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THE HETEROGENEOUS LABOR MARKET EFFECTS OF THE VENEZUELAN EXODUS ON FEMALE WORKERS: EVIDENCE FROM COLOMBIA

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The Heterogeneous Labor Market Effects of the Venezuelan Exodus on Female Workers: Evidence from Colombia[†]

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Abstract

We study the labor market effects of the Venezuelan migration shock on female labor market outcomes in Colombia using a Bartik-instrument approach. For our identification strategy we leverage regional variation from pull factors and time variation from push factors. Our findings show that in the labor market, female immigrants can act as substitutes or complements for native-born women depending on native women's education level; immigrant workers are substitutes in the labor market for native-born low-educated women, because they compete for similar jobs. Hence, the low-educated native women's labor force participation decreases. At the same time, time spent doing unpaid care increases for low-educated native women, possibly further preventing the job search for this group. On the other hand, we find an increase in labor force participation of 1.6 percentage points for high-educated women with at least one minor at home and a 1 percentage point higher likelihood of becoming entrepreneurs due to the migratory shock, which supports the complementary-skill hypothesis. Finally, we don't find evidence that the migratory shock induced households to outsource more home production as a means for high-educated women to spend more time at paid work.

Keywords: migration, female labor market outcomes, care economy, entrepreneurship
JEL Classification: J16, J22, J61, L26, R23.

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1 Introduction

The ongoing social, political and economic crisis in Venezuela has been characterized by its intensity and quick escalation in a short period of time. Since 2015, around 5.4 million Venezuelans have fled their country due to the deterioration of the local living conditions, which positions this event as the largest exodus in the history of the Western Hemisphere in the last 50 years (UNHCR, 2020). Colombia has received the largest share of Venezuelan migrants compared to other countries in Latin America and the Caribbean (LAC). Administrative records from Migración Colombia (MC; Colombian Migration Authority) show that as of August 2021, 1.8 million Venezuelan refugees were living in Colombia, approximately half of whom were undocumented (GIFMM & R4V, 2021).[1]

In this paper, we explore the implications of the Venezuelan migration shock on native women's labor market outcomes in Colombia. We also estimate heterogeneous effects concerning women's different education levels and the presence of at least one minor at home. We focus on the presence of minors under 5 years old at home and not exclusively on the mother-child relationship, because multi-family households are common in Colombia.

In the literature, there is no consensus on the effects of migration on the labor market. Some argue that the effect is positive (Ottaviano & Peri, 2012; Ottaviano et al., 2013; Foged & Peri, 2015), others negative (Anastasopoulos et al., 2021; Borjas, 2017) and still others that they are negligible (Borjas & Chiswick, 2019; Carrasco et al. 2008). Despite the extensive literature on the subject, the issue of gender has been addressed to a very limited extent (Granada et al., 2021). Some papers that analyze the effects on native men and women do see significant differences (Cortés & Tessada, 2011; East & Velásquez, 2022; Bahar et al., 2021), but most of them focus on labor markets in developed countries. Therefore, it is crucial to

[1]See Bahar et al. (2021) for a detailed discussion of the Venezuelan diaspora to Colombia.

differentiate by gender when studying the effects of migration in order to understand how different attributes of workers play a role in making some groups more vulnerable to external shocks.

Our contribution to the literature is twofold. First, we study the differentiated effects of south-to-south migration on women's labor market outcomes, which is mainly absent from the literature. Although other authors have studied the effects of the Venezuelan migration on the Colombian labor market (Bonilla et al., 2020; Delgado-Prieto, 2021), in this paper, we address the research question from a gender perspective, as we seek to understand the impact on women's work (paid and unpaid). Second, we account for the heterogeneity derived from native women's education level and the presence of minors under 5 at home when we estimate the effects of migration.

We hypothesize that immigrants can act as substitutes or complements of native workers in Colombia, depending on the native women's characteristics. On the one hand, we expect to find a substitution effect between immigrants and low-educated native workers, regardless of the educational attainment of the immigrant, because there is evidence of occupational downgrading for migrants in the local labor market, which causes a decrease in equilibrium wages for low-skill jobs due to the increased competition (Santamaria, 2020; Lebow, 2022; Lombardo et al., 2021). On the other hand, we expect to find a complementary effect between immigrants and high-educated native workers, as the latter could benefit from migration by (a) hiring domestic workers to spend more time doing paid work (Pedrazzi & Peñaloza 2020; Cortes & Tessada, 2011; Hiller & Rodríguez-Chatruc, 2020) or (b) hiring more blue-collar immigrant labor in specific industries to open up managerial opportunities for high-educated natives (Blyde, 2020).

Our identification strategy exploits the cross-city variation in the concentration of female

Venezuelan immigrants in order to capture the size of the shock in each city at each moment of time. We use data from Gran Encuesta Integrada de Hogares (GEIH), which is the main household survey in the country. GEIH is also the official source for Colombian labor market statistics and it is representative for the main 23 cities of the country, which were the destination of more than 90 percent of the Venezuelan migrants (Migración Colombia, 2019). To address the potential endogeneity in the timing and location of the immigrants, we use a Bartik-type instrumental variables approach. We instrument the share of female Venezuelans living in each city at each month-year period, using the interaction between the historical share of Venezuelans living in each city in 2005 and the Venezuelan Consumer Price Index (CPI).

Our results show that there are heterogeneous effects on women's labor market and time use outcomes, depending on their education level and the presence of children at home. In particular, we find decreases in labor force participation (LFP) of 0.62 to 0.98 percentage points (p.p.) for low-educated female workers without and with children, respectively. We also find that LFP increases by 1.6 p.p.for high-educated women with at least one minor at home and there is no effect on LFP for high-educated women without children. Interestingly, high-educated women with at least one minor at home are 1 p.p. more likely to become entrepreneurs due to the migratory shock. The influx of immigrant women represents an opportunity for a business to be started at a lower cost, which encourages women with children at home to participate in the labor market. Furthermore, such an influx could enable these women to have a better balance between paid and unpaid work (unpaid care and domestic work), because there is evidence that women of childbearing age and those with children could face more obstacles to being hired in the labor market, making self-employment a desirable alternative occupation for this group (Tribin et al., 2019).

Furthermore, we find that unpaid work increases by 0.87 hours per week for low-educated

women. In particular, for low-educated women with at least one child at home, unpaid work increases via time spent doing direct care activities (i.e. feeding the child and reading before sleeping) and for those without children it increases via indirect care activities (i.e. cooking, cleaning, etc). The constant trade-off between paid and unpaid work is a distinct characteristic of female workers and stems from social norms. Women outside the labor market have to shoulder the burden of unpaid care and domestic work at home, especially low-educated women who cannot outsource the work at home. The housework burden on women further prevents their reintegration into the market by limiting their time to search for jobs, causing adverse shocks to last longer (Floro & Komatsu, 2011). In contrast, when unemployed or outside the labor market, men can use most of their time to search for a new job, because they do not face pressure to assume the burden of care (Floro & Komatsu, 2011).

Finally, our results show that in developing countries there are two realities concerning migration. On the one hand, migrants can act as substitutes for low-educated women and compete for similar jobs in the labor market. In this case, low-educated native women experience adverse effects due to migration and face the need to transit from paid to unpaid work. On the other hand, high-educated native women with at least one minor at home can increase their participation in the labor market as a result of migration.

The remainder of this document proceeds as follows: Section 2 presents a literature review, Section 3 explains the institutional details of migration in Colombia, Section 4 describes the data, Section 5 presents the identification strategy and the econometric model. Finally, Sections 6 and 7 show the results and robustness checks, respectively, and Section 8 concludes.

2 Literature Review

One of the most common inquiries concerning diasporas, like the one generated by the Venezuelan crisis, is about the effects on the local labor market. Even though the literature that studies the impact of migration on the host country's labor market is vast, diverse and well documented, there is still no consensus on migration's effects on natives' labor participation, employment, or wages (Dustman et al., 2016).

On the one hand, some authors have found a negative effect. For example, Anastasopoulos et al. (2021) found that immigration lowered the number of job vacancies in Miami and harmed low-skilled workers' labor market conditions (in terms of wages and employment) and Borjas (2003) found that immigration can lower the wage of competing workers by 3 to 4 percent when there is an increase of 10 percent of the labor supply, but this effect only applies for the segment in the labor market in which there is some competition between migrants and native workers. Also, Borjas (2017) found that the influx of Cuban refugees into Miami during the Mariel boatlift lowered the wages of low-skilled workers by at least 15 percent. Similarly, Schultz et al. (2019) found that undocumented immigration has negative effects, although small, on both the low-skilled native labor force participation (LFP) rate and unemployment rate.

On the other hand, authors have also found negligible effects. For example, Borjas and Chiswick (2019) argue that migration waves in developed countries have no to small negative effects on local labor market outcomes. Likewise, Card (2001, 2005) finds a negligible impact of immigration on natives' wages. Also, Carrasco et al. (2008) and Fusaro and López-Bazo (2020) found a negligible overall impact of immigration on native employment in Spain during the 1990s and in Italy during the period 2009–2017, respectively.

There is also evidence that immigration has had positive effects on native employment, wages and occupational mobility (Ottaviano & Peri, 2012; Ottaviano et al., 2013; Foged & Peri, 2015). For example, Ottaviano and Peri (2012) found that between 1990 and 2006, immigration had a small positive effect on the wages of native workers, especially workers with no high school degree, in the United States. The authors argue the effects found are due to an imperfect substitutability relation between natives and immigrants within education and experience groups[2].

Furthermore, in the last few years a new branch of the literature has addressed the effects of immigration in the local labor market by differentiating by individual characteristics, such as gender, education and experience level. For example, some authors have found that labor supply shocks impact female and male employment to different extents (Foged & Peri, 2015; Mansour et al., 2020; Bonilla et al., 2020; Delgado-Prieto, 2021). Along these lines, Bonilla et al. (2020) and Delgado-Prieto (2021) found for Colombia that the immigration of Venezuelans had a statistically significant negative impact on unemployment, labor force participation and earnings of non-immigrant self-employed, informal workers, who are usually low educated. The authors also found that the effects are consistently larger for women. Cortés and Pan (2013) found that giving temporary work permissions to foreign workers significantly increased the labor participation rate of native women in Hong Kong, especially for mothers of young children. The authors also found that the effect is driven by medium- and high-skilled women.

Similarly, Cortés and Tessada (2011) found that low-skilled immigration increases the number of hours women at the top quartile of wage distribution spend on average in the labor market and their probability of working longer hours. The authors also found that this

[2]In particular, Ottaviano and Peri (2012) estimate the elasticity of substitution between natives and immigrants is around 20, much lower than the value labor economics usually assume (around 33).

behavior is consistent with a reduction in the time they spend doing household work. Along the same lines, East and Velásquez (2022) found that immigration enforcement policies that increase the likelihood of undocumented immigrants being identified, detained and deported, directly affecting low-skilled immigrants, have negative spillovers effects on high-skilled citizen female workers. The authors also found that the effect is larger for mothers with young children, because it increases the price of outsourcing household production (East & Velásquez, 2022). Finally, Viseth (2020) finds for a group of African countries that immigration can enhance productivity in the short term in places where there is a high degree of complementarity between the skills sets of immigrants and native workers.

An additional avenue through which migration can help increase the labor participation of high-educated women is the growth of native businesses, from which women in charge of caring for children can specifically benefit. Tabellini (2020) shows that the arrival of low-educated immigrants increased the employment of high-educated natives through the reduction in production costs. Lower costs enabled firms to grow and, with that, so did the creation of new jobs for high-educated natives.

Additionally, Coen-Pirani et al. (2010) state that the arrival of low-skilled immigrants increased the labor participation and employment of married women during the 1960s, especially of those with higher education, while they found a null effect for single women. Moreover, the authors found that women with children, who had lower participation in the labor market before the migratory shock, also had more space to take advantage of new job opportunities as the demand for high-skilled labor increased.

However, Bahar et al. (2021) studied the effect of an amnesty program in Colombia implemented in 2018 that granted work-like visas to Venezuelans. The authors found that up until that year, the work-like visas did not have any effects on the formal labor market

except for very small negative effects on high-educated female native workers.

Our work follows this strand in the literature in seeking to understand the effects and challenges that native women experiment in the face of a migratory shock. It also analyzes how the characteristics of this group determine the vulnerability of these women. We show that the female workforce is affected differently, but that there is a great deal of heterogeneity. We point out that depending on education and the presence of children in the home, women may be harmed or benefited by an increase in the female labor force due to a migratory shock. This analysis can assist public policy makers in choosing the specific groups on which to focus in the face of a migratory crisis.

3 The Venezuelan Migration in Colombia

Historically, Colombia has been considered a country of emigrants rather than a destination country, due to an economy that has not been particularly prosperous accompanied by more than 50 years of violence, both which have acted as push factors for decades. While Venezuela was one of the main receptors of Colombian migrants during the 1990s (World Bank Group, 2018), there is evidence of large flows of Colombians migrating to Venezuela as early as the 1950s (DANE, 1950).There has been limited migration in the reverse direction: according to the 2005 Census, at that point in time there were 36,819 individuals of Venezuelan origin living in Colombia.

Nevertheless, the Colombian-Venezuelan border has always been very active in terms of pendular migration.[3] Many individuals living in Colombian border cities (such as Cúcuta) and in Venezuelan border cities (such as San Antonio del Táchira) had family, businesses, or

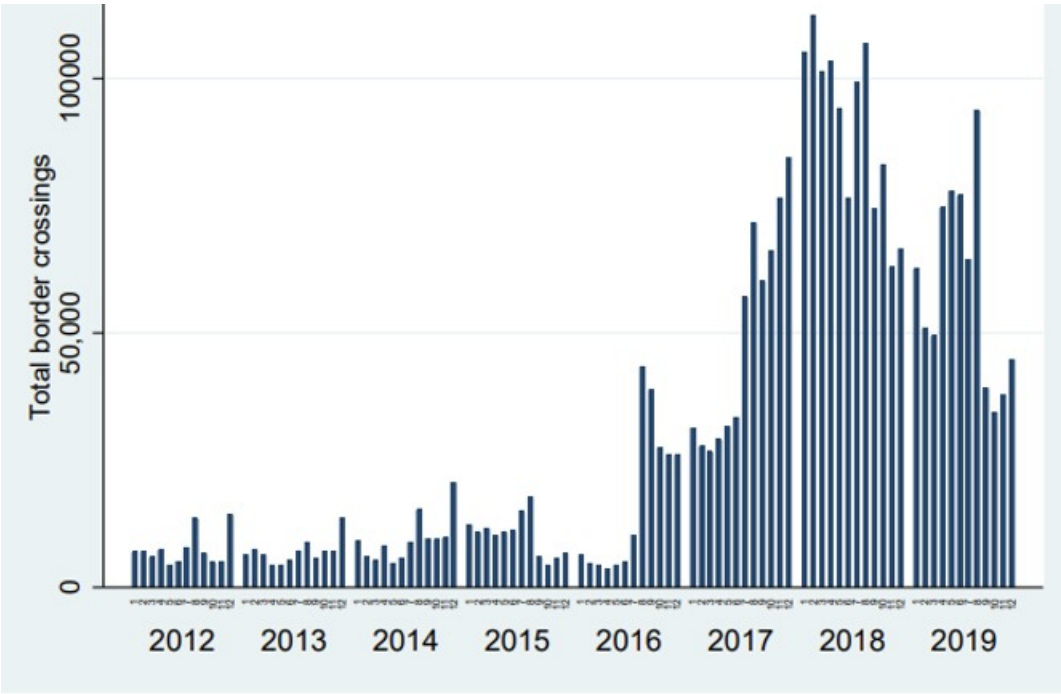
[3]Pendular migration refers to people who reside in one place but have to travel constantly, often daily, because they work or study in another place.

children going to school across the border. The proximity between both countries allowed people to transit between them even several times a day. Official data from Migración Colombia reports that for 2018, approximately 630,000 individuals had a migration card permit, which allowed them to cross the border as many times as they wanted without having to have their passport stamped at Customs, provided they stayed in the Cúctua-San Antonio del Táchira area.

However, in August 2015 for political reasons the Venezuelan President Nicols Maduro ordered all the crossing points along the border with Colombia closed and deported more than 2,000 Colombians living in San Antonio del Táchira, which forced around 18,000 Colombians living in Venezuela to return to their home country (Migración Colombia, 2017). This event dramatically changed future migratory patterns; as soon as the border was reopened in 2016, though only for pedestrians, many Venezuelans and Colombians living in Venezuela started to migrate to Colombia looking for better opportunities, because of the economic and social crisis in Venezuela.

Accordingly, as Figure 1 shows, since August 2016 there has been a growing influx of Venezuelans migrating to Colombia. Official Customs data show that the number of migrants crossing the border, with or without proper legal documentation, more than tripled between 2016 and 2018. This includes migrants who were originally en route to other countries in South America; most of them ended up staying in Colombia.

Figure 1: Total Border Crossings from Venezuela to Colombia per Month



Note: This figure shows the number of Venezuelan migrants who entered the country through any of the official border crossing points per month during this period and were recorded by official sources from Migración Colombia.
Source: Tribin & Knight, 2020.

Moreover, as of 2018, Migración Colombia estimated there were 1,174,743 Venezuelan immigrants living in Colombia. Of them, 695,000 had all their migration documentation up to date and 479,000 had not met all the legal requirements to migrate (38 percent of them had overstayed and 62 percent had crossed the border through an illegal entry point).

The next year a slowdown in the migratory influx occurred, which could be explained by what was happening in Venezuela at the time (OAS, 2019): (a) the challenge to the Maduro government led by the opposition leader Juan Guaidó, which could have acted as an incentive to stay for anti-regime individuals; (b) the closure of the Colombian-Venezuelan border again (between February 2019 and October 2021), which forced migrants to cross via illegal pathways, known as *trochas* and controlled by smugglers and criminal groups; and (c)

the economic reform undertaken by President Maduro to bypass the hyperinflation affecting the economy and palliate the large shortcomings of essential goods that existed across the country. This reform mainly consisted of three measures: (1) informally allowing the free circulation of dollars in the economy as a second currency, (2) eliminating price controls and (3) allowing firms to import certain goods.[4] These steps partially relieved the shortages in the provision of basic goods that Venezuelans were experiencing in their daily lives and boosted the economy. Some combination of these changes could have potentially created a sense of stability that slowed down out-migration.

4 Data

We combine data from different sources for our analyses. Our main data source comes from the GEIH, a monthly cross-sectional household survey that is representative for the main 23 cities of Colombia. The GEIH is the primary source of information regarding the labor market — formal and informal — in the country. This survey includes some questions about time use (weekly time spent in paid and unpaid activities) and a special migration module that has been administered since April 2013. Hence, our period of study runs from May 2013, the month in which the migration module began to be fully implemented, until December 2018.

From the GEIH data, we define a migrant as someone who reported having lived in Venezuela 5 years prior.[5] We also consider two more definitions for our analysis. First, we classify as high-educated women those who had a college degree or had a higher level of

[4]See:El País, October 28 2019

[5]As in Bonilla et al. (2020), to measure migration flows based on GEIH we consider as migrants those women who reported having lived in Venezuela 5 years before, independently of their nationality. While 30 percent of the migrants were of Colombian origin and therefore had returned to their home country (Migración Colombia, 2019), for the purposes of our analysis they are also part of the migratory shock.

education and as low-educated women those who did not have a college degree. Second, we define the variable "at least 1 minor at home" as a dummy that takes the value of 1 if there is at least one child 5 years old or less in the household and 0 otherwise. We focus on the presence of at least one minor at home instead of on the mother-child relationship, because care responsibilities can affect other women in the household in addition to the mother.

We restrict our sample to working-age individuals located in the main 23 cities of the country. In Colombia, the working age starts at 12 years old in urban areas. Moreover, for our analysis, we consider the following outcomes of interest: (a) the likelihood of participating in the labor market, (b) the likelihood of being unemployed, (c) the number of weekly hours spent in paid work, (d) the real monthly labor income in logs, (e) the number of weekly hours spent in unpaid work, (f) the number of weekly hours spent doing household chores and (g) the number of weekly hours spent caring for other household members — children, elderly, sick, or members with disabilities.

Table 1 shows descriptive statistics for working-age low-educated and high-educated native women for 2013 and 2018. We emphasize that for the period of 5 years, the average increase in wages of women with low education was around 5 percent, and even for women with high education, real wages fell. Moreover, the differences between the group's means are outstanding. The data also show a wide gap between low- and high-educated women in all labor market outcomes, which persisted over time (see Table 1). Regarding the average weekly time dedicated to unpaid work, there was a slight reduction for both high- and low-educated women. It is also interesting to note that low-educated women invested more time in unpaid work[6] than high-educated women, perhaps due to lower participation in the labor

[6]Following the standard literature, we split unpaid care work into two types: direct care, which refers to the time devoted to taking care of others, such as feeding someone, helping someone to get dressed and helping someone get things done; and indirect care, which refers to unpaid domestic work, such as cleaning the house, cooking and doing laundry, etc.

market.

Table 1: Labor market and time use outcomes by educational level for urban Colombian women

Outcomes	2013				2018			
	Low-educated		High-educated		Low-educated		High-educated	
	Mean	SD	Mean	Sd	Mean	SD	Mean	SD
Labor force participation	0.56	0.49	0.86	0.34	0.54	0.50	0.84	0.36
Unemployment	0.13	0.34	0.09	0.28	0.13	0.34	0.09	0.29
Labor income (in COP$)	802,566.2	847,808	3'018,024	3'776,901	844,936.3	717,622.7	2'942,841	3'118,696
Paid work time	21:00	25:29	34:01	21:13	19:55	24:09	33:11	21:11
Unpaid work time	26:03	22:04	19:53	19:25	24:55	20:32	19:52	18:31
Indirect care time	17:47	13:30	12:13	11:09	17:09	12:27	12:27	10:45
Direct care time	8:04	14:28	7:17	13:33	7:38	13:34	7:06	12:52

Note: This table contains descriptive statistics on labor market outcomes and time usage for working-age women in Colombia residing in the main 23 cities of the country. For 2018, the exchange rate Colombian pesos (COP) to US dollars (USD) was COP 2.956 = USD 1. For 2013, the exchange rate was COP 1,869 = USD 1.
Source: Calculations by the authors based on data from the GEIH (2013 and 2018) by the DANE.

Table 2 presents statistics on the job industry. We observe that there have been changes in the industries in which female immigrants tend to work. In 2013, they were over-represented in the agricultural sector and in 2018 they seem to have switched to manufacturing and services. For native women, the distribution of jobs by industry is virtually identical across both years.

Table 2: Job industry by female migrants and natives

Industry	2013		2018	
	Migrant	Non-migrant	Migrant	Non-migrant
Agriculture	19.80	0.46	0.08	0.41
Mining	0.00	0.14	0.01	0.13
Manufacturing	0.11	15.02	15.34	14.33
Electricity, gas and water supply	0.00	0.32	0.31	0.37
Construction	0.38	0.87	0.25	1.14
Retail	31.46	23.68	20.10	22.19
Hotels and restaurants	12.92	9.23	27.53	9.43
Transportation	1.83	3.99	1.45	3.47
Finance	0.58	2.69	0.31	2.91
Real estate	3.43	8.53	6.44	10.16
Public administration	0.00	3.07	0.06	3.47
Education	2.28	6.51	1.61	6.76
Health	2.83	8.70	2.58	9.38
Entertainment and recreation activities	10.01	7.15	10.60	7.01
Household services	10.24	7.94	11.93	6.80
NGO and other organizations	0.00	0.01	0.00	0.04
Other	4.14	1.70	1.38	2.03

Table 3 presents the distribution of female immigrants and natives by job occupation for 2013 and 2018. We find that there are substantial differences between immigrants and natives in both years. In particular, we find that the share of women working as employees in both the private and public sectors grew between 2013 and 2018 for both immigrants and natives. Although we initially expected, from other countries' experience, immigrant women to end up joining the labor market as domestic workers (Pedrazzi & Peñaloza 2020; Cortes & Tessada, 2011; Hiller & Rodríguez-Chatruc, 2020, Granada et al., 2021), the data show another story (see Tables 2 and 3).

According to Table 2, most Venezuelan immigrant women worked in hotels, restaurants, retail and manufacturing. Furthermore, they either worked as an employee or were self-employed. In contrast, native women were distributed more evenly across sectors, with the majority being employees in the private sector or self-employed. It should be noted that the rate of self-employment was higher among immigrant women. Self-employed jobs are mainly

low quality, especially for mothers (Olarte & Peña, 2010).

Table 3: Job occupation by female migrants and natives

Occupation	2013		2018	
	Migrant	Non-migrant	Migrant	Non-migrant
Private sector employee	36.90	43.48	40.40	48.31
Public sector employee	0.00	4.21	0.09	4.13
Domestic worker	10.24	7.85	11.93	6.71
Self-employed	43.75	37.27	42.87	35.3
Employer	1.13	2.94	1.03	2.55
Family worker	7.98	3.64	3.39	2.66
Other	0.00	0.60	0.29	0.33

From this preliminary analysis, we conclude there was a great deal of heterogeneity in the female labor market. Colombian women, both those with low education and high education, had persistent gaps for years. Similarly, migrant and non-migrant women had very different outcomes in the labor market, with the former clustered in specific sectors. Therefore, to study the effects of migration on women it is crucial to differentiate women by their characteristics (such as their education level), because those help to determine the impact of the migratory shock.

5 Empirical Specification

We estimate the effect of the migration shock on several labor market outcomes using the baseline model presented in Equation (1). We include high-dimensional fixed effects at the city (θ_c) and time (α_t) levels. Our measure of migration, (m_{ct}), is computed as the share of female Venezuelan refugees living in Colombia over the total working-age population in each city at each moment of time. We also control for relevant individual characteristics (x_{ict}) such as age, age squared, marital status and the presence of minors — children 5 years

old or below — in the household. Finally, we include state GDP to account for economic time-variant factors that could have repercussions on local labor markets that are outside of the migratory shock.

$$y_{ict} = \beta m_{ct} + \delta x_{ict} + \gamma GDP_{ct} + \theta_c + \alpha_t + e_{ict} \tag{1}$$

The subscripts in Equation (1) represent the individual i who lives in city c at time t. Standard errors are clustered at the city level.

There are several challenges that we need to overcome in order to recover causal estimates from Equation (1). First, Ordinary Least Squares (OLS) estimation would be biased, because the immigrant's decision about where to locate in the host country is not random or exogenous. According to Altonji and Card (1991) and Card (2001), immigrants choose their new city of residence based on multiple factors: labor opportunities, housing choices and social networks, among others. With regard to the latter, immigrants tend to be geographically concentrated as they choose to live in areas — or cities -– where others from the same place of origin live, including family members (Chiswick & Miller, 2014). Furthermore, the timing of migration is not exogenous nor random either. For example, we expect more women to have migrated from Venezuela to Colombia as the economic, social and political conditions deteriorated in the former country.

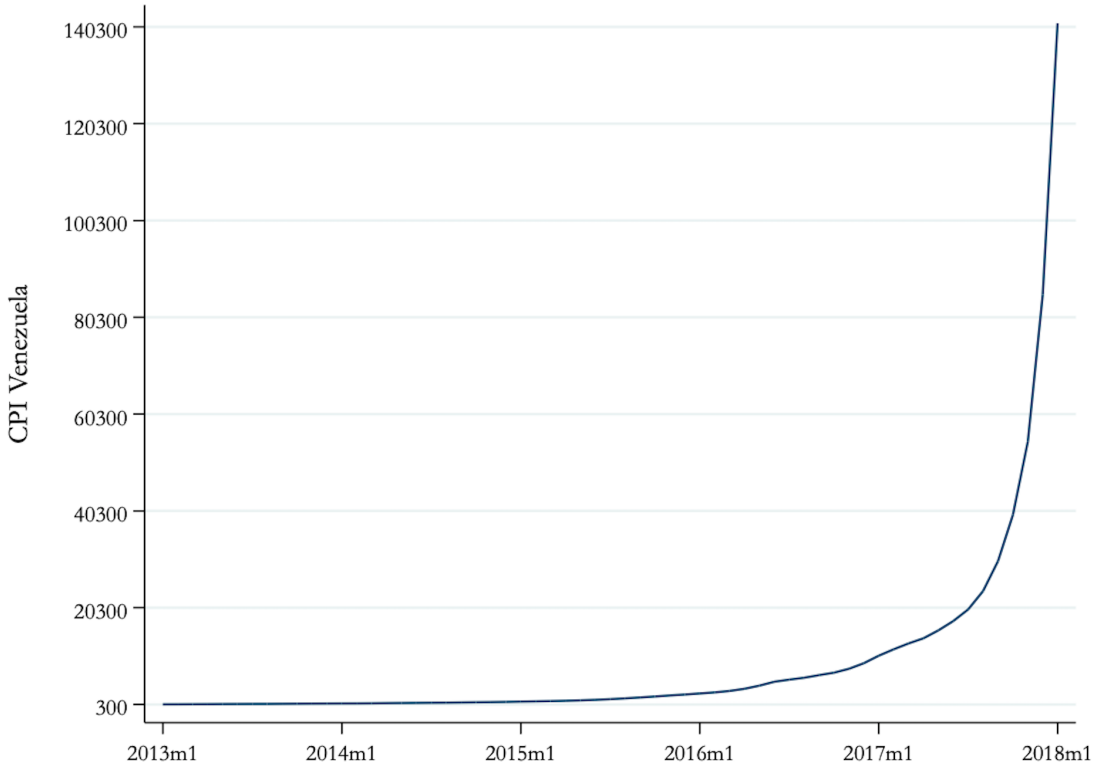
To address the potential endogeneity, we instrument our variable of interest, the influx of female Venezuelan refugees, with Bartik instruments. According to Cunningham (2021), Bartik instruments are created by interacting initial shares of geographical regions (*share-side*) with national growth rates (*shift-side*). Following Bonilla et al. (2020), the instruments we use exploit both the temporal and geographical variation in the push and pull factors

that are associated with the migration wave under study, as shown in Equation (2):

$$b_{ct} = m_{c2005} * cpi_t \tag{2}$$

where m_{c2005} is the share of Venezuelan immigrants in 2005 per city according to the Colombian population census. This variable helps us determine the areas where current immigrants could locate because ties and social networks are already in place. cpi_t is the Venezuelan CPI, which enables us to capture the deterioration of the country's economic conditions in time (see Figure 2). In addition, as pointed out by Jaeger et al. (2018), migration decisions take time and could be correlated in time, so we also include a one-quarter lag of the instrument (b_{ct-3}) from Equation (2) in our model. Our results do not change significantly if we use a one-semester lag instead of one-quarter (see Table A3, A4, A5 and A6).

Figure 2: Venezuelan Consumer Price Index, 2013–2018



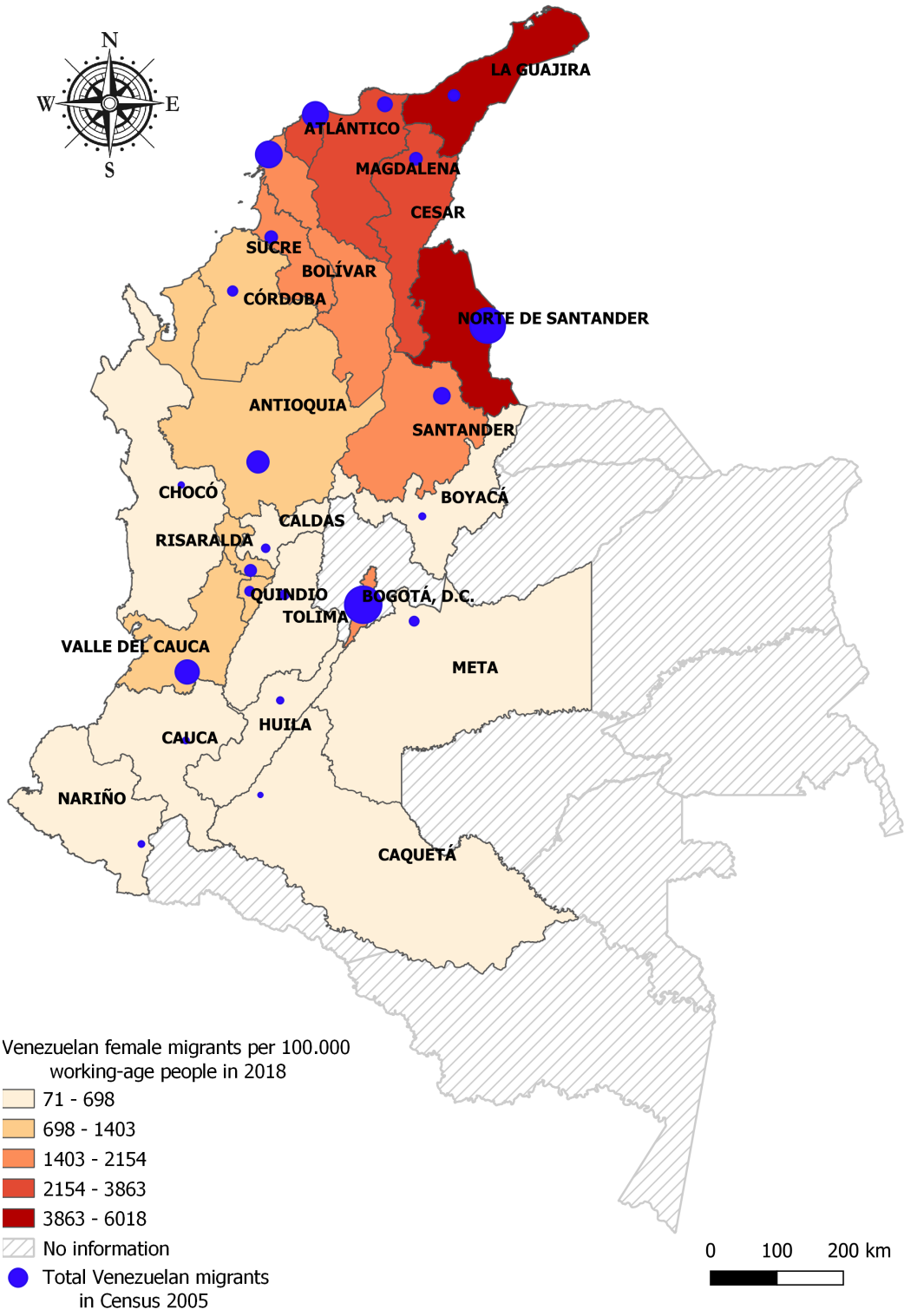
Source: Banco Central de Venezuela.

For the instruments to be valid, they can only affect our outcomes of interest through the current migration channel and have to be relevant. Thus, one potential threat to the validity of our instrument is that previous migration waves could potentially be correlated with current outcomes as stated by Jaeger et al. (2018). We argue, based on Delgado-Prieto (2021) and Bonilla et al. (2020), that the share portion of our instrument, the historical migration settlements from Venezuela measured through the 2005 population census, is not correlated with current labor market outcomes, because the number of migrants at that time was not large and they seemed to locate in cities based on their proximity to Venezuela rather than based on the economic conditions the cities exhibited. But this does not mean that our instrument is not relevant; previous migration settlements can explain the location

of current migrants based on the social networks that are already established (Chiswick & Miller, 2014).

In Figure 3 we present the regional variation in the location of current immigrants and the share of Venezuelan immigrants in each of the 23 cities included in our sample from the 2005 census. As can be seen, most of the current and historical immigrants settled in the cities closer to the border, because there are many commonalities in terms of culture and climate, the distance is shorter and transportation is easier. Taking this into consideration, we argue that the share portion of our Bartik instruments is valid, because immigrants seem to locate in areas where there have been more immigrants historically, independently of the current labor market conditions of the city. In Table A1 there is a detailed summary of the main labor market statistics for each of the 23 cities.

Figure 3: Distribution of Venezuela Migrants in Colombia



Source: GEIH 2018 and Censo 2005.

In addition, concerns about reverse causality from historical Venezuelan migration in Colombia and the current economic crisis that is happening in Venezuela can be dismissed, given that Colombia had a negative net migration rate from Venezuela from the 1980s to the early 2000s. This pattern has been attributed to the ongoing armed conflict in Colombia during those decades and the oil boom that Venezuela experienced. Both factors led to many Colombians' emigrating to Venezuela (Pacheco-Rios, 2016). Another source of concern could be the effect of changes in trade patterns on local labor markets, but trade between Colombia and Venezuela was not substantial during the period of analysis. In particular, since 2009, exports/imports between both countries were severely reduced, as can be seen in Figure A1, because the Venezuelan President Hugo Chávez closed the borders with Colombia in 2009 due to political reasons. Although trade was reactivated in mid-2010, it did not return to previous levels and since that time Venezuela has no longer been one of Colombia's top 5 commercial partners. The value of exports from Colombia to Venezuela since 2013 represents less than 5 percent of the total value of Colombian exports (see Figure A1).

Another source of potential bias could arise from changes in the price of oil, as both Venezuela and Colombia are exporters, but we include State GDP for Colombia, which captures any changes that might be due to oil prices that affect local labor markets and the economy in Colombia.

On the other hand, there is a concern about the reliability of the official reports on inflation in Venezuela, which could induce significant measurement error in the CPI. However, Bonilla et al. (2020) present evidence to the contrary. According to the authors, the correlation between official and unofficial inflation rates is relatively high (Bonilla et al., 2020).

Overall, because the proposed Bartik instruments seem plausibly exogenous and valid,

we estimate Equation (1) through two-stage least squares (2SLS).

$$m_{ct} = \varphi b_{ct} + \phi b_{ct-3} + v_{ct} \tag{3}$$

where the subscript c represents the city and t refers to the time period.

We report the results of the first-stage equation (Equation (3)) in Table A2. We find no evidence of weak instruments as all the coefficients are independently significant and the F-statistic is above 10 in all the specifications.

6 Results

In this section, we report the results of our estimation exercises. We first estimate the impact of the increase in Venezuelan refugees on native women's labor market outcomes. Then, we analyze the impact on the unpaid care burden. We report in the following tables our coefficient of interest, *share of female immigrants*.

a. Labor market outcomes

To determine whether the migratory phenomenon harmed the labor market performance of native women, we estimate Equation (1), using as dependent variables (a) the likelihood of participating in the labor force, (b) the likelihood of being unemployed, (c) the number of hours spent working on average per week and (d) the logarithm of the real labor income. We estimate standard errors clustered at the city level in all specifications. Also, for all specifications, we include age, age squared, marital status the presence of minors in the household and the logarithm of the department GDP as controls.

For the estimations, we separate native women by their educational level into two groups: low educated and high educated. We present these results in Table 4.

Table 4: Estimates for labor market outcomes and paid work by educational level

	(1) Participation Low-educated	(2) Participation High-educated	(3) Unemployment Low-educated	(4) Unemployment High-educated	(5) Paid work Low-educated	(6) Paid work High-educated	(7) Earnings Low-educated	(8) Earnings High-educated
Share of female immigrants	-0.0072**	0.0058	0.0023	0.0018	-0.3132	0.1447	-0.0499	-0.0378
	(0.0033)	(0.0060)	(0.0024)	(0.0060)	(0.2398)	(0.2757)	(0.0491)	(0.2315)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic	29.69	15.57	26.19	15.88	29.69	15.57	29.69	15.57
Observations	1,304,284	175,626	678,717	149,517	1,304,284	175,626	1,304,284	175,626

Note: This table contains the estimated coefficients from Equation (1). The dependent variables are (1, 2) If participates in the labor force; (3, 4) If unemployed; (5, 6) Time spent working per week; and (7, 8) Logarithm of the monthly labor income in real terms. The sample includes working-age native women. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status, if there is at least one minor under 5 years old at home and logarithm of the department GDP. Fixed effects at the city and year-month level were added. Standard errors are clustered at the city level.

First, we find a negative effect of the share of female immigrants on the likelihood of participating in the labor force for low-educated native women of 0.72 p.p. (Table 4). This result is in line with our hypothesis (*substitution-effect*), which we discuss in Section 7, that migrants and native workers compete for the same jobs.

Second, for the other labor market outcomes we find no statistically significant effects, which implies that the immigration of Venezuelans had no impact on the likelihood of unemployment for native women nor on the number of hours the latter spent working on average per week. Third, there is no evidence indicating the rise in working-age female immigrants harmed the labor income of native women.

b. Unpaid care and domestic work

To determine whether the migratory phenomenon reduced the time native women spent doing unpaid care activities, we estimate Equation (1), using as dependent variables (a) the number of hours spent doing unpaid indirect care activities on average per week, (b) the

number of hours spent doing unpaid direct care activities on average per week and (c) the number of hours spent doing unpaid care activities on average per week.[7]

Table 5: Estimates for time use outcomes and unpaid work by educational level

	(1) Unpaid work Low-educated	(2) Unpaid work High-educated	(3) Indirect care Low-educated	(4) Indirect care High-educated	(5) Direct care Low-educated	(6) Direct care High-educated
Share of female immigrants	0.8701** (0.3503)	0.2992 (0.3264)	0.5277* (0.3027)	0.0786 (0.2441)	0.3487* (0.1819)	0.2182 (0.2271)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	29.69	15.57	29.69	15.57	29.69	15.57
Observations	1,304,284	175,626	1,304,284	175,626	1,304,284	175,626

Note: This table contains the estimated coefficients from Equation (1). The dependent variables are (1, 2) Time spent doing unpaid work; (3, 4) Time spent doing indirect care activities; and (5, 6) Time spent doing direct care activities. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status, if there is at least one minor under 5 years old at home and log of the department GDP. Fixed effects at the city and year-month level were added. Standard errors are clustered at the city level.

First, we find a positive and statistically significant effect in the time low-educated native women spent doing unpaid care activities of approximately 0.87 hours per week. This effect comes mainly from time spent doing indirect care activities, which increased, on average, by 0.53 hours per week, while the time spent doing direct care activities increased by only 0.35 hours per week (Table 5). Second, there are no statistically significant effects for the high-educated native women in any of the unpaid care outcomes.

Nevertheless, we do not find evidence of high-educated women's reducing their time spent doing care activities via the outsourcing of domestic production as Cortés and Tessada (2011) find for the US labor market. The authors argue that increasing the supply of low-skilled immigrants leads high-skilled native women, who have the highest opportunity cost of time, to change their time-use decisions. In Section 7 we further discuss this hypothesis (*complementary-effect*).

[7]We define unpaid work time as entire time spent doing indirect care and direct care activities.

6.1 Heterogeneous effects

We would like to evaluate whether women from households in which there is at least one minor under 5 years old at home differentiated labor market outcomes as a result of the migratory shock. This enables us to test the "care chain" hypothesis, which states that households with children would benefit more from outsourcing domestic production (hiring nannies, tutors, or domestic workers) than other households: we should observe high-educated women substituting time devoted to household production to paid work by hiring household production services for a lower price due to the migratory shock (Cortés & Tessada, 2011).

We find a statistically significant reduction of 0.62 to 0.98 p.p. in labor force participation for low-educated native women with and without minors in the household as a consequence of the migratory shock. On the other hand, we find that high-educated native women with minors in the household increase their participation by 1.62 p.p. due to the shock. Finally, for the other outcomes we find no statistical effects (Table 6).

a. Labor market outcomes

Table 6: Heterogeneous effects by educational level and presence of minors in the household

	(1) Low-educated No minor	(2) High-educated No minor	(3) Low-educated Minor	(4) High-educated Minor
A. Participation				
Share of female immigrants	-0.0062*	0.0021	-0.0098*	0.0162**
	(0.0033)	(0.0074)	(0.0047)	(0.0062)
F-statistics	30.38	14.26	30.60	21.77
Observations	925,968	134,629	378,316	40,997
B. Unemployment				
Share of female immigrants	0.0013	0.0041	0.0044	-0.0085
	(0.0029)	(0.0056)	(0.0060)	(0.0109)
F-statistics	27.65	14.36	28.54	20.44
Observations	467,758	113,500	210,959	36,017
C. Paid work				
Share of female immigrants	-0.2313	-0.0568	-0.5232	0.8225
	(0.2183)	(0.1987)	(0.3800)	(0.6377)
F-statistics	30.38	14.26	30.60	21.77
Observations	925,968	134,629	378,316	40,997
D. Earnings				
Share of female immigrants	-0.0379	-0.0433	-0.0915	0.0192
	(0.0527)	(0.2524)	(0.0547)	(0.1916)
F-statistics	30.38	14.26	30.60	21.77
Observations	925,968	134,629	378,316	40,997

Note: This table contains the estimated coefficients from Equation (1). The dependent variables are (a) If participates in the labor market, (b) If unemployed, (c) If currently working and (d) Log of the monthly labor income in real terms. Columns (1) and (2) show results for low-educated and high-educated women without minors under 5 years old at home. Columns (3) and (4) show results for low-educated and high-educated women with at least one minor under 5 years old at home. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and log of the department GDP. Standard errors are clustered at the city level.

b. Unpaid care burden

We find a significant effect of the share of female immigrants on the time low-educated native women with and without minors in the household spent doing unpaid care activities.

In particular, low-educated women increase by 0.83 and 0.95 hours per week the time they devote to such activities. This effect is driven by an increase in indirect care for low-educated women with no children (a 0.60 hour increase) and an increase in direct care for low-educated women with children (a 0.57 hour increase).

Table 7: Heterogeneous effects by educational level and presence of minors in the household

	(1) Low-educated No minors	(2) High-educated No minors	(3) Low-educated Minors	(4) High-educated Minors
A. Unpaid work				
Share of female immigrants	0.8247**	0.3467	0.9446*	0.3154
	(0.2967)	(0.3272)	(0.5340)	(0.6752)
-statistics	30.38	14.26	30.60	21.77
Observations	925,968	134,629	378,316	40,997
B. Indirect care				
Share of female immigrants	0.5993*	0.0589	-0.3755	0.1127
	(0.2915)	(0.2660)	(0.3441)	(0.2643)
F-statistics	30.38	14.26	30.60	21.77
Observations	925,968	134,629	378,316	40,997
C. Direct care				
Share of female immigrants	0.2334	0.2866	0.5711*	0.1846
	(0.1522	(0.2260)	(0.3150)	(0.5332)
F-statistics	30.38	14.26	30.60	21.77
Observations	925,968	134,629	378,316	40,997

Note: This table contains the estimated coefficients from Equation (1). The dependent variables are (a) Time spent doing unpaid work, (b) Time spent doing indirect care activities and (c) Time spent doing direct care activities. Columns (1) and (2) show results for low-educated and high-educated women without minors under 5 years old at home. Columns (3) and (4) show results for low-educated and high-educated women with at least one minor under 5 years old at home. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and log of the department GDP. Standard errors are clustered at the city level.

To sum up, we find that the immigration of female working-age Venezuelans harmed the participation in the labor market of low-educated native women and increased the time they spent doing unpaid care activities (both indirect and direct care). Furthermore, we find an

increase in labor force participation of high-educated native women with children.

7 Mechanisms

In this section, we study different mechanisms that could explain our results. Below we discuss the two main channels through which female migration can affect the local labor markets, according to the literature.

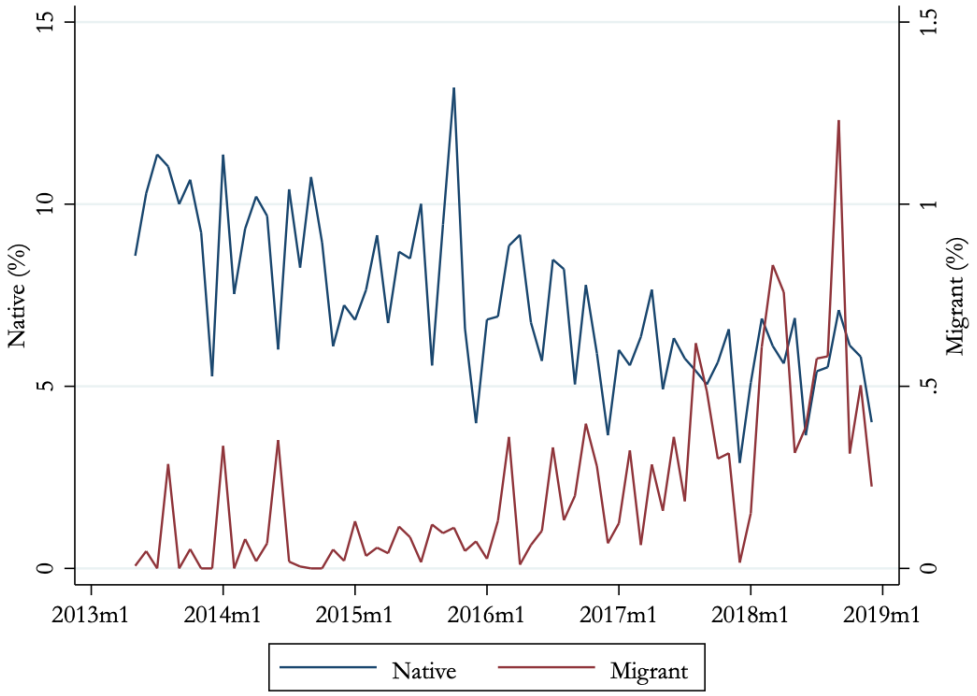
7.1 Home Production Channel

There is evidence that the influx of migrant women could reduce the burden of care and domestic work that prevents native women from working. The "care chain" refers to the increase in labor force participation of native women after significant migration shocks of low-educated female workers, as this opens up the possibility for hiring domestic services at low cost for native households (Pedrazzi & Peñaloza 2020; Cortes & Tessada, 2011; Hiller & Rodríguez-Chatruc, 2020).

Table 3 shows that migrants mostly work as employees in the private sector or as self-employed. Even though between 2013 and 2018 there was an increase of 1.7 p.p. accross both native and migrant women who self-report t domestic work as their main job occupation , Figure 4 shows that the share of households classified as high educated (the head of the household has a college degree or more) who hired domestic work declined over time. Moreover, we do not find a significant increase in the number of working hours per week for high-educated native women (Table 6) nor a decrease in the time they spent doing unpaid work (Table 7). Therefore, it does not seem to be the case that the migratory shock

in Colombia had a complementary effect via outsourcing home production as Cortés and Tessada (2011) document for the United States.

Figure 4: Share of Households with a High-educated Head with Domestic Workers, 2013–2018



Note: This figure shows the share of households with a high-educated head who hired domestic work by the origin of the domestic worker (native or migrant from Venezuela).
Source: Own calculation using GEIH data.

A plausible explanation for this result is that in Colombia the outsourcing of home production was easily accessible even prior to the migratory phenomenon. Mainly due to the fact that domestic work is still a highly informal occupation in Colombia characterized by relative low wages and a lack of social security [8]. This is contrary to the case of the United States, where the shortage of individuals willing to do paid domestic work has raised

[8]Domestic workers in Colombia earn, on average, 70 percent of the mandatory monthly minimum wage (Otero-Cortes & Acosta, 2021)

the average wages of the occupation, making less households willing to outsource home production. Because in Colombia high-earning households have always had the option of outsourcing home production, the migratory shock might have only marginally changed its cost, which is different from what happened in the United States.

7.2 Complementary-skills Channel

To test for the complementary-skills channel, we estimate Equation (1) using a 2SLS approach and the exact specification used for the results in Section 5 on the following outcome: a dummy variable that takes the value of 1 if the individual is an entrepreneur and 0 otherwise. We present the results in Table 8.

Table 8: Estimates for likelihood of becoming a female entrepreneur

	Entrepreneur	
	Low-educated	High-educated
Share of female immigrants	-0.0010	0.0096***
	(0.0011)	(0.0029)
Controls	Yes	Yes
F-statistics	23.66	15.16
City FE	Yes	Yes
Period Fe	Yes	Yes
Observations	585,368	133,218

Note: This table contains the estimated coefficients from Equation (1). The dependent variable is a dichotomous variable equal to 1 when the individual's reported job occupation is "employer" and 0 in any other case. The sample includes working-age native women who were working. Controls include age, age squared, marital status, if there is at least one minor under 5 years old at home and log of the department GDP. Fixed effects at the city and year-month level were added. Industry-sector fixed effects added when reported. Standard errors are clustered at the city level.

Table 9: Estimates for likelihood of becoming a female native entrepreneur – minors vs. no minors at home

	No Minors		Minors	
	Low-educated	High-educated	Low-educated	High-educated
Share of female immigrants	-0.0008	0.0091***	-0.0016	0.0113*
	(0.0013)	(0.0040)	(0.0013)	(0.0051)
Controls	Yes	Yes	Yes	Yes
F-statistics	24.38	14.04	24.02	19.88
City FE	Yes	Yes	Yes	Yes
Period Fe	Yes	Yes	Yes	Yes
Observations	410,465	101,775	174,903	31,443

Note: This table contains the estimated coefficients from Equation (1). The dependent variable is a dichotomous variable equal to 1 when the individual's reported job occupation is "employer" and 0 in any other case. The sample includes working-age native women who were working. Sample is split between high-educated and low-educated women with and without the presence of at least one minor at home. Controls include age, age squared, marital status and log of the department GDP. Fixed effects at the city, year-month and industry level were added. Our results are robust to not adding industry fixed effects. Standard errors are clustered at the city level.

The results show that high-educated native women are more likely to become entrepreneurs as a consequence of the migratory shock, but there is no significant effect on the likelihood of becoming entrepreneurs for low-educated native women (see Table 8).

We also find heterogeneous effects of the migratory shock in the likelihood of women's becoming entrepreneurs. There are only positive effects for high-educated women and no effects for low-educated women. Additionally, high-educated women with children at home are the ones who benefit the most as they are 1.1 p.p. more likely to become entrepreneurs, while the effect on high-educated women without children is 0.86 p.p. Overall, these results are in line with Tabellini (2020), who argues that the arrival of low-educated immigrants increases the employment of high-educated natives through the reduction of production costs; lower costs allow firms to grow, which results in the creation of new job opportunities for high-educated natives.

We also would like to test whether the previous results would change if we focus on women who are in fact the mothers of the minors. For this exercise, we have a reduced sample, because we only retain women who have children 5 years old or younger. Our results are consistent: high-educated women benefit from the migratory shock and are more likely to become entrepreneurs, in particular if they are mothers.

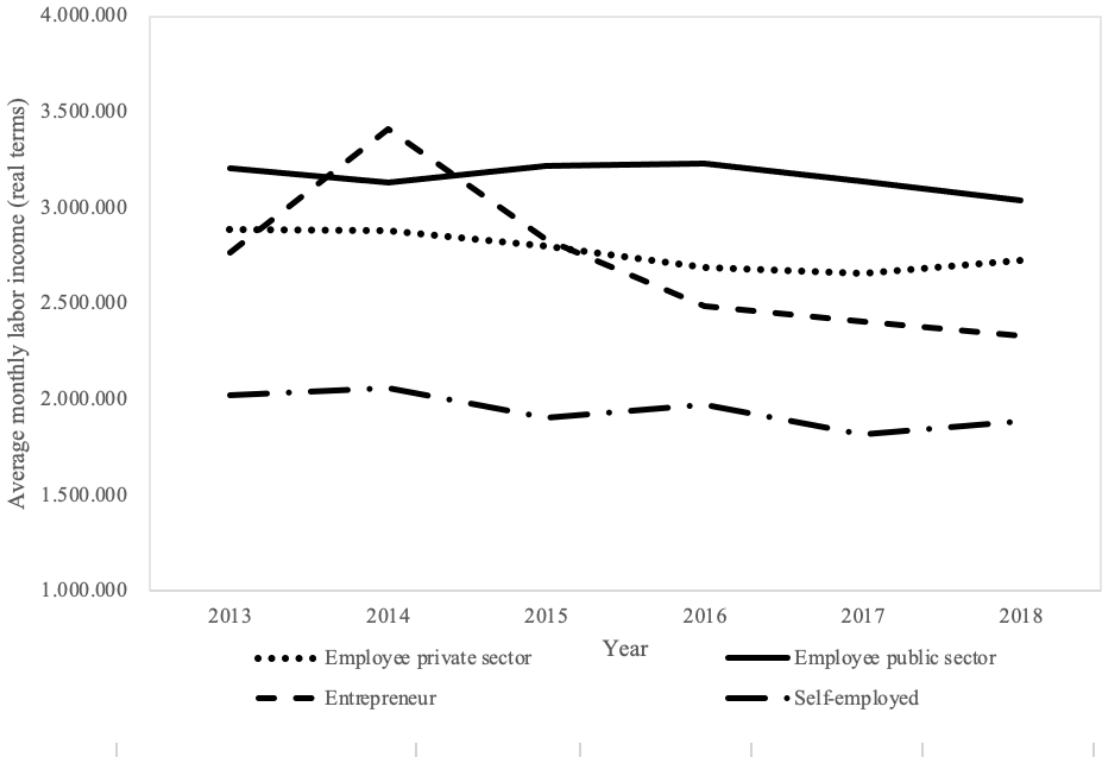
Table 10: Estimates for likelihood of becoming a female entrepreneur – children vs. no children at home

	No minors		Minors	
	Low-educated	High-educated	Low-educated	High-educated
Share of female immigrants	-0.004	0.0080**	-0.0041*	0.0179**
	(0.0012)	(0.0033)	(0.0022)	(0.0076)
Controls	Yes	Yes	Yes	Yes
F-statistics	23.93	14.67	22.99	16.86
City FE	Yes	Yes	Yes	Yes
Period Fe	Yes	Yes	Yes	Yes
Observations	500,807	112,905	84,561	20,313

Note: This table presents the estimated coefficients from Equation (1). The dependent variable is a dichotomous variable equal to 1 when the individual's reported job occupation is "employer" and 0 in any other case. The sample includes working-age native women who were working. Controls include age, age squared, marital status and log of the department GDP. Fixed effects at the city and year-month level were added. Standard errors are clustered at the city level.

Due to the results presented in both this subsection and the previous one, we argue that the complementary-skills channel is the main driving force with regard to the observed positive effect of migration on labor force participation for high-educated women with the presence of at least one minor at home. This is because being an entrepreneur is a well-paid activity on average (see Figure 5), but with the added work schedule flexibility that usually prevents women from participating in the labor market.

Figure 5: Average monthly labor income per job occupation for high-educated native women, 2013–2018



Note: This figure shows the average reported labor income by job occupation for high-educated native women. Not included in the figure other job occupation types, which represent less than 2 percent of the sample.
Source: Own calculation using GEIH data.

7.3 Robustness checks

Finally, as a robustness check we estimate Equation (1) using a sample that only includes native men. We consider as our outcomes of interest the same list of outcomes we evaluated for women and we also include the likelihood of becoming a male entrepreneur. We present the results in Table 11 and 12.

Table 11: Estimates for labor market outcomes for men

	(1) Participation Low-educated	(2) Participation High-educated	(3) Unemployment Low-educated	(4) Unemployment High-educated	(5) Paid Work Low-educated	(6) Paid Work High-educated	(7) Earnings Low-educated	(8) Earnings High-educated
Share of female immigrants	-0.0073** (0.0035)	-0.0002 (0.0054)	0.0001 (0.0025)	0.0060 (0.0039)	0.0551 (0.1860)	-0.2423 (0.1910)	0.0376 (0.1130)	-0.1427 (0.3554)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic	- 30.29	14.96	28.57	15.92	30.29	14.96	30.29	14.96
Observations	1,153,881	141,051	803,433	126,763	1,153,881	141,051	1,153,881	141,051

Note: This table contains the estimated coefficients from Equation (1). The dependent variables are (1, 2) If participates in the labor market, (3, 4) If unemployed, (5, 6) If currently working and (7, 8) Log of the monthly labor income in real terms. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status, if there is at least one minor under 5 years old at home and log of the department GDP. Fixed effects at the city and year-month level were added. Industry-sector fixed effects added when reported. Standard errors are clustered at the city level.

Table 12: Estimates for unpaid care and domestic work for men

	(1) Unpaid work Low-educated	(2) Unpaid work High-educated	(3) Indirect care Low-educated	(4) Indirect care High-educated	(5) Direct care Low-educated	(6) Direct care High-educated
Share of female immigrants	0.0460 (0.1747)	0.4963 (0.3286)	-0.0799 (0.1301)	0.1393 (0.1836)	0.1310 (0.0789)	0.3369* (0.1813)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	30.29	14.96	30.29	14.96	30.29	14.96
Observations	1,153,881	141,051	1,153,881	141,051	1,153,881	141,051

Note: This table contains the estimated coefficients from Equation (1). The dependent variables are (1, 2) Time spent doing unpaid work, (3, 4) Time spent doing indirect care activities and (5, 6) Time spent doing direct care activities. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status, if there is at least one minor under 5 years old at home and log of the department GDP. Fixed effects at the city and year-month level were added. Standard errors are clustered at the city level.

We also find a negative effect of female migration on labor force participation for low-educated men. This could mean that migrants compete with locals for jobs in that segment of the labor market regardless of their gender, as has been pointed out in the literature (Bonilla et al., 2020; Delgado-Prieto, 2021), but we do not find any other significant effect in the evaluated labor market outcomes. Additionally, we find an increase in time spent doing direct care activities for high-educated men, which seems plausible given the increased labor

force participation of high-educated women with children.

Table 13: Estimates for likelihood of becoming a male entrepreneur

	No minors		Minors	
	Low-educated	High-educated	Low-educated	High-educated
Share of female immigrants	-0.0003	-0.0092	0.0011	-0.0060
	(0.0016)	(0.0058)	(0.0025)	(0.0109)
Controls	Yes	Yes	Yes	Yes
F-statistics	25.65	15.64	30.50	12.59
City FE	Yes	Yes	Yes	Yes
Period Fe	Yes	Yes	Yes	Yes
Observations	496,097	87,062	201,369	23,906

Note: This table contains the estimated coefficients from Equation (1). The dependent variable is a dichotomous variable equal to 1 when the individual's reported job occupation is "employer" and 0 in any other case. The sample includes working-age native men who were working. Sample is split between high-educated and low-educated men with and without the presence of at least one minor at home. Controls include age, age squared, marital status and log of the department GDP. Fixed effects at the city, year-month and industry level were added. Industry-sector fixed effects added when reported. Standard errors are clustered at the city level.

We find no effects of migration on the likelihood of native men becoming entrepreneurs (Table 13). This could indicate that the complementary-skills channel only applies to native women, because it helps diminish some of the difficulties women face while accessing the labor force, due to time constraints and the care burden, which men did not face in a large proportion before the migratory shock. Those difficulties are more severe for women with at least one minor at home, primarily mothers. The literature has shown this is not necessarily the case for men: their time constraints are not binding, as they are for women, when it comes to choosing how much work versus care activities to do.

8 Concluding Remarks

We study the impact of a large migration shock in Colombia, driven by the Venezuelan political and economic crisis, on female labor market and time-use outcomes. The estimated effects are heterogeneous, depending on women's individual characteristics such as the education level and presence of children under 5 years old at home.

We hypothesize that immigrants can act as substitutes for low-educated native workers and complements for high-educated native workers in the local labor market. Our results show that the substitution effect happened as a response to the migratory shock: there was a decrease in LFP of 0.62 and 0.98 pp for low-educated female workers without and with at least one minor at home, respectively. Moreover, we find evidence that low-educated native women are led to transit from paid to unpaid work due to the migratory shock. Low-educated women with children at home in particular began to spend more time doing direct care activities, while low-educated women without children at home started devoting more time to indirect care activities. We do not find effects on wages, because displaced native women seem to be switching out of the labor force.

On the other hand, there is evidence of complementary skills between high-educated natives and immigrants. Our findings indicate that high-educated native women with at least one minor at home increased their participation in the labor market by 1.62 p.p. Interestingly, they were also between 0.9 and 1.1 p.p. more likely to become entrepreneurs due to the migratory shock. We do not find significant effects on LFP for high-educated women without at least one minor at home, but there is still a significant effect on the likelihood of becoming entrepreneurs as a consequence of the migratory shock.

Finally, we do not find evidence of the "care chain" happening, in which high-educated

women outsource low-cost home production to free up time for working more hours in the labor market. First, we find no significant effects on the number of working hours for high-educated native women nor a decline in the time they spent doing care activities. What is more, we find a decline in the share of households with a high-educated head who hire domestic work. Moreover, the change in the composition of domestic workers by their country of origin (native vs. immigrant) is very small. In developing countries, contrary to developed countries, the domestic labor market is filled by the natives due to inequality and low access to job opportunities. Therefore, immigrant women are not needed to fill a gap in a labor-scarce industry. On the contrary, domestic work in Colombia is a sector in which women compete for their positions and the demand does not necessarily exceed the supply.

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9 Appendix

Table A1: Labor market statistics by city, 2013 and 2018.

	2013			2018		
	LFP	Occupation	UR	LFP	Occupation	UR
Barranquilla	61.01	56.15	7.96	65.06	59.56	8.46
Bogotá D.C	71.96	65.46	9.03	69.11	61.86	10.49
Bucaramanga	69.80	63.26	9.37	67.13	61.21	8.81
Cali	66.02	56.61	14.25	67.45	59.67	11.53
Cartagena	59.81	53.87	9.92	56.66	51.73	8.71
Cúcuta	66.94	56.49	15.61	60.92	50.98	16.32
Florencia	58.45	51.29	12.24	59.54	51.81	13.00
Ibagué	69.65	60.04	13.79	65.24	55.97	14.21
Manizales	60.45	53.45	11.58	59.53	52.83	11.24
Medellín	65.60	58.25	11.20	65.42	57.73	11.75
Montería	65.61	58,48	10,86	63.84	57.43	10.04
Neiva	65.69	57.85	11.94	63.06	55.75	11.60
Pasto	67.98	60.69	10.73	64.70	58.91	8.96
Pereira	60.62	52.23	13.83	65.16	59.26	9.05
Popayán	56.99	48.11	15.57	59.11	52.68	10.88
Quibdó	61.19	50.02	18.27	58.53	48.08	17.85
Riohacha	65.45	58.72	10.29	62.29	53.48	14.15
Santa Marta	62.04	55.90	9.90	59.50	54.50	8.41
Sincelejo	64.61	57.87	10.42	68.22	61.65	9.62
Tunja	62.25	54.71	12.10	61.40	54.49	11.25
Valledupar	61.94	55.81	9.89	61.15	52.12	14.76
Villavicencio	63.09	55.97	11.28	65.98	58.10	11.93

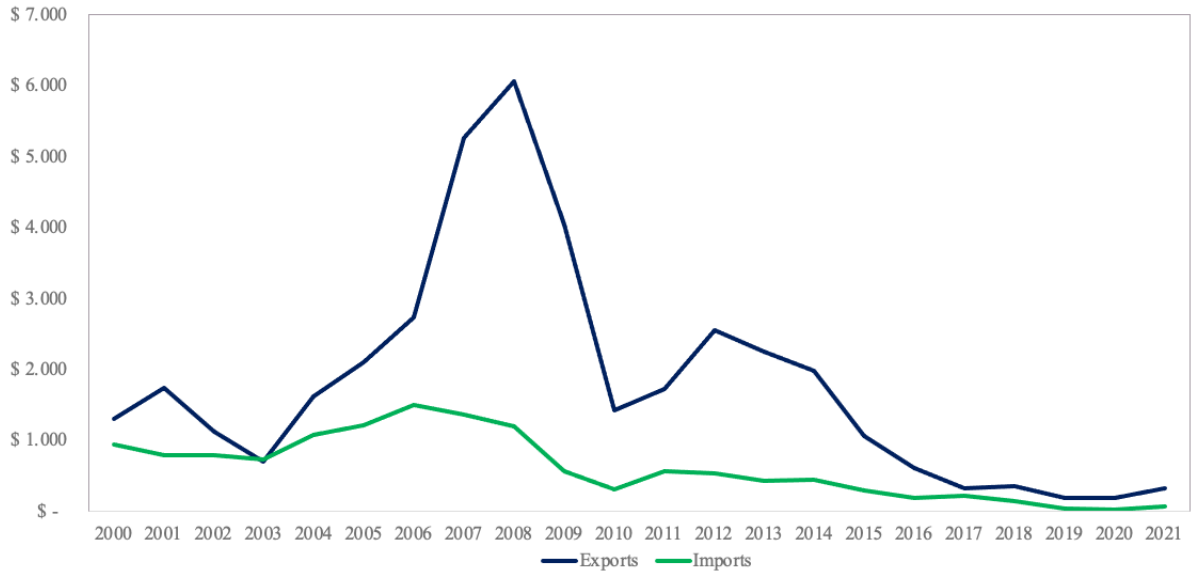
Notes: This table contains a summary of the main labor market statistics for the main 23 cities of Colombia for 2013 and 2018. We compute labor force participation rate (LFP), occupation rate and unemployment rate (UR). Source: GEIH. Authors calculations.

Table A2: First stage results for baseline specification

			Low Education		High Education	
	Low educ	High educ	Minors	No minors	Minors	No minors
Bartik	-10.4453***	-8.8719*	-9.7666***	-10.7877***	-9.8880*	-8.4199*
	(2.95)	(4.56)	(2.9916)	(2.9126)	(5.7202)	(4.1877)
Bartik lagged	-115.4828***	102.3661*	110.4971***	117.9659***	112.2922**	98.0119**
	(26.57)	(40.83)	(27.8076)	(25.7899)	(52.6002)	(37.0782)
R-squared	0.7995	0.8104	0.7943	0.8030	0.8013	0.8145
Observations	1,304,284	175,626	378,316	925,968	40,997	134,629

Notes: This table contains the estimated coefficients from Equation (3). Dependent variables: current migration flow. The sample includes working-age native women who were working. Depending on the estimation, the sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women and also between women with at least one minor at home or without a minor at home. Controls include age, age squared, marital status and log of the department GDP. Fixed effects at the city and year-month level were added. Standard errors are clustered at the city level.

Figure A1: Value of imports and exports between Colombia and Venezuela, 2000-2021 (million of dollars)



Note: The value of exports is in FOB dollars and the valye of imports is in CIF dollars. Source: DIAN-DANE.

Table A3: Estimates for labor market outcomes and paid work by educational level using a six-month lag

	(1) Participation Low-educated	(2) Participation High-educated	(3) Unemployment Low-educated	(4) Unemployment High-educated	(5) Paid Work Low-educated	(6) Paid Work High-educated	(7) Earnings Low-educated	(8) Earnings High-educated
Share of female immigrants	-0.0063*	0.0053*	-0.0018	-0.0020	-0.0805	0.3673**	-0.0657	-0.2046
	(0.0036)	(0.0027)	(0.0019)	(0.0026)	(0.1137)	(0.1431)	(0.0385)	(0.1569)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic	31.21	16.10	28.44	16.07	31.21	16.10	31.21	16.10
Observations	1,242,032	168,282	646,054	143,127	1,242,032	168,282	1,242,032	168,282

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (1, 2) If participates in the labor force; (3, 4) If unemployed; (5, 6) Time spent working per week; (7, 8) Logarithm of the monthly labor income in real terms. The sample includes working-age native women. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status, if there a minors under 5 years old at home and logarithm of the department GDP. Fixed effects at the city and year-month level were added. Standard errors are clustered at the city level.

Table A4: Estimates for time use outcomes and unpaid work by educational level using a six-month lag

	(1) Unpaid Work Low-educated	(2) Unpaid Work High-educated	(3) Indirect Care Low-educated	(4) Indirect Care High-educated	(5) Direct Care Low-educated	(6) Direct Care High-educated
Share of female immigrants	0.6437**	0.3046	0.3340	0.1702	0.3130*	0.1329
	(0.3441)	(0.3172)	(0.2936)	(0.1962)	(0.1707)	(0.1818)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	31.21	16.10	31.21	16.10	31.21	16.10
Observations	1,242,032	168,282	1,242,032	168,282	1,242,032	168,282

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (1, 2) Time spent doing unpaid work; (3, 4) Time spent doing indirect care activities; (5, 6) Time spent doing direct care activities. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status, if there a minors under 5 years old at home and log of the department GDP. Fixed effects at the city and year-month level were added. Standard errors are clustered at the city level.

Table A5: Heterogeneous effects by educational level and presence of minors in the household using a six-month lag

	(1) Low-educated No minor	(2) High-educated No minor	(3) Low-educated Minor	(4) High-educated Minor
A. Participation				
Share of female	-0.0062	0.0023	-0.0067*	0.0155***
immigrants	(0.0037)	(0.0041)	(0.0038)	(0.0040)
F-statistics	33.76	16.62	28.57	15.12
Observations	882,852	129,079	359,180	39,203
B. Unemployment				
Share of female	-0.0011	0.0017	-0.0043	-0.0141**
immigrants	(0.0017)	(0.0022)	(0.0033)	(0.0060)
F-statistics	30.41	16.09	27.40	16.30
Observations	445,740	108,716	200,314	34,411
C. Paid work				
Share of female	-0.1103	0.2128	-0.0067	0.9119**
immigrants	(0.1074)	(0.2220)	(0.1491)	(0.4051)
F-statistics	33.76	16.62	28.57	15.12
Observations	882,852	129,079	359,180	39,203
D. Earnings				
Share of female	-0.0721*	-0.2128	-0.0521	-0.1345
immigrants	(0.0397)	(0.1549)	(0.0394)	(0.1748)
F-statistics	33.76	16.62	28.57	15.12
Observations	882,852	129,079	359,180	39,203

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (A) If participates in the labor market; (B) If unemployed; (C) If currently working; (D) Log of the monthly labor income in real terms. Columns (1) and (2) show results for low educated and high educated women who do not have the presence of minors under 5 years old at home. Columns (3) and (4) show results for low educated and high educated women who have the presence of minors under 5 years old at home. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and log of the department GDP. Standard errors are clustered at the city level.

Table A6: Heterogeneous effects by educational level and presence of minors in the household using a six-month lag

	(1) Low-educated No minors	(2) High-educated No minors	(3) Low-educated Minors	(4) High-educated Minors
A. Unpaid work				
Share of female immigrants	0.6602**	0.2458	0.7198	0.4732
	(0.2935)	(0.2730)	(0.5467)	(0.5889)
F-statistics	33.76	16.62	28.57	15.12
Observations	882,852	129,079	359,180	39,203
B. Indirect care				
Share of female immigrants	0.4061	0.0970	0.2008	0.3057
	(0.2785)	(0.1833)	(0.3325)	(0.2936)
F-statistics	33.76	16.62	28.57	15.12
Observations	882,852	129,079	359,180	39,203
C. Direct care				
Share of female immigrants	0.2596*	0.1504	0.5171	0.1590
	(0.1283)	(0.1316)	(0.3559)	(0.4578)
F-statistics	33.76	16.62	28.57	15.12
Observations	882,852	129,079	359,180	39,203

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (A) Time spent doing unpaid work; (B) Time spent doing indirect care activities; (C) Time spent doing direct care activities. Columns (1) and (2) show results for low educated and high educated women who do not have the presence of minors under 5 years old at home. Columns (3) and (4) show results for low educated and high educated women who have the presence of minors under 5 years old at home. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and log of the department GDP. Standard errors are clustered at the city level.

Table A7: Estimates for labor market outcomes and paid work by educational level - Controlling for trade

	(1) Participation Low-educated	(2) Participation High-educated	(3) Unemployment Low-educated	(4) Unemployment High-educated	(5) Paid Work Low-educated	(6) Paid Work High-educated	(7) Earnings Low-educated	(8) Earnings High-educated
A. Including exports								
Share of female immigrants	-0.0120***	0.0016	0.0033	0.0032	-0.5053	0.0686	-0.0739	-0.1101
	(0.0031)	(0.0062)	(0.0029)	(0.0072)	(0.3506)	(0.3506)	(0.0575)	(0.2822)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic	31.33	14.17	28.44	16.07	31.33	14.17	31.33	14.17
Observations	820,524	106,730	426,163	90,324	820,524	106,730	820,524	106,730
B. Including GDP and exports								
Share of female immigrants	-0.0109***	0.0026	0.0046	0.0021	-0.4777	0.1277	-0.0580	-0.0287
	(0.0031)	(0.0063)	(0.0032)	(0.0070)	(0.3500)	(0.3491)	(0.0533)	(0.2808)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic	30.94	14.21	28.44	16.07	30.94	14.21	30.94	14.21
Observations	820,524	106,730	426,163	90,324	820,524	106,730	820,524	106,730

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (1, 2) If participates in the labor force; (3, 4) If unemployed; (5, 6) Time spent working per week; (7, 8) Logarithm of the monthly labor income in real terms. The sample includes working-age native women. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and if there a minors under 5 years old at home and for panel (A) logarithm of the department exports (value in USD) and for panel (B) logarithm of the department GDP and logarithm of the department exports (value in USD). Fixed effects at the city and year-month level were added. Standard errors are clustered at the city level.

Table A8: Estimates for time use outcomes and unpaid work by educational level- Controlling for trade

	(1) Unpaid Work Low-educated	(2) Unpaid Work High-educated	(3) Indirect Care Low-educated	(4) Indirect Care High-educated	(5) Direct Care Low-educated	(6) Direct Care High-educated
A. Including exports						
Share of female immigrants	0.8960**	0.0706	0.6674**	0.0085	0.2373	0.0737
	(0.3829)	(0.3883)	(0.2947)	(0.3101)	(0.1813)	(0.2538)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	31.33	14.17	31.33	14.17	31.33	14.17
Observations	820,524	106,730	820,524	106,730	820,524	106,730
B. Including GDP and exports						
Share of female immigrants	0.9603**	0.1680	0.6677**	0.0145	0.1656	-0.0580
	(0.3748)	(0.3959)	(0.3026)	(0.3117)	(0.2699)	(0.0533)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	30.94	14.21	30.94	14.21	30.94	14.21
Observations	820,524	106,730	820,524	106,730	820,524	106,730

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (1, 2) Time spent doing unpaid work; (3, 4) Time spent doing indirect care activities; (5, 6) Time spent doing direct care activities. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and if there a minors under 5 years old at home and for panel (A) logarithm of the department exports (value in USD) and for panel (B) logarithm of the department GDP and logarithm of the department exports (value in USD) Fixed effects at the city and year-month level were added. Standard errors are clustered at the city level.

Table A9: Heterogeneous effects by educational level and presence of minors in the household - Controlling for trade

	(1) Low-educated No minor	(2) High-educated No minor	(3) Low-educated Minor	(4) High-educated Minor
A. Participation				
Share of female	-0.0109**	-0.0043	-0.0155***	0.0173**
immigrants	(0.0039)	(0.0077)	(0.0038)	(0.0064)
F-statistics	31.61	12.63	31.99	20.35
Observations	592,354	83,455	228,170	23,275
B. Unemployment				
Share of female	0.0026	0.0064	0.0051	-0.0108
immigrants	(0.0030)	(0.0067)	(0.0072)	(0.0119)
F-statistics	28.96	12.64	26.77	19.85
Observations	298,230	69,873	127,933	20,451
C. Paid work				
Share of female	-0.4143	-0.2939	-0.7668	1.2206*
immigrants	(0.3249)	(0.3262)	(0.5507)	(0.5995)
F-statistics	31.61	12.63	31.99	20.35
Observations	592,354	83,455	228,170	23,275
D. Earnings				
Share of female	-0.0593	-0.1485	-0.1323*	0.0422
immigrants	(0.0644)	(0.2984)	(0.0668)	(0.2645)
F-statistics	31.61	12.63	31.99	20.35
Observations	592,354	83,455	228,170	23,275

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (A) If participates in the labor market; (B) If unemployed; (C) If currently working; (D) Log of the monthly labor income in real terms. Columns (1) and (2) show results for low educated and high educated women who do not have the presence of minors under 5 years old at home. Columns (3) and (4) show results for low educated and high educated women who have the presence of minors under 5 years old at home. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and log of the department exports (value in USD). Standard errors are clustered at the city level.

Table A10: Heterogeneous effects by educational level and presence of minors in the household - Controlling for trade and GDP

	(1) Low-educated No minor	(2) High-educated No minor	(3) Low-educated Minor	(4) High-educated Minor
A. Participation				
Share of female	-0.0100**	-0.0033	-0.0138***	0.0185***
immigrants	(0.0039)	(0.0080)	(0.0034)	(0.0060)
F-statistics	30.46	12.34	34.12	22.50
Observations	592,354	83,455	228,170	23,275
B. Unemployment				
Share of female	0.0038	0.0051	0.0066	-0.0118
immigrants	(0.0032)	(0.0066)	(0.0077)	(0.0122)
F-statistics	27.48	12.42	27.59	21.88
Observations	298,230	69,873	127,933	20,451
C. Paid work				
Share of female	-0.3940	-0.2578	-0.7266	1.3388**
immigrants	(0.3304)	(0.3171)	(0.5438)	(0.5953)
F-statistics	30.46	12.34	34.12	22.50
Observations	592,354	83,455	228,170	23,275
D. Earnings				
Share of female	-0.0449	-0.0549	-0.1147*	0.0928
immigrants	(0.0634)	(0.2952)	(0.0587)	(0.2667)
F-statistics	30.46	12.34	34.12	22.50
Observations	592,354	83,455	228,170	23,275

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (A) If participates in the labor market; (B) If unemployed; (C) If currently working; (D) Log of the monthly labor income in real terms. Columns (1) and (2) show results for low educated and high educated women who do not have the presence of minors under 5 years old at home. Columns (3) and (4) show results for low educated and high educated women who have the presence of minors under 5 years old at home. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and log of the department GDP and log of the department exports (value in USD). Standard errors are clustered at the city level.

Table A11: Heterogeneous effects by educational level and presence of minors in the household - Controlling for trade

	(1) Low-educated No minors	(2) High-educated No minors	(3) Low-educated Minors	(4) High-educated Minors
A. Unpaid work				
Share of female immigrants	0.9607***	0.2786	0.7683	-0.2836
	(0.3126)	(0.3852)	(0.6629)	(0.8709)
F-statistics	31.61	12.63	31.99	20.35
Observations	592,354	83,455	228,170	23,275
B. Indirect care				
Share of female immigrants	0.7708**	0.0169	0.4518	-0.0305
	(0.2747)	(0.3360)	(0.3757)	(0.3325)
F-statistics	31.61	12.63	31.99	20.35
Observations	592,354	83,455	228,170	23,275
C. Direct care				
Share of female immigrants	0.2007	0.2737	0.3194	-0.2641
	(0.1582)	(0.2663)	(0.3621)	(0.6706)
F-statistics	31.61	12.63	31.99	20.35
Observations	592,354	83,455	228,170	23,275

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (A) Time spent doing unpaid work; (B) Time spent doing indirect care activities; (C) Time spent doing direct care activities. Columns (1) and (2) show results for low educated and high educated women who do not have the presence of minors under 5 years old at home. Columns (3) and (4) show results for low educated and high educated women who have the presence of minors under 5 years old at home. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and log of the department exports (value in USD). Standard errors are clustered at the city level.

Table A12: Heterogeneous effects by educational level and presence of minors in the household - Controlling for trade and GDP

	(1) Low-educated No minors	(2) High-educated No minors	(3) Low-educated Minors	(4) High-educated Minors
A. Unpaid work				
Share of female immigrants	0.9541***	0.3262	0.9657	-0.0574
	(0.3126)	(0.3789)	(0.6273)	(0.8457)
F-statistics	30.46	12.34	34.12	22.50
Observations	592,354	83,455	228,170	23,275
B. Indirect care				
Share of female immigrants	0.7598**	0.0326	0.4703	-0.0486
	(0.2876)	(0.3379)	(0.3743)	(0.3168)
F-statistics	30.46	12.34	34.12	22.50
Observations	592,354	83,455	228,170	23,275
C. Direct care				
Share of female immigrants	0.2070	0.3057	0.4972	-0.0200
	(0.1507)	(0.2718)	(0.3456)	(0.6598)
F-statistics	30.46	12.34	34.12	22.50
Observations	592,354	83,455	228,170	23,275

Note: This table contains the estimated coefficients from Equation (1). Dependent variables: (A) Time spent doing unpaid work; (B) Time spent doing indirect care activities; (C) Time spent doing direct care activities. Columns (1) and (2) show results for low educated and high educated women who do not have the presence of minors under 5 years old at home. Columns (3) and (4) show results for low educated and high educated women who have the presence of minors under 5 years old at home. The sample includes working-age native women who were working. The sample was split between low-educated (less than a college degree) and high-educated (college degree or more) women. Controls include age, age squared, marital status and log of the department GDP and log of the department exports (value in USD). Standard errors are clustered at the city level.