of overall employed workforce within a skill group, an increase in  $p_{ijt}$  could occur from either an increase in immigrant labor supply or a decrease in native labor supply. As such, Panel C estimates report the impact of  $p_{ijt}$  holding native labor supply constant. As before, the conclusion that migration does not have a detrimental wage impact is supported. However, since the change in native labor force is likely endogenous, we do not prefer this specification, but we include it to be comparable to other literature and to demonstrate that our approach has similar qualitative effects across different specifications. Panel D in Table 4 replicates the weighted analysis, replacing the ratio of Venezuelans in the overall employed workforce,  $p_{ijt}$ , with the log number of Venezuelans. This specification is

qualitatively similar to the results using ratios.

Overall, Table 4 indicates that when we assume migrants and natives with the same education and experience compete in the labor market, migration does not adversely affect natives' wages. The lack of substitutability between natives and migrants presented in Table 2 could explain the null effects reported in Table 4. Therefore, we complement the analysis by estimating the wage impact of immigration based on occupation cells, as grouping immigrants and natives according to the occupations they hold guarantees that they are competing for a similar job position.

## Occupation Cells

We present the effects of changes in immigrant presence on changes in wages at the level of occupations in Table 5. As in the analysis based on education and experience, we present two specifications according to whether the migrant shock is gender-specific or not. Columns (1)-(3) show the results of a specification in which male migrants compete with male Peruvians. The specification in columns (3)(5), on the other hand, assumes that the migrant variable is composed of all Venezuelans, disregarding their gender. For every specification, we present OLS and 2SLS estimates, as well as the first-stage coefficient on the excluded instrument,  $\hat{p}$ , and the corresponding F-statistic. The first-stage F-statistic exceeds the threshold of 10 in all specifications. Recall that, for this analysis, the immigration variable is measured as the (log) number of Venezuelans. Thus, the immigration variable is the same as in Panel D of Table 4.

Table 5: The Effects of Immigration on Native Wages Using Occupation Cells

	Gender-specific shock		No gender-specific Shock	
	Migrant variable	SE	Migrant variable	SE
	(1)	(2)	(3)	(4)
OLS	0.0026	0.0077	0.0037	0.0078
IV	-0.0139	0.013	-0.0130	0.0129
First stage estimates	1.0499***	0.1882	1.0203***	0.1773
F-statistics	33.13		33.13	
Observations	60		60	

Note: Shown are estimated coefficients from OLS or 2SLS regressions of change in average natives' wages on the number of immigrants in an occupation. In the 2SLS regressions, the number of immigrants in an occupation is instrumented with the former number of immigrants working in that occupation before migration (in Venezuela). We include controls for average worker characteristics (age, years of education). Standard errors are in parenthesis.

We start the discussion with the results assuming a gender-specific shock. In column 1, the least-squares regression coefficient of the change in log monthly wages of Peruvians on  $p_{o,t}$  is positive, but small and not statistically significant. The point estimate of  $p_{o,t}$  (se 0.0077) implies that a 20% increase in employment due to an inflow of immigrants is associated with a 0.05% increase in native wages. However, we cannot reject the hypothesis that immigration has no impact on native wage growth. The 2SLS estimate, showing the effect of  $p_{o,t}$  on the change in native wages when  $p_{o,t}$  is instrumented with  $rot$ , is negative and not statistically significant. The point estimate of -0.0139 implies that a 20% increase in the number of employed Venezuelans is associated with a 0.25% decrease in native wages.

Columns (3) and (4) in Table 5 show estimates of effects of immigration on native wages when the migration variable is composed of both male and female migrants. Coefficients are qualitatively similar to those presented in Column (1). As in the previous case, we cannot reject the hypothesis that immigration has no impact on native wages.

The contrast between the OLS and IV estimates indicates that the distribution of Venezuelan immigrants across occupations in Peru is not independent of the unobserved determinants of wages in those occupations and that, as a result, OLS underestimates the immigration's negative impact on native wages. The positive bias to

OLS uncovered in this study is in line with previous literature for developed (Orrenius and Zavodny 2007; Sharpe and Bollinger 2020) and developing economies (Broussard 2017; Del Carpio and Wagner 2016).

Our results also align with studies supporting the use of alternative criteria to define labor markets in the skill-cell approach. Steinhardt (2011) for Germany and Sharpe and Bollinger (2020) for the United States show that when workers are grouped based on occupations, the estimated impact of immigration is larger. Our coefficients in the occupation analysis (Table 5) are also larger than those in the education-experience analysis (Panel D in Table 4), although they remain statistically not significant.

The absence of a negative impact of immigration on wages is usually explained by the lack of substitutability between immigrants and natives. Previous findings are consistent with immigrant assimilation increasing the substitutability of immigrants for native workers and hence the wage impacts on natives become more adverse over time (Friedberg 2001; Orrenius and Zavodny 2007). The time frame in our data impedes us to assess whether immigration decreases natives' wages as they assimilate in the hosting economy. However, Venezuelans and Peruvians share the same language and are very similar in cultural terms. Moreover, Venezuelans are not engaged in the Peruvian educational system. Thus, we doubt they would be more substitutable over time.

The absence of a negative impact of immigration on native wages might be explained by a highly elastic labor demand or an inflexible labor market. We therefore proceed to investigate whether there was an impact in the employment dimension. Define native employment growth in an occupation as  $N_{o,t} - N_{o,t-k}$ . We regress native log employment growth on the log entry of immigrants in that occupation,  $\log(P_{o,t} - P_{o,t-k=0})$ . In these data,  $P_{o,t-k=0}$  equals zero, so the change in the log number of natives employed in an occupation from 2016 to 2018 is simply regressed on the log number of Venezuelans employed in the occupation in 2018.

Table 6 presents OLS and IV estimates of the impact of the migrant inflow on Peruvian employment. We present results for overall, formal, and informal employment, and we present the analysis assuming the shock is gender-specific.

Table 6: The Effects of Immigration on Native Employment Using Occupation Cells

	Formal	Informal	Total
	(1)	(2)	(3)
OLS	-0.4133*** (0.0588)	-0.0189 (0.0329)	-0.0141 (0.01644)
IV	-0.3015*** (0.0970)	-0.0409 (0.0533)	-0.0273 (0.0267)
First stage estimates	1.0499*** (0.1881)	1.0499*** (0.1881)	1.0499*** (0.1881)
F- statistic	31.13	31.13	31.13
Observations	60	60	60

Note: Employment regressions are weighted by the sample size of the native cell. Standard errors are in parenthesis.

The least-square regression coefficients indicate that migrant flows result in job displacements in the formal sector. The point estimates imply that for every 20% increase in the number of employed Venezuelans, native formal employment of the same gender falls by about 5%. The estimates corrected for the endogeneity of the migration variable indicates that a 20 percent increase in employment due to the influx of immigrants decreases native formal employment by about 5%. Estimates on informal and overall employment are negative but not statistically significant.

In Appendix C, we submit our main results to a series of robustness checks. First, in Table C.1 we apply the inverse hyperbolic sine transformation<sup>27</sup> to the immigrant shock and the employment levels. Our results hold their qualitative nature and almost identical in magnitude. Furthermore, in Table C.2, we perform several placebo experiments in which we randomly assign the migrant shock to arbitrary native occupations. None of these placebo experiments replicate our main findings. These results indicate that our findings are likely to be reflecting a true causal relationship and not a spurious correlation. Finally, in Table C.3, we report two additional robustness checks. First, we change the baseline period to the first quarter of 2015. The results are qualitatively identical and slightly larger in absolute value. This allows us to rule out that our main results are driven by abnormal labor market behavior in the original baseline period. Next, we evaluate the effects of the 2018 immigrant wave on employment growth between 2015 and 2016. This is a false experiment in the sense that,

<sup>27</sup>For a random variable  $x$ , this is defined as  $\log(x + \sqrt{x + 1})$ .

beyond a spurious correlation, we should not expect that the immigrant shock to be associated with pre-existing native labor market trends. We find that, the immigrant shock has a positive association with pre-existing native employment trends<sup>28</sup>. This empirical exercise yields a similar conclusion than the placebo tests in Table C.2: our main results cannot be replicated by an arbitrary assignment of the immigrant shock. The positive result from this placebo experiment allows us to dismiss the possibility that our main results are simply the reflection of long-run negative trends in native formal employment. Namely, the placebo experiment in columns (4)-(6) suggests that immigrants clustered in occupations where native employment was growing between 2015 and 2016.

Overall, Table 6 indicates that migration flows decrease formal employment without affecting informal employment. Thus, we do not find any evidence of a change in composition of Peruvian employment toward informality. Native workers who were displaced in their formal employment either enroll the unemployed mass or leave entirely the workforce. Since our sample is based only on workers in the labor force, our results suggest that immigration operates on the labor force status margin. That is, migration affects whether to work or not (extensive margin) but does not affect in which sector to work (intensive margin).

## 7 Economic Interpretation and Discussion

There are several ways in which Peruvian workers could adjust to an inflow of low cost, informal workers. One way is by switching from informal to formal employment, resulting in an occupational upgrading for natives (Broussard 2017; Del Carpio and Wagner 2016). This is a result of natives taking advantage of the low-cost informal workers and creating jobs. Another way is through the extensive margin of employment. Our results align with the latter and thus rule out any change in composition employment towards informality.

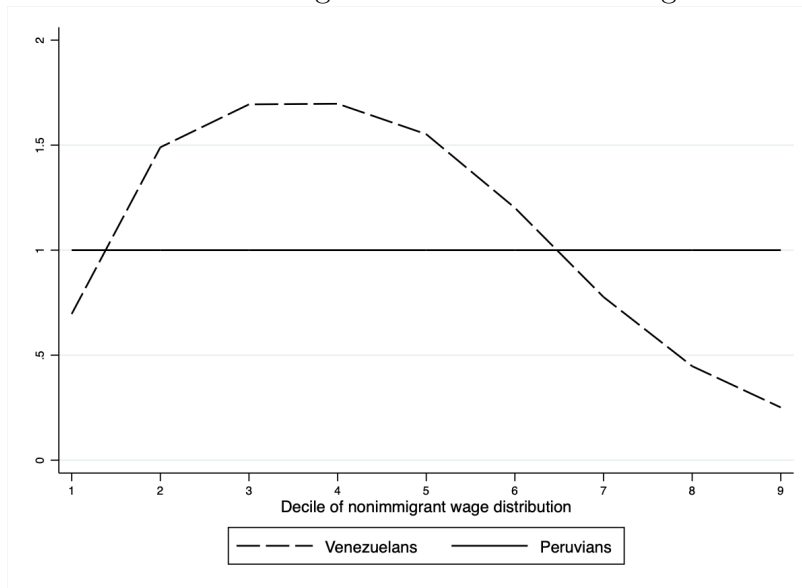
An important question is what happens with those who lost their jobs: did they leave the workforce entirely or join the unemployed? We are unable to test any adjustment mechanisms because our analysis based on occupations is based on the employed workforce. However, knowing who competes with whom in the labor market can shed light on the underlying mechanism. Figure 4 depicts kernel estimates of the actual density of immigrants in the non-immigrant wage distribution. The horizontal

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<sup>28</sup>To some extent, this could be explained by immigrants' self-sorting into growing occupations.

line shows as a reference the native wage distribution. The kernel estimates are above the horizontal line at wages where immigrants are more concentrated than natives, and below the horizontal line at wages where immigrants are less concentrated than natives.

Figure 4: Position of Foreign Workers in Native Wage Distribution



Note: Shown are kernel estimate of the actual density of immigrants in the native wage distribution. Samples include individuals in the last quarter of 2018 used in the occupation analysis.

Figure 4 illustrates that Venezuelans are overrepresented at the bottom of the native wage distribution and underrepresented in the middle or upper ends of the wage distribution. Thus, those groups with the lowest propensity to be employed formally should be most affected by the inflow of Venezuelan migrants.

Evidence in Figure 4 added to the fact that formal and informal workers combine to produce output in the Peruvian labor market suggests that Peruvians employed formally are substituted by low-cost informal immigrant labor. That is, immigrants lower the cost of production and employers substitute natives by less expensive immigrant labor.<sup>29</sup> However, lower production costs will also expand output and increase the demand for formal workers, i.e., Peruvians can take advantage of low-cost immigrant labor generating additional jobs. Unlike the migration episode from Syria to

<sup>29</sup>See Cisneros-Acevedo (2021) and Galarza and Requejo (2019). Cespedes and Ramírez-Rondán (2021) for evidence of how informal and formal labor combine in production in the Peruvian labor market.

Turkey, this is not happening in the case of study. Further research is needed to test whether migration rises formal employment in the long run.

## 8 Conclusions

This paper combines newly available data on the Venezuelan population residing in Peru in 2018 and the Peruvian Household Employment Survey (2016-2018) to assess the impact of Venezuelan migration on Peruvian labor market conditions.

The most important task in examining the causal impact of immigration on native labor market outcomes is identifying who competes with whom. The prior literature has relied upon education and experience groups to estimate the effect of immigration on native wages. We argue that because immigrants and natives are likely to work in different occupational segments despite having similar education and work experience, this grouping may not be ideal. We improve upon the methodology by forming skill groups using occupation groups.

Because occupational choice is endogenous, we rely on Venezuelans' former occupations as a source of exogenous variation. Our 2SLS estimates indicate negligible effects on native wages. We then turn to uncover the impact of immigration on native employment. The analysis highlights that immigration decreased formal employment without resulting in a change in composition employment towards informality. Specifically, a 20% increase in the number of Venezuelans decreased natives' formal employment by 6%.

Our results indicate that migration operates in the extensive margin of employment and align with informal work and formal work being substitutes in production. Descriptive evidence showing that migrants are concentrated at the bottom of the native wage distribution suggests that the least productive natives employed in the formal sector are being substituted with immigrant informal labor.



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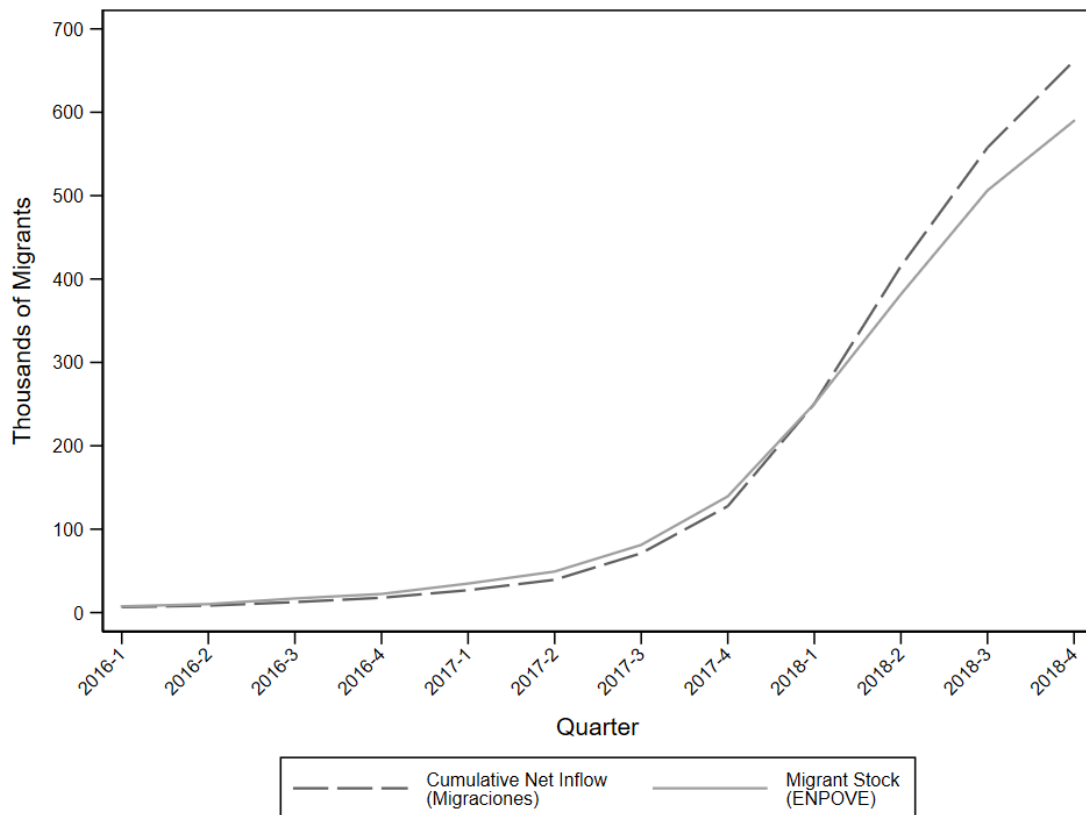
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# A Appendix A

Figure A.1: Venezuelan Migration in Peru. Comparison between ENPOVE and Migraciones



Note: With ENPOVE, date of arrival has been used to calculate the number of Venezuelans in Peru in every quarter. If an individual arrived in quarter  $t$ , that individual is counted in all quarters after  $t$ . Counts are then calculated as the weighted counts of observations in every quarter. With Migraciones, counts in quarter  $t$  are  $entries_t - exit_t + cumulative\ net\ inflow_{t-1}$ .

## B Appendix B

Table B.1: Recoding of Education Groups

Peru (ENAHO)	Venezuela (ENPOVE)	Recode
No degree, Kindergarten, Elementary School, Some High School	No Degree, Kindergarten, Some Basic Education, Complete Basic Education, Some Diversified Education	High School Dropouts
High School Graduates, Some Non-College Higher Education	Diversified Education, Some Technical Education	High School Graduates or Some Technical Education
Complete Non-College Higher Education, Some College	Technical Education, Some College	Technical Education Graduates or Some College
College Degree, Masters' Degree/Ph.D.	College Degree, Masters' Degree/Ph.D.	College Graduates



## C Appendix C

Table C.1: The Effects of Immigration on Native Employment Using Occupation Cells. Inverse Hyperbolic Sine Transformation.

	Formal	Informal	Total
	(1)	(2)	(3)
OLS	-0.441*** (0.0589)	-0.0194 (0.0326)	-0.0145 (0.0156)
IV	-0.3122*** (0.1022)	-0.0409 (0.0546)	-0.0255 (0.0261)
First stage estimates	1.0320*** (0.1926)	1.0320*** (0.1926)	1.0320*** (0.1926)
F- statistic	28.70	28.70	28.70
Observations	60	60	60

Note: Employment regressions are weighted by the sample size of the native cell. Standard errors are in parenthesis.

Table C.2: Placebo Experiments. The Effects of Random Immigrant Shocks on Native Employment Using Occupation Cells.

	Placebo Experiment 1		Placebo Experiment 2		Placebo Experiment 3		Placebo Experiment 4		Placebo Experiment 5					
	Formal (1)	Informal (2)	Formal (4)	Informal (5)	Total (6)	Formal (7)	Informal (8)	Total (9)	Formal (10)	Informal (11)	Total (12)	Formal (13)	Informal (14)	Total (15)
OLS	0.0527 (0.0634)	-0.0137 (0.0262)	0.0102 (0.0602)	0.0027 (0.0248)	0.0020 (0.0124)	0.1109* (0.057)	-0.0025 (0.0242)	-0.0053 (0.0121)	-0.0569 (0.0583)	-0.0060 (0.0242)	-0.0038 (0.0121)	0.0908 (0.0734)	0.0096 (0.0306)	0.0296* (0.0148)
IV	0.1352 (0.0929)	0.0090 (0.038)	0.1060 (0.0771)	0.0248 (0.0312)	0.0163 (0.0157)	0.1915*** (0.07)	-0.0211 (0.0294)	-0.0118 (0.0147)	0.1056 (0.0742)	-0.0009 (0.0288)	0.0091 (0.0146)	0.0114 (0.1078)	-0.0532 (0.046)	-0.0156 (0.0233)
First stage estimates	0.6317*** (0.0935)	0.6317*** (0.0935)	0.7130*** (0.0784)	0.7130*** (0.0784)	0.7130*** (0.0784)	0.8238*** (0.0826)	0.8238*** (0.0826)	0.8238*** (0.0826)	0.8157*** (0.0789)	0.8157*** (0.0789)	0.8157*** (0.0789)	0.6394*** (0.0960)	0.6394*** (0.0960)	0.6394*** (0.0960)
F-statistic	45.64 60	45.64 60	82.62 60	82.62 60	82.62 60	99.55 60	99.55 60	99.55 60	106.78 60	106.78 60	106.78 60	44.36 60	44.36 60	44.36 60
Observations	60	60	60	60	60	60	60	60	60	60	60	60	60	60

Note: Employment regressions are weighted by the sample size of the native cell. Standard errors are in parenthesis. The results come from matching each endogenous regressor-instrument pair to a random native occupation using false identifiers. Each group of results come from changing the randomization seed. The seeds used are arbitrary: 123, 1234, 711, 1206, and 2504.

Table C.3: Further Robustness Checks. Baseline Change and Placebo Experiment.

	2015-2018			2015-2016 (Placebo Experiment)		
	Formal	Informal	Total	Formal	Informal	Total
	(1)	(2)	(3)	(4)	(5)	(6)
OLS	-0.5104*** (0.0593)	0.0418 (0.0370)	-0.0082 (0.0144)	0.5045** (0.2125)	0.2820** (0.1137)	0.1705 (0.1026)
IV	-0.6412*** (0.1024)	0.0520 (0.0612)	-0.0312 (0.0243)	1.0969*** (0.4139)	0.6312*** (0.2244)	0.5168** (0.2057)
First stage estimates	0.9945*** (0.1866)	0.9945*** (0.1866)	0.9945*** (0.1866)	0.9144*** (0.2009)	0.9144*** (0.2009)	0.9144*** (0.2009)
F-statistic	28.40	28.40	28.40	20.73	20.73	20.73
Observations	59	59	59	57	57	57