# Migration, Market Power, and Firms*

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**Abstract**

I analyze the impact of migration on firm outcomes within a non-competitive framework where firms have market power in both labor and product markets. Leveraging an instrumental variables approach, I exploit the Venezuelan exodus in Colombia to examine how the influx of migrants affected wages, labor market power, and product market power in the Colombian manufacturing sector. Despite increasing labor productivity, the migration shock did not affect average wages, as firms were able to increase wage markdowns in response to the expanded labor supply. Additionally, the shift in income composition toward lower-income consumers caused by the inflow of forced migrants reduced firm product market power, leading to decreased price mark-ups. In the medium term, these productivity improvements, combined with greater labor market power, increased firm profitability without translating into higher wages, thus prompting new firm entry into the sector.

*JEL Classification:* F22, J21, J61, J42, L10, O17

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# 1 Introduction

Migration is a growing global phenomenon. According to IOM (2022), the global immigrant population increased from 173 million in 2000 to 281 million in 2020, representing a 62% rise.[1] While extensive research has explored the economic implications of migration, much of it has focused solely on viewing migration as a labor supply shock to the host economy, under the assumption that firms operate in perfectly competitive product and labor markets. These approaches tend to overlook the fact that migration can influence the economy through a consumption channel driven by the inflow of migrants (Olney, 2015; Galaasen et al., 2025). Additionally, they generally assume that migration shocks influence native wages solely through changes in the marginal productivity of labor (Ottaviano and Peri, 2012; Peri, 2016).

However, economic research has shown that labor and product markets are often far from perfectly competitive, underscoring the importance of accounting for these factors to achieve a more accurate analysis of migration impacts (Van Reenen, 2024; Deb et al., 2024). On the one hand, recent work has highlighted the pervasiveness of labor market power across both developed and developing countries (Manning, 2011; Yeh et al., 2022; Berger et al., 2022; Amodio et al., 2024; Estefan et al., 2024). Such settings suggest that firm labor market power—often overlooked—can significantly influence the wage effects of migration that we observe and estimate empirically.

On the other hand, a frequently ignored aspect of the effect of migration is its impact on demand within the host economy, specifically when considering that firms have market power in the product market. Under this setting, a migration shock can influence the labor market through a demand channel in two ways. First, by increasing the demand for goods produced locally, and therefore affecting the demand for labor and wages paid to workers (Cengiz and Tekgüç, 2022; Galaasen et al., 2025). Second, by shifting the income composition of demand, affecting firms' ability to set prices above marginal costs to local consumers and, in turn, influencing the optimal wages they offer.

Considering all these elements expands the question of how migration affects hosting

[1] In terms of the migrant share of the world population, this figure rose from 2.3% in 1990 to 3.6% in 2020.

economies beyond a simple labor supply shock on wages. It also encompasses dimensions such as the rent-sharing effects of migration, its impact on firm profits, and changes in firm dynamics.

In this paper, I aim to contribute to this research agenda by evaluating the impact of a high-skilled labor supply shock caused by a migration exodus on firm-level outcomes within a non-competitive framework, including wages, the marginal productivity of labor, wage mark-downs, and price mark-ups. In this context, firm wages depend not only on marginal productivity of labor but also on firm market power in both the output and labor markets. Additionally, I will estimate medium-run outcomes to explore how these changes affect firm profitability and entry.

I focus specifically on the influx of Venezuelan migrants into Colombia between 2012 and 2020. Amid Venezuela's economic and social turmoil, approximately 2.5 million Venezuelans sought refuge in Colombia. By leveraging geographic and temporal variations in the migrant influx, I investigate how this substantial shock influenced the Colombian manufacturing sector. To achieve this, I estimate the production function of manufacturing firms by applying the proxy variable approach from the economic literature (Ackerberg et al., 2015; Gandhi et al., 2020). This enables me to estimate the marginal productivity of inputs, as well as firm market power in both the labor and output markets, using methodologies from De Loecker and Warzynski (2012) and Yeh et al. (2022). I document significant labor and product market power among manufacturing firms, comparable to those found in developed and developing countries (Yeh et al., 2022; Amodio et al., 2024; Estefan et al., 2024).

When estimating the impact of the migration shock on firm outcomes, my results reveal several noteworthy findings. First, the migration shock had a positive effect on both employment and output (measured in quantities) of firms in the Colombian manufacturing sector. Second, given that migrant workers hired in this sector were particularly high-skilled, I find that their presence increased firm-level marginal productivity of labor. Third, despite this enhancement in productivity, the migration shock did not significantly affect the average wages paid by firms.

I interpret this puzzling result within a non-competitive framework, where firms face an

upward-sloping labor supply curve and a downward-sloping product demand curve. Under these conditions, changes in labor productivity could be offset by adjustments in wage mark-downs and price mark-ups imposed by firms in the labor and product markets, respectively. I provide evidence supporting this interpretation. On the one hand, I find that the Venezuelan exodus increased firm labor market power by heightening wage mark-downs. On the other hand, since migrants tended to have lower incomes compared to native workers and therefore are more sensitive to price changes, they shifted the demand composition, which in turn reduced price mark-ups imposed by the firms in the manufacturing sector. Altogether, these effects boosted overall firm productivity without translating into higher labor costs, thereby increasing profits and stimulating firm entry into the Colombian manufacturing sector in the years following the exodus.

This paper makes contributions to four strands of the economic literature. First, it contributes to the literature on the demand effects of migration in host economies. Previous studies often focus on how migration episodes influence demand, production decisions, or specific markets such as housing (Saiz, 2003, 2007; Kerr and Kerr, 2011; Gonzalez and Ortega, 2013; Olney, 2015; Howard, 2020; Cengiz and Tekgüç, 2022; Peri et al., 2022; McCully et al., 2024; Galaasen et al., 2025). However, most of these studies rely on a competitive framework in the product market. The closest papers to this one are those by Olney (2015) and Galaasen et al. (2025). In these works, the authors argue that migration can influence native wages through a consumption channel. Specifically, an increase in the demand for goods driven by an inflow of migrants can directly affect the demand for labor, thereby influencing the wages perceived by workers in the host economy.

However, this paper is the first to examine the demand impact of migration within a framework where firms possess product market power and can set prices above marginal cost. I demonstrate that, under this setting, a migration shock can influence wages through an additional channel beyond the traditional consumption mechanism. Specifically, I provide evidence that if firms have market power in the local product market and migrants exhibit different demand elasticities due to their characteristics, such as income levels or consumption preferences, migration can impact wages by influencing the firm's ability to impose price

mark-ups.

Second, this paper contributes to the literature on the labor market impacts of migration under imperfect competition in the labor market (Naidu et al., 2016; Amior and Manning, 2020; Amior and Stuhler, 2022; Elias et al., 2024). Most studies on the labor market effects of migration have used competitive frameworks, assuming migration influences native wages solely through changes in the marginal productivity of labor (see, for instance, Ottaviano and Peri, 2012; Borjas, 2014; Card and Peri, 2016; Dustmann et al., 2016). To my knowledge, Amior and Manning (2020) is among the first to conceptualize how migration might affect labor market power and wage mark-downs. However, in that paper the authors do not empirically estimate the effect of migration on firm mark-downs and focus only on compositional changes in the labor force between migrants and natives, their different labor supply elasticities, and reservation wages.

I make three contributions to this branch of the economic literature. First, as mentioned above, I incorporate for the first time the analysis of price mark-ups alongside wage mark-downs as another channel through which migration can affect wages and the labor market in general. Second, I utilize production-function estimation techniques to directly measure firm wage mark-downs and price mark-ups in the Colombian manufacturing sector, examining how increased labor supply affects these variables and providing direct evidence of the impact of migration on both labor and product market power. Finally, I propose an alternative channel, namely self-employment, through which migration can affect firm labor market power. I argue that in developing countries, where self-employment is pervasive, migration can alter the value of the informal sector, which serves as an outside option for formal workers, thereby enhancing the labor market power of formal firms.

Third, this paper explores the medium-run effect of migration on firm-level outcomes, such as profitability and industry dynamics related to firm entry. Although limited, some studies suggest that migration shocks can affect firm profitability through changes in cost structures or returns to scale in labor and capital hiring (Beerli et al., 2021; Doran et al., 2022; Imbert et al., 2022). I extend this by showing that in the presence of market power, firms may capture productivity gains from migration, enhancing their profitability and encouraging firm

entry, without affecting wages for workers.

Finally, I contribute to the growing literature on labor market power, particularly in developing countries (Yeh et al., 2022; Amodio and De Roux, 2024; Amodio et al., 2024). In developed countries like the US, many studies document labor market power and its evolution over time (Yeh et al., 2022; Berger et al., 2022; Azar et al., 2023). For developing countries, evidence, although sparse, indicates that firms possess some degree of labor market power (Amodio et al., 2022, 2024; Estefan et al., 2024). I contribute to this literature by examining determinants of labor market power in developing countries, and proposing migration as a crucial one. The closest paper to this one is Amodio et al. (2022), which investigates the impact of self-employment on firm labor market power in Peru. Building on their findings, I introduce the impact of migration on self-employment as a novel channel through which migratory shocks can increase wage mark-downs imposed by firms in the formal sector.

Additionally, this paper makes incremental contributions to the literature on forced migration in developing countries (Morales and Pierola, 2020; Caruso et al., 2021; Bahar et al., 2021; Peñaloza-Pacheco, 2022; Olivieri et al., 2022; Bonilla-Mejía et al., 2023; Delgado-Prieto, 2024; Lombardo et al., 2025). Specifically, it investigates a rare instance of high-skilled migration between developing countries. Most studies examining large-scale forced migration episodes—such as those from Syria to Turkey, Jordan, Egypt, or Lebanon (Tumen, 2016; Fallah et al., 2019; Cengiz and Tekgüç, 2022), or from Afghanistan to Iran or Pakistan (Hugo et al., 2012)—are set in contexts where the incoming migrant workforce is primarily low-skilled relative to the native labor force. In such cases, there is limited potential for productivity gains within the local economy. In contrast, this paper demonstrates how a high-skilled labor supply shock from a developing country like Venezuela can positively impact the labor productivity of Colombian manufacturing firms through the complementarity between native workers and migrants.

The paper is organized as follows: Section 2 provides background information on the Venezuelan exodus in Colombia; Section 3 describes the data sources used in the paper and shows some descriptive statistics of the Venezuelan migration and the manufacturing sector in Colombia; Section 4, describes intuitively the conceptual framework through which the results of the paper are analyzed. Section 5 provides details on the estimation of key firm

variables and describes the reduced-form approach employed to estimate the impact of the Venezuelan exodus on the Colombian manufacturing sector. Section 6 presents the main results. Section 7 presents robustness exercises for the main empirical results. Finally, section 8 concludes.

## 2 Context: The Venezuelan Exodus

Since 2013, when Nicolás Maduro took office as the official representative of *Chavismo* in Venezuela, the country has been immersed in profound and critical economic and social chaos. According to official statistics from international organisms, during the 2013-2019 period, Venezuelan GDP plummeted by about 62% and the annual inflation was greater than 100% since 2015 and was about 180.000% in 2018 (ECLAC, 2019; Bonilla-Mejía et al., 2020). This, coupled with food and medicine shortages, human rights violations, political prosecution, and the drop in public revenues due to the fall in the international prices of oil, the main exported commodity of the Venezuelan economy, triggered an unprecedented exodus in the following years (United Nations, 2019; Caruso et al., 2021; Peñaloza-Pacheco, 2022; Rozo and Vargas, 2021; UNHCR, 2022).

According, to UNHCR (2022), by 2022, about 5.5 million Venezuelans had left their country and moved to a different country, mainly in Latin America, which represented about 20% of the total population in the country, according to the last Venezuelan census carried out in 2011. Colombia, a bordering country of Venezuela, has been the main host of Venezuelan immigrants during this massive exodus. During the 2016-2022 period, more than 2.5 million Venezuelans settled in Colombia seeking refuge and better life conditions.

Although the economic and social conditions in Venezuela started to deteriorate before 2016, the massive influx of Venezuelans in Colombia started particularly in August of 2016. Due to a political crisis between the Colombian and Venezuelan governments, the border between both countries, were completely closed for almost a year from 2015 to 2016 (Peñaloza-Pacheco, 2022). After months of negotiations between both governments, the borders were re-opened, which triggered the massive influx of people from Venezuela to Colombia (See

Figure 1).

Due to the forced nature of the displacement of Venezuelan migrants in Colombia, the conditions under which this migration crisis has taken place have not been the best ones. As I will show later, Venezuelan migrants have been under poverty conditions and with lack of access to basic public services such as health, education, and formal work. Although in 2018, the Colombian government implemented a mass amnesty program for Venezuelan workers, which consisted of the emission of different waves of work permits, their conditions in the labor market are still remarkably characterized by low wages, the absence of formal contracts, and limited opportunities to work in the areas in which migrants are specialized (Bahar et al., 2021).

## 3 Data and Descriptive Statistics

To analyze the impact of the Venezuelan exodus on firm outcomes I work with three main datasets.

**Colombian Annual Manufacturing Survey (2012-2020):** The first source of data is the Colombian Annual Manufacturing Survey (EAM, by its acronym in Spanish) carried out by DANE. This dataset is a representative panel of the Colombian manufacturing sector that surveys manufacturing firms in Colombia with more than 10 employees or firms with fewer employees but with sales above a certain threshold. From the EAM, I have information regarding employment, wage bill, investment, capital, energy and raw materials demand, as well as intermediate consumption. Crucially, I have detailed quantity data on firms' inputs and outputs, which is essential for estimating firms' production functions.

**Colombian 2018 Census:** Secondly, to calculate the number of immigrants in each local labor market of Colombia, I use the 2018 Colombian Census carried out by the National Statistics Office (DANE, by its acronym in Spanish). The Census is the most accurate source of information regarding the number of Venezuelan immigrants in Colombia. I calculate, for each local labor market, the number of Venezuelans who entered the country during the 2015-2018

period.[2]

**Great Integrated Household Survey (2013-2020):** Finally, the third source of data used in this paper is the Colombian Household Survey (GEIH, by its acronym in Spanish). The GEIH is a nationally representative cross-sectional survey that inquires question related to sociodemographic characteristics of individuals, economic activity and labor market conditions of workers in the country. Also, since April 2013, it allows to identify migrants by country of origin over time. I will use the GEIH to characterize the labor market integration of Venezuelan and Colombian workers over time.

Finally, I obtain some descriptive statistics on living conditions in Colombia of Venezuelans, from the Encuesta Pulso de la Migración (EPM) carried out by DANE since 2021.

### 3.1 The Venezuelan Migrants in Colombia

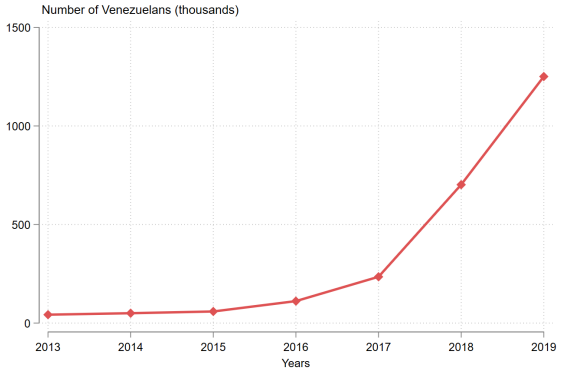
As was mentioned above, the Venezuelan exodus in Colombia started in 2016. Since then, the rate at which Venezuelan migrants entered in the country increased significantly, mainly during the 2016-2020 period (See Panel a of Figure 1). Although estimates on the number of Venezuelans living in Colombia are very difficult to obtain due to the sudden nature of the exodus, according to official estimates by 2022 approximately 2.5 million Venezuelans were living in Colombia.

When considering the geographic distribution of migrants in the country, by 2019 it can be seen in Panel (b) of Figure 1 that they are strongly concentrated in those regions that are closer to the border between Colombia and Venezuela. This concentration is expected (and crucial for the empirical analysis implemented in this paper), because it is explained by the forced nature of the exodus in the country. Namely, once the borders between both countries were re-opened in 2016, many migrants who entered in the country did it by walking or public ground transportation, hence making of those regions closer to the border the more likely places to settle due to the geographic proximity.

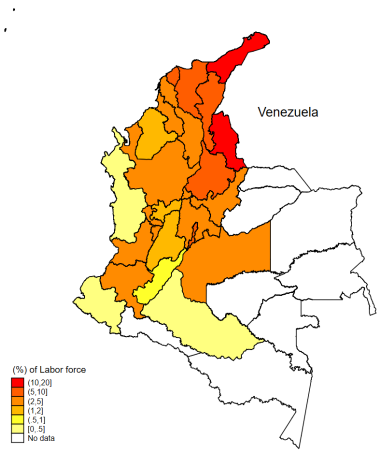
[2] The main limitation of the 2018 Census, is that it only captures the number of Venezuelans in Colombia up to 2018 and my analysis considers also 2019-2020. However, it is expected that in the last years of my period under study, migration trends for each local labor market reflect the patterns observed in the previous years.

Figure 1: The Venezuelan Exodus in Colombia

(a) Inflow of Venezuelans in Colombia, 2013-2019




(b) Distribution of Venezuelans, 2019




Notes: Venezuelan immigrants are defined as individuals born in Venezuela. The number of immigrants was normalized by the working-age population of each department in 2012. Departments with no data in the figures primarily consist of regions in the Amazon characterized by low population density and small main cities where data is unavailable. According to the latest available census in Colombia (2018), the population in these departments accounts for less than 3% of the total population in Colombia. Survey weights are applied to calculate the shares by department. Source: Own elaboration based on GEIH data from DANE.

According to my calculations, based on the Colombian GEIH, whereas in the main regions of Colombia such as Bogotá or Antioquia, the share of Venezuelans relative to the local labor force in 2019 was about 2.3% or 1.3%, respectively, in the bordering departments such as La Guajira or Norte de Santander, this share was between approximately 10 and 20%.

Moreover, Table 1 shows the characteristics of the Venezuelan migrants settled in the country. As can be seen, there are remarkable differences between Colombians and Venezuelans. First, although the gender composition seems to be similar between the two groups, Venezuelan individuals are, on average, younger and with more years of education. These characteristics are expected given the self-selection of migrants when they decide to leave their home country, which indicates that Venezuelan migrants are mainly part of the working-age population and represent a significant increase in the supply of at least similarly qualified workers in Colombia.

Nevertheless, when considering the labor market conditions under which Venezuelan migrants have integrated into the country, Table 1 indicates that Venezuelan individuals are more likely to be unemployed, they tend to earn about 28% lower hourly wages, work about

5 hours more than Colombian workers, are about 50% more likely to be an informal worker, and are almost twice more likely to be below the poverty line.

Table 1: Descriptive Statistics of Venezuelan Migrants, 2013-2019

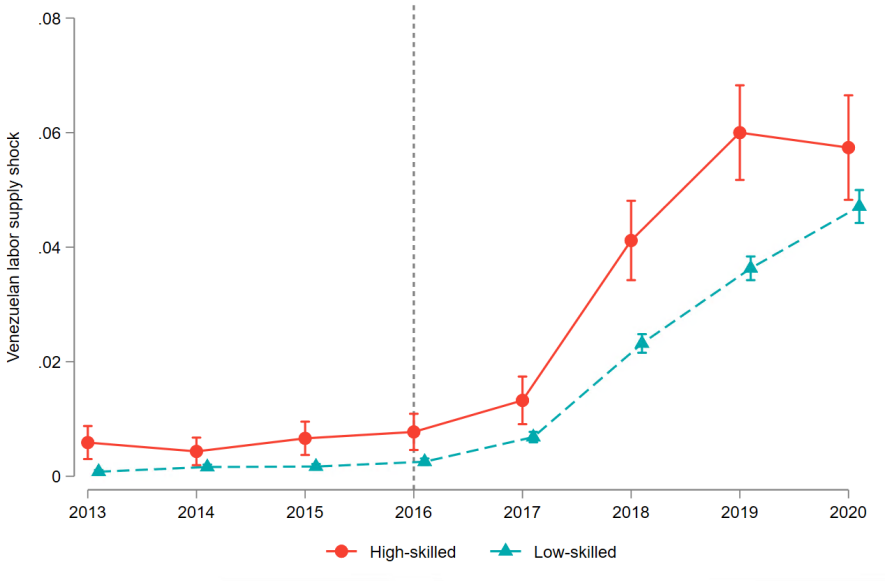
| | Venezuelan | Colombian | Difference | P-Value | Observations |
|---|---|---|---|---|---|
| Male | 0.49 | 0.49 | 0.00 | 0.706 | 508035 |
| Age | 30.03 | 36.49 | -6.46 | 0.000 | 508035 |
| Years of education | 10.33 | 9.61 | 0.72 | 0.001 | 507999 |
| Unemployment | 0.15 | 0.11 | 0.04 | 0.000 | 360542 |
| Employment | 0.68 | 0.65 | 0.03 | 0.012 | 508035 |
| Hourly wages (logs) | 8.04 | 8.38 | -0.34 | 0.000 | 293563 |
| Hours worked | 49.82 | 44.58 | 5.23 | 0.000 | 316279 |
| Formality | 0.10 | 0.41 | -0.31 | 0.000 | 312935 |
| Income per capita (logs) | 12.53 | 12.97 | -0.45 | 0.000 | 508035 |
| Poverty rate | 0.37 | 0.20 | 0.17 | 0.000 | 508035 |

Notes. Source: Own elaboration based on GEIH data from DANE.

When considering the Colombian manufacturing sector under analysis in this paper, Figure 2 shows the share of Venezuelans working in the manufacturing sector by skill level (high and low).[3] First, the figure suggest that the evolution of the participation of Venezuelan migrants in this economic sector, mirrored that of the overall country, with a very low participation before 2016, and a exponential increase in the following years, reaching between 4-6 p.p., relative to the local labor force in that sector. Secondly, the figure also shows that the labor supply shock in the manufacturing sector, was overrepresented by high-skilled Venezuelan workers, as opposed to low-skilled workers. This skill-biased composition of the migrant workers in the sector, could have potential implications in terms of their effects within firms, given the potential complementarities that might be created between native and migrant labor force.

[3] High-skilled individuals are defined as those with 16 or more years of education, equivalent to having a university degree. Low-skilled individuals are those with fewer than 16 years of education.

Figure 2: Participation of Venezuelan workers in the Manufacturing Sector by Skill-level, 2013-2019




Notes: Venezuelan immigrants are defined as individuals who reported being born in Venezuela. Those with 16 or more years of education (equivalent to a university degree) are classified as high-skilled. Source: Own elaboration based on GEIH data from DANE.

Finally, to analyze the underlying conditions under which the Venezuelan population is living in Colombia, I use the Encuesta Pulso de la Migración (EPM) carried out by the Colombian Government to characterize the integration of the migrants in the country since 2021. According to the EPM survey, at the national level, almost 92% of Venezuelans in the country indicated that they migrated to improve their economic conditions, additionally, about 96% of them are planning to stay in the country, and only 7.1% of the individuals with a post-secondary degree has been able to validate it. Finally, when calculating the geographical mobility of Venezuelans living in the country during the 2016-2019 period, my estimations suggest that about 95% of Venezuelans in the country have been living in the same municipality relative to Colombian individuals for whom that probability is about 96%.

## 3.2 The Manufacturing Sector in Colombia

According to official statistics from DANE, by 2015, the manufacturing sector in Colombia grouped about 12% of the employment in the country, making it the third most important

economic sector in terms of employment, after Commerce and Agriculture. Table 2 shows some descriptive statistics regarding the main characteristics of the manufacturing firms in my sample.

As can be seen, on average the total number of employees hired by the firms in my sample is about 65, and approximately 63% are white-collar workers. On the other hand, regarding how important the labor costs are relative to the revenues of the firms, Table 2 shows that the total wage bill of the firms represent around 25% of the sales. Furthermore, as expected, the average annual wage paid by a firm to a white-collar worker represents about 2.4 times the average annual wage perceived by a blue-collar worker.

Table 2: Descriptive Statistics of Manufacturing Firms, 2013-2019

| | Mean | Median | S.D. | Min | Max |
|---|---|---|---|---|---|
| Employment | 65.38 | 40 | 65.56 | 10 | 482 |
| White-collar workers | 24.28 | 14 | 28.86 | 1 | 238 |
| Blue-collar workers | 41.10 | 26 | 42.66 | 3 | 341 |
| Wage bill / Sales | 0.25 | 0.24 | 0.11 | 0.04 | 0.94 |
| Capital (in COP 100,000) | 38.62 | 12.26 | 85.13 | 0.36 | 1300 |
| Annual Wage (in COP 100,000) | 234.38 | 215.28 | 88.61 | 51.52 | 1,091.29 |
| Annual Wage Blue-Collars (in COP 100,000) | 181.16 | 168.83 | 55.27 | 49.13 | 1,023.15 |
| Annual Wage White-Collars (in COP 100,000) | 434.96 | 329.85 | 368.52 | 19.44 | 7,379.92 |
| Sales (in COP 1,000,000) | 7,280.57 | 3,360.62 | 11,300.00 | 311.79 | 128,000.0 |

Notes. Own elaboration based on EAM data from DANE.

## 4 Theoretical Framework: Main Intuitions

In this section, I provide a simple intuition of the different mechanisms through which migration can affect wages under a non-competitive framework. Later, I will develop a full model to incorporate many other relevant dimensions. The exercise on this section is aimed mainly to provide some insights that help us rationalize the empirical results found in the paper.

Consider a simple economy under which firms face a downward-sloping product demand

and an upward-sloping labor supply. Assuming that firms only use labor ($\ell$), then their profit function is going to be given by:

$$\Pi = p(q(\ell))q(\ell) - w(\ell)\ell \tag{1}$$

Which implies that the FOC with respect to $\ell$ is given by

$$\frac{\partial p}{\partial q}\frac{\partial q}{\partial \ell}q + p\frac{\partial q}{\partial \ell} = \frac{\partial w}{\partial \ell}\ell + w \tag{2}$$

Rearranging this gives us with:

$$VMPL\left[\frac{1}{\varepsilon}+1\right] = w\left[\frac{1}{\eta}+1\right]$$

Where $\varepsilon$ and $\eta$ represents the product-demand and labor-supply elasticities faced by the firm, respectively. Rearranging and taking logs gives us the expression for wages:

$$log(w) = log(VMPL) + log(\mu) - log(\nu)$$

Where $VMPL$ represents the marginal productivity of labor ($\ell$) expressed in dollars; $\mu$ indicates the price mark-up imposed by the firm in the products market; and $\nu$ is the wage mark-down. Under this scenario, in which we consider that firms operate in a non-competitive framework in both, the labor and product markets, any impact of migration on wages of workers, is going to be driven by its intermediate impacts on the labor market power of firms, the marginal productivity of labor, but also, on firms' ability to charge prices higher than their marginal cost. In the following subsections I will approach each of these dimensions individually to rationalize the potential impacts on them.

### 4.1 Marginal Productivity of Labor

There are several ways under which a migration shock can affect the marginal productivity of local labor, and particularly in our case, of labor hired by Colombian manufacturing firms. Under the assumption that natives and migrants are perfect substitutes, the higher supply of

Venezuelan workers should reduce the productivity of local labor (Ottaviano and Peri, 2012; Peri, 2016). However, if that is not the case, and migrants are complements with natives in Colombian manufacturing firms, there could be potential increasing returns of scale and marginal productivity of the overall labor force can increase. This situation can materialize if Venezuelan workers entering the manufacturing sector have some specific skills that are complements with the type of skills possessed by Colombian workers, which could lead to a diffusion of knowledge and abilities bringing significant productivity gains for the firms (Beerli et al., 2021; Bahar et al., 2022; Lombardo and Peñaloza-Pacheco, 2025).

Overall, Venezuelan migrants in Colombia are, on average, at least as qualified as Colombian workers (Lebow, 2024). However, for the case of the Colombian manufacturing sector, as I showed above, Venezuelan migrants self-selected and represented a particular high-skilled labor supply shock. This self-selection is expected given that the manufacturing sector is one of the economic sectors in the country with lower levels of informality and therefore the entry barriers for workers are higher.

For the case of Colombian manufacturing sector, Lombardo and Peñaloza-Pacheco (2025) show that this high-skilled labor supply shock improved firms' performance, their technology adoption decisions, and the quality of goods offered to the market, which boosted their export performance. With this in mind, it is expected that the hiring of this high-skilled workers would have represented labor productivity gains, and a higher complementarity between the native workforce and migrants.

### 4.2 Labor Market Power: Wage Mark-downs

The labor market power of firms can be affected by migration in two different ways. The first one is the one proposed by Amior and Manning (2020) (henceforth the *elasticities channel*). According to the authors, under the assumptions that the labor supply elasticity of natives and migrants differ, such that the labor supply of migrants is less elastic compared to natives, and that firms cannot wage discriminate between immigrants and native workers, then they are going to impose an average wage mark-down that takes into account both groups of workers. Given that the reservation wage of migrants, due to their vulnerable conditions is expected

to be significantly lower compared to natives, this implies that their labor supply elasticity is particularly lower, which would allow firms to impose a greater mark-down on them. However, given that, by assumption, firms cannot wage discriminate across groups of workers, the average mark-down should go up, reflecting an increase in the firms' market power.

This approach, however, relies on the assumption that firms cannot discriminate in wages between immigrants and natives. This assumption, although plausible in a developed country, where labor informality is significantly low compared to developing countries, could be particularly flawed in a developing country like Colombia, where in the manufacturing sector informality rate is about 60% (See, for instance, Arellano-Bover and San, 2020; Amodio et al., 2022; Dostie et al., 2023, for examples of evidence on the absence of wage discrimination in developing countries). Given this, the vulnerable conditions under which most of the workers are hired in Colombia imply a greater capacity of firms to discriminate in terms of wages between migrants and natives, and impose differential mark-downs on them, ruling out the potential impact on the average mark-down hypothesized by the authors.

Nevertheless, I argue that, in the case in which one is calculating the impact on the average mark-down imposed by the firms of a migration episode, the *elasticities channel* can be present even in absence of wage discrimination as opposed to the hypothesis stated by Amior and Manning (2020). The main reason is that the average mark-down imposed by a firm in the labor market is going to be calculated as a weighted average of the mark-downs for all the employees within a firm. Therefore, when firms hire more migrants (who are going to be self-selected in worse jobs), even in absence of wage discrimination, there is a pure compositional effect of migration in which the average wage mark-down is going to be changed by the influence of the mark-downs imposed on the migrants. Considering this, it is only necessary to assume that migrants hired by the firms are going to self-select in jobs in which firms can impose a larger mark-down in order to expect a compositional change in the average mark-down and, therefore, a mark-down effect driven by the *elasticities channel*.

On the other hand, in this paper, I propose an alternative channel through which the labor market power of firms in a developing country can be affected: the *self-employment channel*. According to Amodio et al. (2022), self-employment in developing countries operates as

an outside option for workers in the formal sector. Then, the presence of a significant self-employment labor market represents an opportunity for workers to have an alternative in case their utility in the formal labor market is not sufficiently large. Given this, the larger the self-employment sector in a local labor market faced by a firm, the greater the outside option of the workers in the formal sector, and then the lower market power the firms are going to have. Intuitively, if the outside option (the self-employment sector) is a credible threat to the firm, then the wage mark-down imposed is going to be lower to reduce the probability of losing workers to the self-employment sector.

However, if migration affects disproportionately the self-employment labor market income through a larger competition between natives and migrants, this would reduce the outside option value for workers in the formal sector and would increase the labor market power of formal firms. In the case of the Venezuelan exodus in Colombia, this has been proven to be the case. For instance, Caruso et al. (2021), Peñaloza-Pacheco (2022), and Bonilla-Mejía et al. (2023) show that the Venezuelan exodus negatively affected the labor income of workers in the self-employment sector under different definitions. Considering this, one would expect an increase in the labor market power of formal firms driven by the *self-employment channel*.

### 4.3 Product Market Power: Mark-ups

An often overlooked aspect in the economics of migration literature relates to its demand effect and how inflow of migrants in hosting economies can affect the consumers composition and with this the decisions made by the firms in the market. There are few papers in the economic literature that analyze how migration affects the output side of the product market in the hosting economy, and usually those papers are focused on the housing market (Saiz, 2003, 2007; Kerr and Kerr, 2011; Gonzalez and Ortega, 2013; Olney, 2015; Howard, 2020; Cengiz and Tekgüç, 2022; Peri et al., 2022; Galaasen et al., 2025). However, all of them rely on competitive frameworks and do not take into account the impact under a non-competitive setting in which migration can also affect firm mark-ups.

In this paper, however, I analyze the effect on firms' output market, and particularly on their market power in the products market through the lenses of the demand structure,

namely the composition changes of the consumers following a migration shock. According to Sangani (2022), under a model in which household search intensity depends on the opportunity cost of time, the mark-up level that firms can impose in the output market depend directly on the income level of the consumers. Based on this, in this paper I propose two new contributions.

On the one hand, I hypothesize that given that migration changes the income distribution of the demand, this would have an impact in the ability of firms in the economy to charge prices higher than their marginal cost. In particular, under refugee crisis or forced migration episodes where most of migrants are in vulnerable conditions, it is expected that the income distribution moves toward the left, implying a reduction in firms' output market power. This result, however, is not exclusive to this type of migration episodes. In case of high-skilled or high-income migration episodes, the expected effect could be the other way around increasing the market power of firms.

Additionally, given the wage equation presented above, the effect of migration on mark-up can be an alternative channel through which this type of episode might impact indirectly wages in the labor market. As seen before, if migration reduces the output market power of firms, then it would induce a reduction in the wages that firms pay to workers.

# 5 Empirical strategy

In this section, I will briefly describe the methodology implemented to calculate the wage mark-downs, product mark-ups, and the labor marginal productivity of Colombian manufacturing firms by using the EAM. Then, I will explain the empirical strategy considered to obtain the reduced-form evidence on the impact of the Venezuelan exodus on firm outcomes.

## 5.1 Mark-down and mark-up estimation

To estimate firm-level mark-downs, I follow the procedure suggested by Yeh et al. (2022). According to the authors, under the assumptions that (i) firms engage in cost minimization; there exists a flexible input $k'$ such that (ii) there are no adjustment costs for that input; (iii) it is

not subject to market power; (iv) it is chosen statically, and (v) it is used only for production, then firm $i$'s mark-down can be estimated; and finally if the production function of firm $i$ $F(.)$ is twice continuously differentiable and satisfies Inada conditions facing a continuously differentiable product demand schedule that is strictly decreasing, then the mark-down ($\nu_{it}$) of firm $i$ in period $t$ is going to be given by:

$$\nu_{it} = \frac{\theta^l_{it}}{\alpha^l_{it}\mu_{it}}$$

Where $\theta^l_{it}$ is the output elasticity of labor and $\alpha^l_{it}$ is the share of labor in the revenues of firm $i$ in period $t$, and, finally $\mu_{it}$ is the mark-up that firm imposes in the product market. To estimate the product market mark-up of the firm $\mu_{it}$, one needs to use the flexible input output-elasticity and share on revenues. According to De Loecker and Warzynski (2012) then, the mark-up is given by:

$$\mu_{it} = \frac{\theta^{k'}_{it}}{\alpha^{k'}_{it}}$$

Where $\theta^{k'}_{it}$ and $\alpha^{k'}_{it}$ are the output-elasticity and the share on revenues, respectively, of flexible input $k'$ of firm $i$ in period $t$. Although the labor and flexible input shares in the revenues of the firms can be calculated directly from the data, in order to obtain the output elasticity of both factors of production, I need to estimate the production function of the firms. To do so, I follow the economic literature and estimate the production function by implementing a proxy variable procedure (See, for instance, De Loecker and Warzynski, 2012; Ackerberg et al., 2015; Gandhi et al., 2020). In my main specification, I consider a general second-order trans-log production function specific to each 2-digit industry, such that the output elasticities of the production factors vary across firms and over time. However, in Section 7, I conduct several robustness exercises to demonstrate that my results remain unchanged when different production functions are assumed.

For the case of the mark-ups estimations, Bond et al. (2021) raises some concerns about how by using revenue data the mark-up imposed by firms should be trivially equal to one and, therefore, all estimates by using a flexible-input approach could be purely statistical noise. In

the case of this paper, one of the advantages of the EAM database from Colombia, is that it contains information on price and quantity of outputs. Given this, I follow Fieler et al. (2018) and build firm-specific price indices to calculate firms' output in terms of quantity, therefore providing more confidence in the mark-up estimations (see Appendix D for further details). Descriptive statistics related to the estimated market power of firms in both the labor and product market are provided in Appendix C.

### 5.2 Reduced form evidence

To study the impact of the Venezuelan migration on firm outcomes, I estimate the following first-difference specification:

$$\Delta y_{imjt} = \omega_j + \beta_t \Delta M_{m,2018} + X_m^{'} \delta + \Delta \varepsilon_{imjt} \tag{3}$$

Where $\Delta y_{imjt}$ is the outcome variable change of firm $i$ in local labor market $m$, industry $j$ between period $t$ and the baseline year (2015) before the beginning of the exodus. In this paper, the main outcomes under study are the total number of employees, output (measured in quantities), marginal productivity of labor, average wage, wage mark-down, and price mark-up—all expressed in logarithmic form. Additionally, I will analyze the impact on firms' profits (in logs) and on entry.

$\Delta M_{m,2018}$ is the change in the stock of Venezuelans living in local labor market $m$ between 2015 and 2018 relative to the population of that local labor market; $\omega_j$ are 4-digit industry fixed effects which control for shocks that occurred between year $t$ and the baseline period that affected differentially firms in different economic activities; $X_m^{'}$ are pre-exodus local labor market characteristics, such as local labor market fiscal revenues and expenditures in the past, per capita GDP, multidimensional non-monetary poverty rate, Gini coefficient, the share of individuals with subsidized health coverage, coca crop hectares cultivated, homicide rate, national transfers from the central Government, the number of terrorist attacks, and the total amount of exports to Venezuela for each local labor market in the past, which control for any shocks that affected different local labor markets in my sample, and that are explained by

these characteristics. Finally, $\varepsilon_{imjt}$ is the standard error of the specification which is clustered at the local labor market level.

The coefficient of interest is $\beta_t$ which captures the impact on the outcome variable of interest of a change in the share of migrants that moved to each local labor market after 2015. I run a separate regression for each year and store the coefficients $\beta_t$ to show them in an event-study type figure. Given that the share of migrants in each local labor market is not random, I follow the economic literature and use an instrumental variable approach to estimate consistent causal coefficients (Ibáñez et al., 2021; Caruso et al., 2021; Peñaloza-Pacheco, 2022; Lombardo and Peñaloza-Pacheco, 2025; Lombardo et al., 2025). I take advantage of the forced nature of the Venezuelan exodus in Colombia and the fact that due to proximity and lack of resources, migrants were disproportionately located in the local labor markets closer to the border between Colombia and Venezuela, and use the inverse distance between Colombia and Venezuela as an instrumental variable. More specifically, my first-stage regression is the following:

$$\Delta M_{m,2018} = \alpha + \theta_1 D_m^{-1} + X_m^{'}\delta + \epsilon_m \tag{4}$$

Where $D_m$ denotes the minimum distance between each local labor market $m$ in the sample and the Venezuelan states situated in the two main border crossing points between the countries: Puente Simón Bolivar in Norte de Santander and Paraguachón in La Guajira. Finally, $X_m$ is the same vector of local labor market controls presented above. The main identifying assumption of the empirical approach is that, once I control for the pre-determined vector of local labor market characteristics and industry fixed effects, then there are not other changes at the local labor market level explained by the distance variable that affect firms' outcomes during the analysis period. As can be seen in Table A.1 of the Appendix, the first-stage regression is statistically significant indicating that the distance is a good exogenous predictor of the share of migrants located in each local labor market during the time in which the exodus took place.

# 6 Main Results

In this section, I provide the empirical results of the main estimates evaluating the effect of the Venezuelan exodus on firm outcomes. The results are shown in Figure 3, presented in an event-study format. The estimated coefficients of the average effects are provided In Table A.2 of Appendix A.

**Employment:** First, I analyze the impact of the Venezuelan exodus on employment within firms in the Colombian manufacturing sector. Panel (a) of Figure 3 indicates that prior the reopening of the borders, there were no differential trends in terms of employment (in logs) that could be attributed to the share of Venezuelan migrants. However, starting in 2016, a significant upward trend emerges, leading to an increase in the total number of employees hired by the firms over time. My estimates suggest that by 2020, employment increased by approximately 6% relative to the baseline period.

**Output:** Next, I assess the impact of migration on the total output of firms, measured in quantities. Panel (b) of Figure 3 suggests that a 1 percentage point (p.p.) increase in the share of migrants at the local labor market level increased the total output of the firms by approximately 5%, with this effect remaining relatively stable over time. Two potential mechanisms could explain this outcome.

First, the observed increase in employment shown in Panel (a) of Figure 3 may have translated into higher output through a scale effect—namely, hiring more migrants enables firms to produce more. Second, considering general equilibrium effects of the migration shock, this result could also reflect demand-side response to migration; as the migrant population in the local market grows, firms may face higher demand for their products, which in turn could have driven increased production.

**Marginal Productivity of Labor:** Given the previous results on output and employment, the key variable of interest to look at is the marginal productivity of labor. The results, shown in Panel (c) of Figure 3, suggest that the Venezuelan exodus led to an average increase of approximately 2.7% in the marginal productivity of labor in Colombian manufacturing firms relative to the baseline. These findings imply that hiring Venezuelan workers enhanced labor

productivity, likely due to the skills and abilities that migrants contributed to the economy.

These results are consistent with Lombardo and Peñaloza-Pacheco (2025), who demonstrate that Venezuelan migration exerted a firm-level upgrading effect on manufacturing firms in Colombia. Their analysis shows that, following the exodus, firms increased their hiring of high-skilled workers—particularly within R&D divisions—which translated into greater investments in R&D, improved production techniques, and organizational practices. Ultimately, this contributed to enhancements in product quality and export performance. A similar effect is observed when using output per workers as a measure of labor productivity, as shown in Figure A.1 of Appendix A.

**Wages:** I examine the impact of the Venezuelan exodus on the average wages paid by firms in the manufacturing sector. The results are presented in Panel (d) of Figure 3. Despite the observed increase in the marginal productivity of labor depicted in Panel (c), wages remained relatively stable and did not exhibit a corresponding positive impact.

Under a competitive framework, these findings are somewhat puzzling, as wages should reflect marginal labor productivity. Consequently, the positive effect on productivity identified earlier should have translated into higher wages paid by firms. However, if we shift from a purely competitive framework to one in which firms possess market power in both labor and product markets, a gap may exist between the actual wages and the labor productivity—arising from wage mark-downs and price mark-ups. In such a setting, a change in either of these elements could help rationalize the absence of significant wage effects observed in the estimates. These results are illustrated in Panel (e) and (f) of Figure 3.

**Wage Mark-downs:** Panel (e) of Figure 3 presents the main estimates of the Venezuelan exodus impact on the labor market power of firms in the Colombian manufacturing sector. It reveals that firms more exposed to migration increased the wage mark-downs imposed in the labor market following the exodus. Specifically, my estimates suggest that a 1 p.p. increase in the share of migrants relative to the local labor force increased wage mark-downs by approximately 5.9%, on average. Moreover, this effect did not seem to dissipate over time but remained stable in the years following the reopening of the borders.

To contextualize these figures in dollars terms, we know from Appendix C that Colombian

manufacturing workers were receiving about 55 cents per dollar of marginal output due to firm labor market power. Based on my estimates and an average increase of approximately 2.5 p.p. in the migrant share at the country level, it implies that workers now receive roughly 52 cents per dollar produced—a reduction constituting an approximate increase of 3 cents in the firms' rent extracted from workers per dollar of output following the exodus.

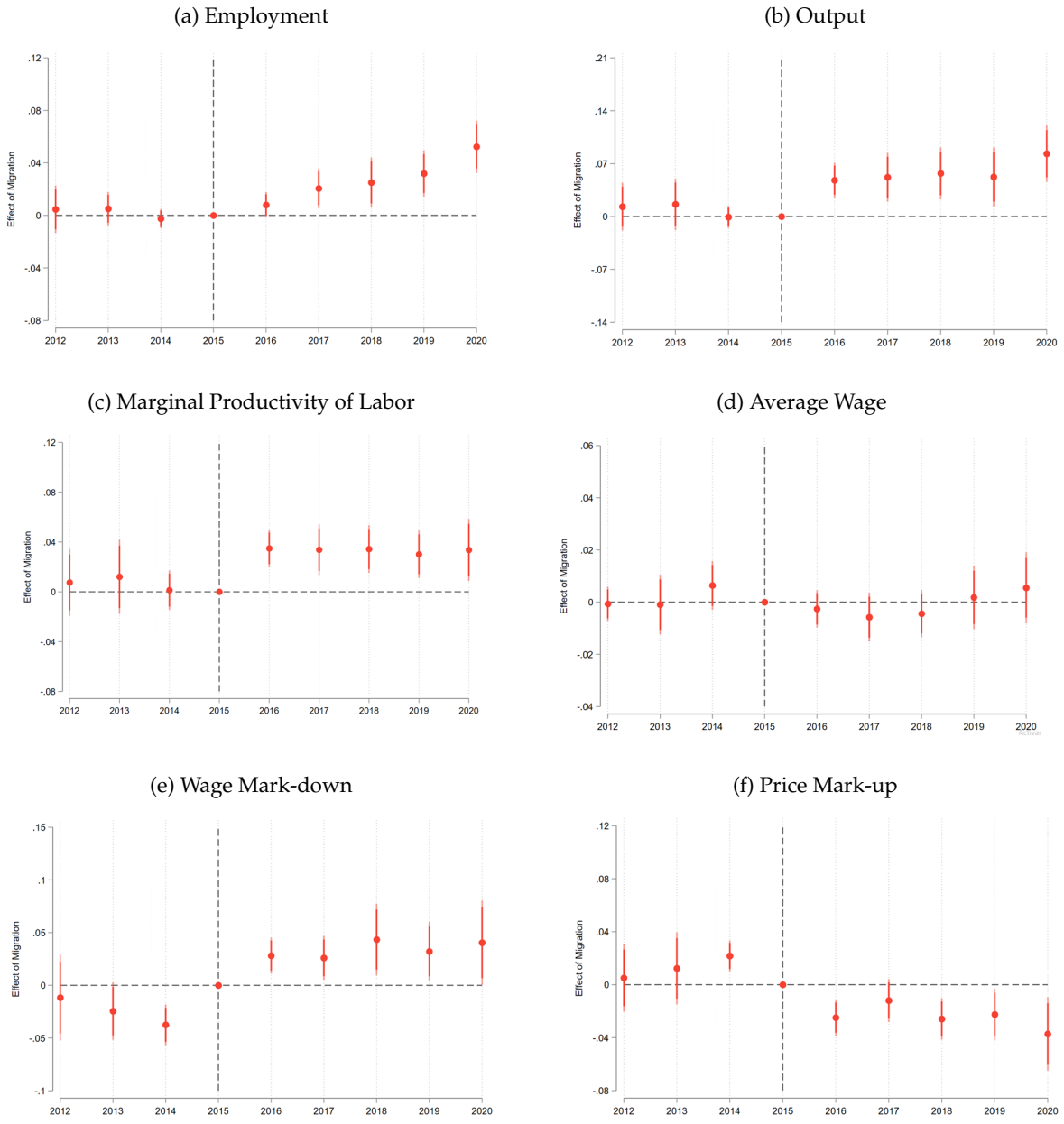
**Price Mark-up:** Finally, Panel (f) of Figure 3 indicates that firms' product market power, as reflected in price mark-ups, was also influenced by the Venezuelan exodus. My estimates suggest that a 1 p.p. increase in the share of migrants reduced by approximately 3.7% firm market power in the goods market.

As previously mentioned, migration not only alters the supply and composition of the labor force but also constitutes a demand shock to domestic markets, with significant implications for how firms interact with the newly arriving consumers. Venezuelan migrants, on average, had considerable lower income levels, which implies a higher demand price-elasticity (Sangani, 2022). This higher elasticity could have constrained firms' ability to extract rents from consumers, since the overall mark-up would now be a weighted average of the mark-up they impose on native consumers and the lower mark-up they can impose on migrant consumers.

The results presented so far highlight four key findings: (i) the migration shock caused by the Venezuelan exodus constituted a high-skilled supply shock in the manufacturing sector, leading to a positive impact on the marginal productivity of labor. This enabled firms to increase their total output as they hired more employees; (ii) despite expanding the labor supply in the Colombian manufacturing sector by approximately 5 p.p. and affecting marginal productivity of labor, Venezuelan migration did not significantly impact wages paid to workers; (iii) the greater supply of Venezuelan workers in the local labor market increased firms' wage mark-downs, allowing them to capitalize the productivity gains without translating these into higher wages for workers; (iv) finally, I demonstrate that the Venezuelan migration shock was not solely a labor supply shock but also a demand shock—an aspect often overlooked in the economic literature. Specifically, I show that the changing income composition of demand, driven by the lower incomes of migrants entering Colombia, had significant impli-

cations within a non-competitive framework, as the exodus reduced firms' ability to impose large mark-ups in the manufacturing goods market.

Figure 3: Impact of the Venezuelan exodus on Manufacturing Firms Outcomes, 2012-2020




Notes. Each figures shows the estimated coefficients of equation 3 separately for each year. The estimates include Industry fixed effects at the 4-digit CIIU level. They also control for the Local Labor Market (LLM) controls specified in Section 5.2. The bars represent the 95% (light bars) and 90% (darker bars) confidence intervals. Standard errors are clustered at the level of the local labor market level. Source: Own estimates based on EAM data from DANE.

### 6.1 Medium-run impacts: Firms' profits and dynamics

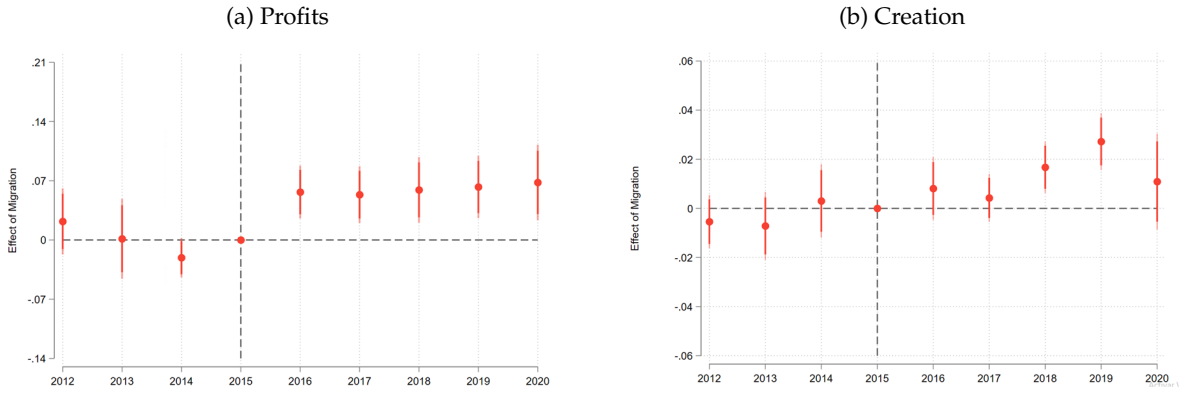
The results presented so far indicate that, although labor productivity increased as a consequence of the migration shock in Colombia, this did not translate into higher wages for workers. This suggests that firms may be capturing a larger share of the benefits generated by increased productivity. However, it is also crucial to consider the effects of mark-down and mark-up margins. An increase in wage mark-downs could enhance firm profits, but a reduction in mark-ups would imply a decrease in profits, as it reflects a lesser ability to charge prices above marginal costs to consumers. Therefore, understanding how profits evolve following a migration shock within a non-competitive framework is primarily an empirical question.

I estimate the impact of migration on firm profits. The results are shown on the left-hand side of Figure 4. Before the exodus, there were no differential trends explained by the rate of migration relative to the baseline period. However, after the exodus started, profits not only increased but continued to do so over subsequent years. My estimates, controlling for pre-determined local labor market characteristics, suggest that firm profits increased by approximately 6% relative to the pre-exodus baseline.

These higher profits could be explained by the increase in the marginal productivity of labor, as well as by the higher wage mark-downs that firms could impose due to the labor supply shock. Although a reduction in product price mark-ups could potentially limit the ability of firms to secure higher profits, the decline was not significantly large to offset the benefits derived from increased productivity and wage mark-downs.

Finally, under conditions of free entry, higher profits are expected to incentivize the creation of new firms to capitalize on the increased profitability of the manufacturing sector resulting from the Venezuelan labor supply shock. My estimates of firm creation, shown on the right-hand side of Figure 4, confirm this expectation. They indicate that, following the migration shock, firm creation increased in 2019 by approximately 2 p.p. per 1 p.p. rise in the migrant share.

Figure 4: Impact of the Venezuelan exodus on Medium-Run Outcomes, 2012-2019




Notes. Each figures shows the estimated coefficients of equation 3 separately for each year. The estimates include Industry fixed effects at the 4-digit CIIU level. They also control for the Local Labor Market (LLM) controls specified in Section 5.2. The bars represent the 95% (light bars) and 90% (darker bars) confidence intervals. Standard errors are clustered at the level of the local labor market level. Source: Own estimates based on EAM data from DANE.

# 7 Robustness Checks

In this section, I present different robustness exercises related to the main empirical results in the paper.

**Alternative Production Functions:** In the main results presented in the paper, a 2-digit industry specific second-order translog production function was assumed. As was mentioned above, this approach has several advantages as it does not impose that the production function has to be the same across firms in different industries within the manufacturing sector nor that the output-elasticities of the production inputs has to be constant over time nor the same across firms within the same sector. As robustness exercises, I estimate different alternatives by considering a Cobb-Douglas production function rather than a second-order translog, and by imposing that the second-order translog production function is the same across industries in the manufacturing sector, namely, by estimating the production functions for all firms at once and not sector by sector. The results of these exercises along with a discussion of the implications for each approach are presented in section B.1 of Appendix B.

**Identification under the proxy variable method:** According to Gandhi et al. (2020), when using the proxy variable approach to estimate gross output production functions, additional

sources of variation in demand for flexible inputs are necessary. They suggest that time-series variation in aggregate price indexes for flexible inputs can serve as such a source, especially when analyzing long-panel datasets—the 10-year data span of this paper sufficiently meets this criterion.

Alternatively, Flynn et al. (2019) propose imposing a specific returns-to-scale assumption, namely constant returns to scale (CRS), which enables point identification of the production function (other papers considering this method are, for instance, Yeh et al., 2022; Estefan et al., 2024). Following this approach, I re-estimated the second-order translog production functions under the CRS assumption. The results, presented in section B.2 of Appendix B, indicate that the estimates of mark-ups, mark-downs, and marginal productivity of labor—along with the effect of migration on the main outcomes—remain very similar to the original estimates.

**Leave-one-out estimates:** Next, I rule out the possibility that my estimates are primarily driven by the most important local labor markets or 2-digit industries in my sample. To do this, I present the main results from Section 6 using a leave-one-out approach, systematically omitting the local labor markets and 2-digit industries with the largest number of firms. Specifically, for local labor markets, I exclude Bogotá, Medellín, Cali, Barranquilla, and Santander. For the 2-digit industries, I exclude Chemicals, Iron, Rubber/Plastic, Textiles, and Food. The results of these robustness checks are shown in sections B.3 and B.4 in Appendix B.

**Alternative independent variable definition:** Finally, I change the independent variable definition by considering not the share of Venezuelan migrants relative to the local population, but instead the share relative to the local labor force and the employed population in each local labor market. The results of this exercise are presented in section B.5 of Appendix B.

## 8 Final Remarks

In this paper, I analyze the impact that migration can have on firm outcomes under a non-competitive setting, where wages are determined not only by the marginal productivity of labor but also by firms' market power in both labor and product markets. I exploit the geographic and temporal variation of the Venezuelan exodus to Colombia to investigate this

question in the context of the Colombian manufacturing sector.

My findings indicate that the Venezuelan exodus did not affect the wages paid by manufacturing firms in Colombia. Delving into the determinants of wages within a non-competitive framework, I find that while migration increased the marginal productivity of labor, this did not translate into positive wage effects for workers due to the corresponding increase in firms' labor market power. Additionally, I show that changes in demand income composition brought about by the migration shock reduced firms' ability to impose mark-ups in the output market.

In examining the medium-run impacts of migration, I find that these changes in productivity and firms' market power increased profitability, thereby fostering greater firm entry in the manufacturing sector.

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# A Appendix: Tables and Figures

Table A.1: First Stage

| | (1) | (2) |
|---|---|---|
| Inverse Distance | 156.98*** | 147.42*** |
| | (11.53) | (13.00) |
| F-statistic | 185.5 | 128.61 |
| Number of Municipalities | 124 | 120 |
| Observations | 3,800 | 3,794 |
| Industry FE | Yes | Yes |
| LLM Controls | No | Yes |

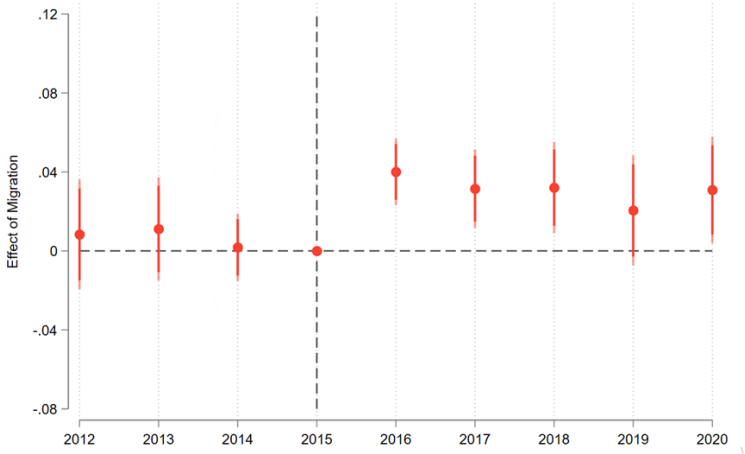
Notes: The coefficients represent the estimation of the interaction between the main independent variable and a dummy variable that takes a value of 1 for observations from years between 2016 and 2020, pooling all years in the sample, according to equation 3. Industry fixed effects are specified at the 4-digit CIIU level. Local Labor Market (LLM) controls include the variables specified in Section 5.2. Kleibergen-Paap rk Wald F-statistics is provided. Significance levels are denoted by ***, **, and * for 1%, 5%, and 10% levels, respectively. Source: Own elaboration based on data from DANE.

Table A.2: Effect of Migration on Firm Outcomes

| | Labor | Output | MPL | Wages | Mark-down | Mark-up | Profits |
|---|---|---|---|---|---|---|---|
| Share of migrants | 0.024*** | 0.048*** | 0.027*** | -0.003 | 0.059*** | -0.037*** | 0.060*** |
| | (0.009) | (0.010) | (0.008) | (0.004) | (0.009) | (0.011) | (0.011) |
| F-statistic | 60.11 | 60.11 | 51.91 | 60.11 | 56.80 | 56.77 | 59.21 |
| Observations | 27,961 | 27,961 | 26,079 | 27,961 | 25,741 | 26,494 | 27,872 |
| Industry FE × Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| LLM Controls × Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Notes: The coefficients correspond to the estimation of the interaction between the main independent variable with a dummy variable that takes a value of 1 if the observation corresponds to a year between 2016 and 2020 by pooling all years in the sample following equation 3. Industry fixed effects are specified at the 4-digit CIIU level. Local Labor Market (LLM) controls include the variables specified in Section 5.2. Kleibergen-Paap rk Wald F-statistics is provided. Significance levels are denoted by ***, **, and * for 1%, 5%, and 10% levels, respectively. Standard errors are clustered at the level of the local labor market level. Source: Own elaboration based on data from DANE.

Figure A.1: Impact of the Venezuelan exodus on the Average Product Per Worker, 2012-2020




Notes. The estimates include Industry fixed effects at the 4-digit CIIU level. They also control for the Local Labor Market (LLM) controls specified in Section 5.2. The bars represent the 95% (light bars) and 90% (darker bars) confidence intervals. Standard errors are clustered at the level of the local labor market level. Source: Own elaboration based on data from DANE.

# B Appendix: Robustness Exercises

## B.1 Alternative Production Functions

In the main specification considered in this paper, I used a 2-digit industry-specific second-order translog production function as follows:

$$y_{it} = \omega_{it} + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \beta_e e_{it} + \beta_{lk} l_{it} k_{it} + \beta_{lm} l_{it} m_{it} + \beta_{le} l_{it} e_{it} + ...$$

$$...\beta_{km} k_{it} m_{it} + \beta_{ke} k_{it} e_{it} + \beta_{me} m_{it} e_{it} + \beta_{ll} l_{it}^2 + \beta_{kk} k_{it}^2 + \beta_{mm} m_{it}^2 + \beta_{ee} e_{it}^2 + \varepsilon_{it}$$

where $l, k, m, e$ are labor, capital, intermediate materials, and energy (all in logs), respectively. $y_{it}$ denotes the log of output for firm $i$ in period $t$. The term $\omega_{it}$ captures the firm-level TFP and $\varepsilon_{it}$ accounts for unobserved shocks specific to the firm and period.

Under this framework, the output elasticities—used for calculating wage mark-downs and price mark-ups—are not constant but depend on the levels of inputs utilized by the firms. This flexibility makes the second-order translog production function particularly suitable, as it is widely used in the economic literature for estimating firm wage mark-downs and price mark-ups via production function techniques (Yeh et al., 2022; Amodio et al., 2024; Estefan

et al., 2024). Moreover, estimating the production function separately for each 2-digit industry ensures a high degree of flexibility, especially in estimating the coefficient vector ($\beta$). This approach enhances the model's capacity to capture industry-specific production dynamics.

Alternatively, I also re-estimate the production function using, first, the same second-order translog form assuming it is identical across all firms regardless of the sector to which they belong—which I will refer to as the homogeneous translog. Although this approach still allows output elasticities of inputs to vary across firms and over time, it imposes the restriction that the coefficient vector ($\beta$) is constant across the entire sample. Additionally, to test the robustness of my results, I consider a simpler production function: a Cobb-Douglas model estimated separately for each 2-digit industry in my sample, specified as follows:

$$y_{it} = \omega_{it} + \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \beta_e e_{it} + \varepsilon_{it}$$

Under the Cobb-Douglas production function, the marginal productivity of labor (MPL) is simply the average output per worker (APL) of the firm, scaled by the coefficient $\beta_l$ of the production function, according to the following expression:

$$MPL_{it} = \beta_l \frac{Y_{it}}{L_{it}}$$

Where $Y_{it}$ and $L_{it}$ are the output and labor used by the firm, both in levels. Since $\beta_l$ is constant over time, all variation in the MPL comes from the APL. Additionally, the wage mark-down $\nu_{it}$ and the price mark-up $\mu_{it}$ are given by the following expressions:

$$\nu_{it} = \frac{\beta_l}{\beta_m} \frac{\alpha_{it}^m}{\alpha_{it}^l} \qquad \mu_{it} = \frac{\beta_m}{\alpha_{it}^m}$$

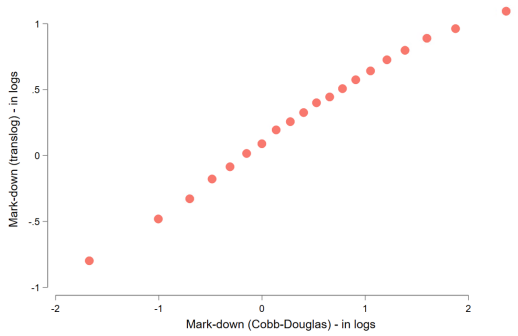
These simpler expressions imply that all the variation in the wage mark-downs and the price mark-ups will be primarily explained by the shares of labor and materials in the firms' revenues.

First, in Figure B.1, it can be observed that the measures of wage mark-down, price mark-up, and marginal productivity of labor—derived using both the Cobb-Douglas production

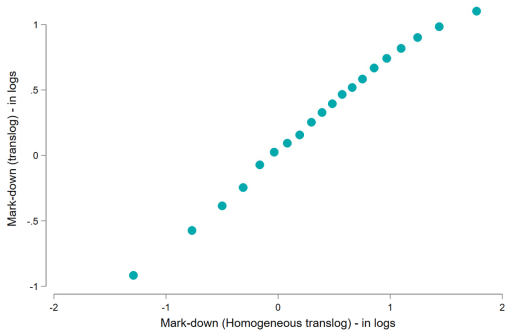
function and the Homogeneous Translog—are strongly correlated with those obtained using the main specification employed in the paper.

Figure B.1: Robustness exercise: Comparison of Firm Variables under Different Production Functions

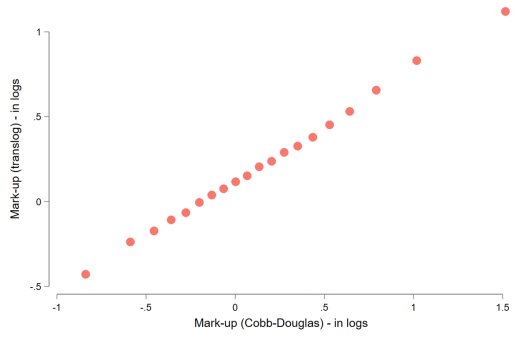
(a) Mark-down - Cobb-Douglas



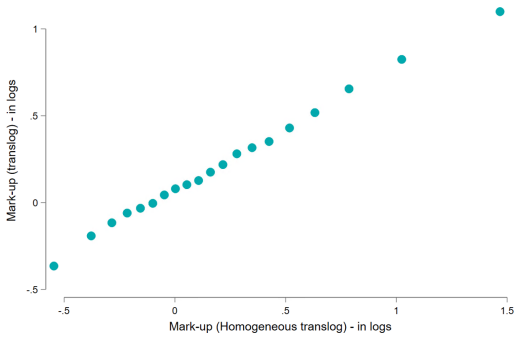

(b) Mark-down - Homogeneous Translog



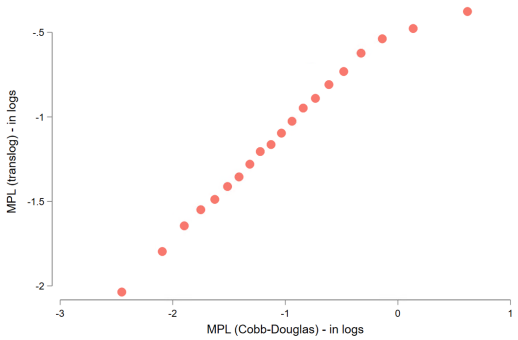

(c) Mark-up - Cobb-Douglas



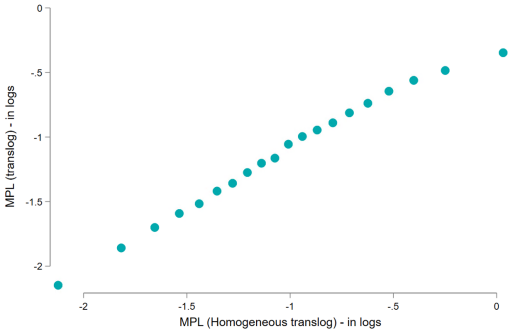

(d) Mark-up - Homogeneous Translog




(e) MPL - Cobb-Douglas




(f) MPL - Homogeneous Translog




Notes. The figures show the binscatter plot of the relationship between each corresponding variable (in logs) under different production functions. Source: Own estimates based on EAM data from DANE.

Additionally, when analyzing the effects on the MPL, wage mark-down, and price mark-up using either of the two alternative production functions, the results in Table B.1 are very similar to the original estimates presented in Table A.2.

Table B.1: Robustness Exercise: Effect of Migration on Firm Outcomes under Different Production Functions

| | MPL | Mark-down | Mark-up |
|---|---|---|---|
| **Panel A: Homogeneous Translog** | | | |
| Share of migrants | 0.016*** | 0.050*** | -0.027** |
| | (0.006) | (0.011) | (0.012) |
| F-statistic | 62.47 | 58.99 | 54.52 |
| Observations | 26,499 | 26,447 | 26,629 |
| | MPL | Mark-down | Mark-up |
| **Panel B: Cobb-Douglas** | | | |
| Share of migrants | 0.028*** | 0.049*** | -0.030*** |
| | (0.006) | (0.010) | (0.011) |
| F-statistic | 60.02 | 51.99 | 54.54 |
| Observations | 26,864 | 26,816 | 26,856 |
| Industry FE × Year FE | Yes | Yes | Yes |
| LLM Controls × Year FE | Yes | Yes | Yes |

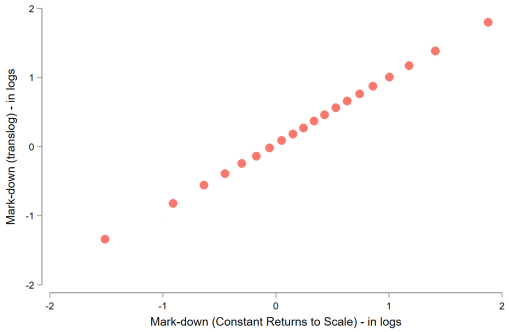
Notes: The coefficients correspond to the estimation of the interaction between the main independent variable with a dummy variable that takes a value of 1 if the observation corresponds to a year between 2016 and 2020 by pooling all years in the sample following equation 3. The coefficients represent the estimation of the interaction between the main independent variable and a dummy variable that takes a value of 1 for observations from years between 2016 and 2020, pooling all years in the sample, according to equation 3. Industry fixed effects are specified at the 4-digit CIIU level. Local Labor Market (LLM) controls include the variables specified in Section 5.2. Kleibergen-Paap rk Wald F-statistics is provided. Significance levels are denoted by ***, **, and * for 1%, 5%, and 10% levels, respectively. Standard errors are clustered at the level of the local labor market level. Source: Own elaboration based on data from DANE.

## B.2 Constant Returns to Scale Production Function

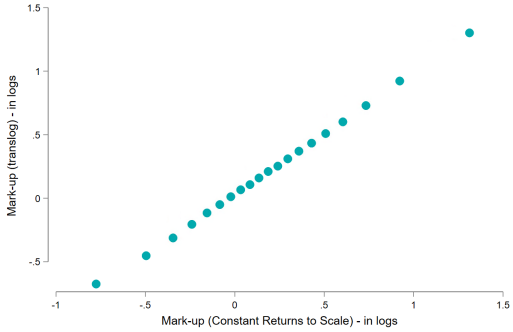
When considering a second-order translog production function with constant returns to scale, it can be seen in Figure B.2 that the original measures of MPL, wage mark-down, and price mark-ups are strongly correlated with the new ones under this specific production function.

Figure B.2: Robustness exercise: Comparison of Firm Outcomes under Different Production Functions

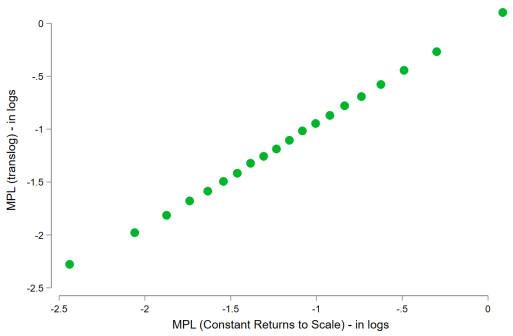
(a) Mark-down - Constant Returns to Scale




(b) Mark-up - Constant Returns to Scale




(c) MPL - Constant Returns to Scale




Notes. The figures show the binscatter plot of the relationship between each corresponding variable (in logs) under different production functions. Source: Own estimates based on EAM data from DANE.

Additionally, in Table B.2 the results are very similar to the ones presented in the main specification of Table A.2.

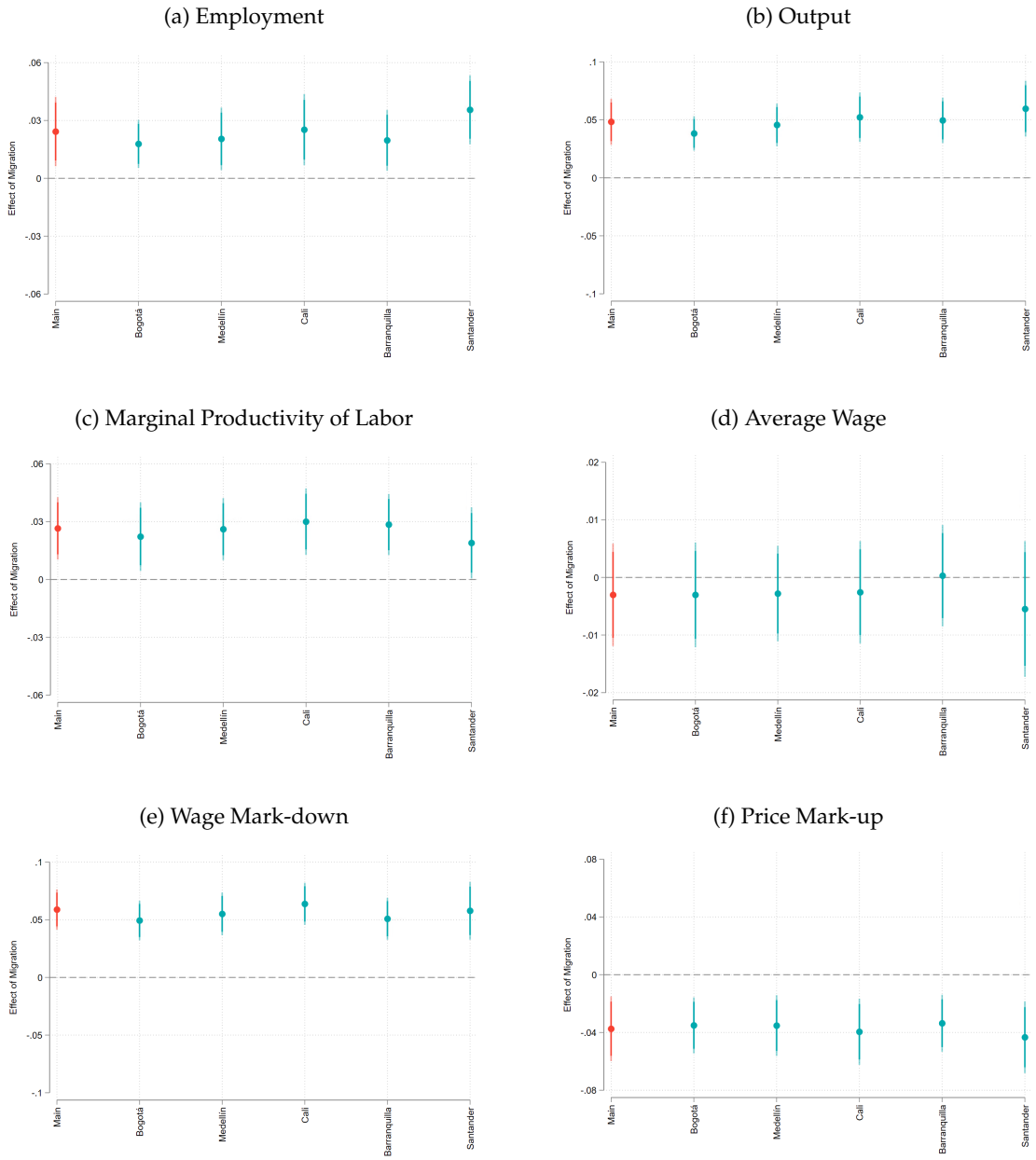
Table B.2: Robustness Exercise: Effect of Migration on Firm Outcomes - Constant Returns to Scale

| | MPL | Mark-down | Mark-up |
|---|---|---|---|
| Share of migrants | 0.031*** | 0.066*** | -0.042*** |
| | (0.008) | (0.010) | (0.007) |
| F-statistic | 54.47 | 56.30 | 51.48 |
| Observations | 25,719 | 25,398 | 25,433 |
| Industry FE × Year FE | Yes | Yes | Yes |
| LLM Controls × Year FE | Yes | Yes | Yes |

Notes: The coefficients correspond to the estimation of the interaction between the main independent variable with a dummy variable that takes a value of 1 if the observation corresponds to a year between 2016 and 2020 by pooling all years in the sample following equation 3. Industry fixed effects are specified at the 4-digit CIIU level. Local Labor Market (LLM) controls include the variables specified in Section 5.2. Kleibergen-Paap rk Wald F-statistics is provided. Significance levels are denoted by ***, **, and * for 1%, 5%, and 10% levels, respectively. Standard errors are clustered at the level of the local labor market level. Source: Own elaboration based on data from DANE.

## B.3 Leave-one-out: Local Labor Markets

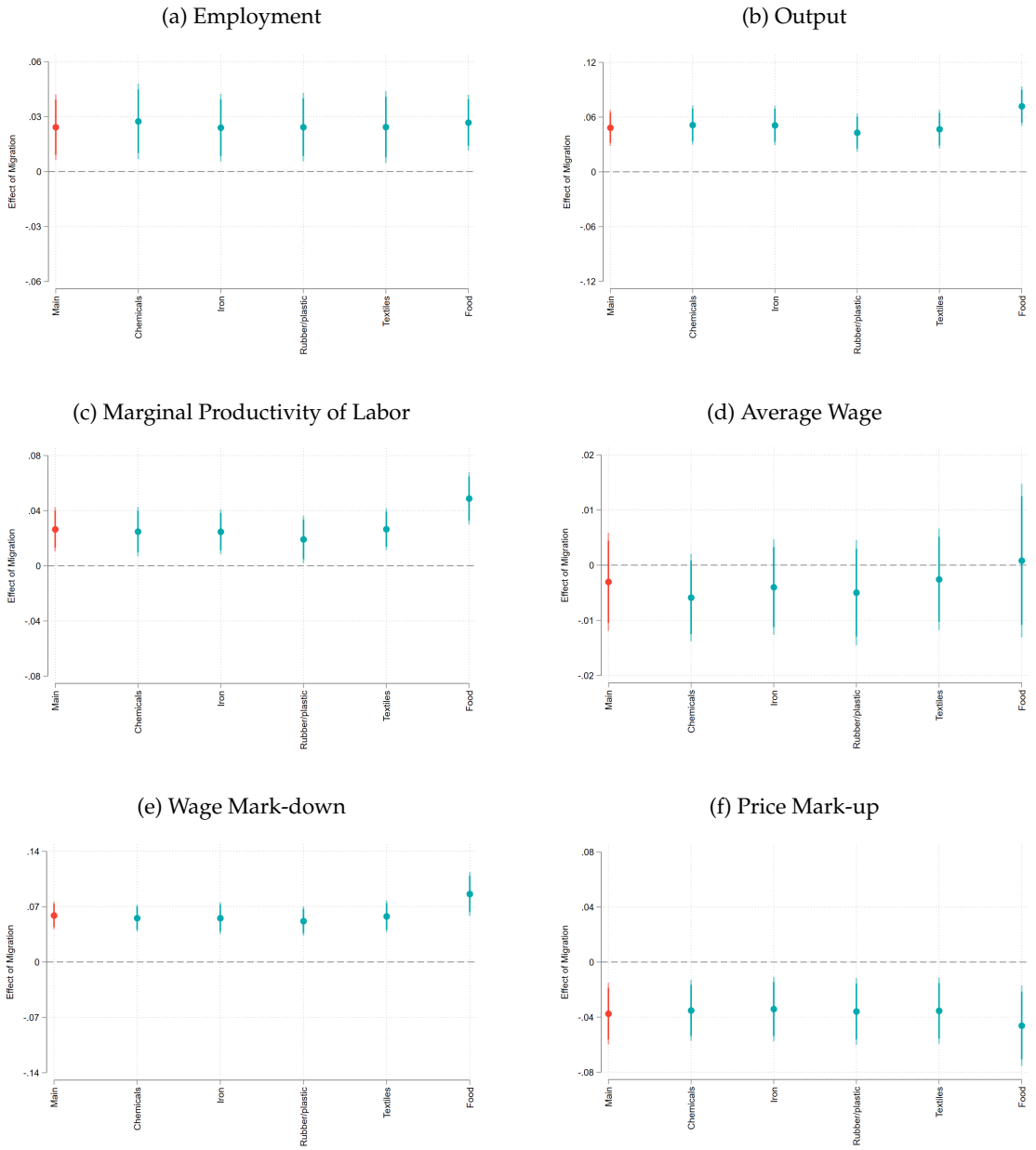
Figure B.3: Robustness exercise: Leave-one-out Top 5 Local Labor Markets, 2012-2020




Notes. The coefficients correspond to the estimation of the interaction between the main independent variable with a dummy variable that takes a value of 1 if the observation corresponds to a year between 2016 and 2020 by pooling all years in the sample following equation 3. The red coefficient indicates the original estimated effect of the migration shock on each respective outcome. The blue estimates correspond to the same effect but omit the local labor market specified on the x-axis. The estimates include Industry fixed effects at the 4-digit CIIU level. They also control for the Local Labor Market (LLM) variables specified in Section 5.2. The bars represent the 95% (light bars) and 90% (darker bars) confidence intervals. Standard errors are clustered at the level of the local labor market level. Source: Own elaboration based on data from DANE.

## B.4 Leave-one-out: Industries

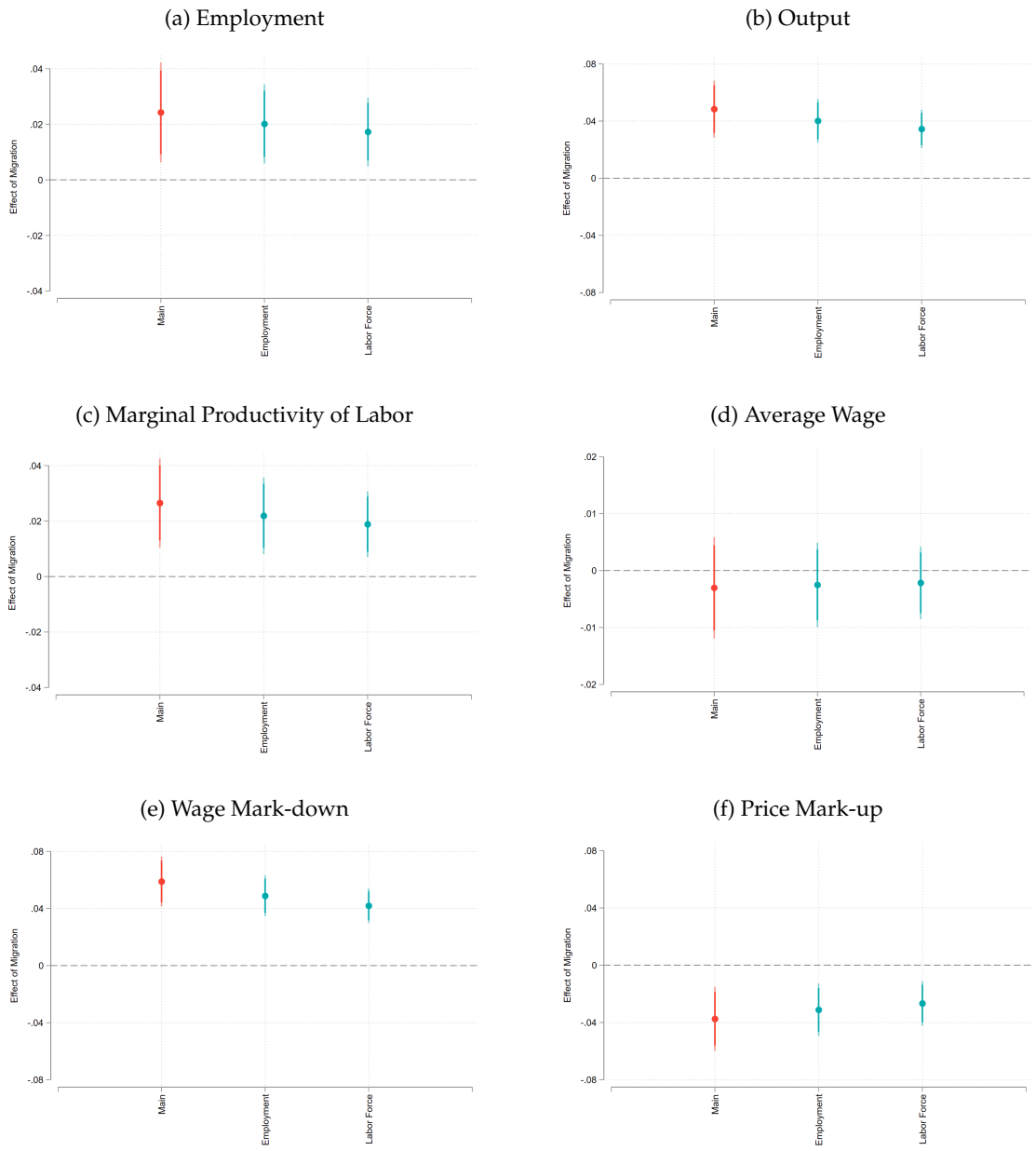
Figure B.4: Robustness exercise: Leave-one-out Top 5 Industries, 2012-2020




Notes. The coefficients correspond to the estimation of the interaction between the main independent variable with a dummy variable that takes a value of 1 if the observation corresponds to a year between 2016 and 2020 by pooling all years in the sample following equation 3. The red coefficient indicates the original estimated effect of the migration shock on each respective outcome. The blue estimates correspond to the same effect but omit the 2-digit industry specified on the x-axis. The estimates include Industry fixed effects at the 4-digit CIIU level. They also control for the Local Labor Market (LLM) variables specified in Section 5.2. The bars represent the 95% (light bars) and 90% (darker bars) confidence intervals. Standard errors are clustered at the level of the local labor market level. Source: Own elaboration based on data from DANE.

## B.5 Alternative Independent Variable Definitions

Figure B.5: Robustness exercise: Alternative Definitions of Independent Variables, 2012-2020




Notes. The coefficients correspond to the estimation of the interaction between the main independent variable with a dummy variable that takes a value of 1 if the observation corresponds to a year between 2016 and 2020 by pooling all years in the sample following equation 3. The red coefficient indicates the original estimated effect of the migration shock on each respective outcome. The blue estimates represent the same effect, but calculated by changing the method to compute the share of migrants in each local labor market relative to the group specified on the x-axis. The estimates include Industry fixed effects at the 4-digit CIIU level. They also control for the Local Labor Market (LLM) variables specified in Section 5.2. The bars represent the 95% (light bars) and 90% (darker bars) confidence intervals. Standard errors are clustered at the level of the local labor market level. Source: Own elaboration based on data from DANE.

# C Appendix: Market Power in the Colombian Manufacturing Sector

In this section, I will first show some descriptive evidence regarding the existence of market power of manufacturing firms in the Colombian labor market. In Table C.1, I show the average, median and standard deviation of the mark-down and mark-up in Colombia for the different main economic activities that make up the manufacturing sector in the country.

Three main aspects are worth mentioning. First, for all the economic activities in the manufacturing sector considered, there seems to exist labor and/or product market power. Specifically, I estimate that, on average, the ratio between the marginal product of labor and the average wage paid by the firms in my sample is 1.82, indicating that for every additional dollar produced by the firm, the workers are only receiving 55 cents. For the case of the output market, there is also evidence of market power. My estimates suggest that consumers are being charged, on average, a price that is 41% higher than the marginal costs. Secondly, there is significant heterogeneity across economic activities within the manufacturing sector. Transportation, Paper, and Medical Equipment exhibit the largest mark-down, whereas Clothing manufacturing, Oil refinery, and Other minerals exhibit the highest mark-ups.

Table C.1: Mark-down estimates by economic activity, 2013-2019

| | Markdowns | | | Markups | | |
|---|---|---|---|---|---|---|
| | Mean | Median | S.D. | Mean | Median | S.D. |
| Other Transportation | 3.40 | 2.52 | 2.81 | 1.08 | 0.86 | 0.76 |
| Paper | 2.94 | 2.48 | 2.15 | 1.37 | 1.11 | 0.84 |
| Medical Equipment | 2.72 | 2.10 | 2.10 | 1.15 | 0.97 | 0.69 |
| Basic Metal | 2.57 | 2.04 | 1.84 | 1.28 | 1.09 | 0.83 |
| Machinery and Equipment | 2.39 | 1.84 | 1.90 | 1.19 | 0.99 | 0.80 |
| Radio Equipment | 2.32 | 1.44 | 2.07 | 1.27 | 1.11 | 0.72 |
| Electric Equipment | 2.31 | 1.84 | 1.78 | 1.30 | 1.13 | 0.65 |
| Furniture/Other Industries | 2.26 | 1.80 | 1.72 | 1.20 | 1.05 | 0.69 |
| Printing | 2.23 | 1.90 | 1.64 | 1.06 | 0.87 | 0.63 |
| Wood | 2.19 | 1.82 | 1.75 | 1.22 | 1.06 | 0.70 |
| Oil Refinery | 2.15 | 0.64 | 2.73 | 1.69 | 1.55 | 0.65 |
| Other Minerals | 2.06 | 1.26 | 2.19 | 1.63 | 1.19 | 1.20 |
| Metal Manufacturing | 1.98 | 1.49 | 1.66 | 1.23 | 1.05 | 0.73 |
| Leather | 1.88 | 1.51 | 1.37 | 1.35 | 1.20 | 0.63 |
| Food and Beverages | 1.86 | 1.64 | 1.16 | 1.45 | 1.23 | 0.81 |
| Vehicles | 1.69 | 1.27 | 1.30 | 1.29 | 1.13 | 0.63 |
| Chemicals | 1.44 | 1.11 | 1.20 | 1.57 | 1.33 | 0.88 |
| Rubber/Plastic | 1.42 | 1.18 | 0.98 | 1.39 | 1.21 | 0.71 |
| Office Equipment | 1.20 | 1.14 | 0.65 | 1.12 | 0.86 | 0.76 |
| Textiles | 1.20 | 1.01 | 0.93 | 1.53 | 1.36 | 0.75 |
| Clothing manufacturing, tanning | 0.96 | 0.76 | 0.79 | 1.79 | 1.58 | 0.90 |
| Total | 1.82 | 1.39 | 1.52 | 1.41 | 1.20 | 0.82 |

Notes. The Table shows the mean, median, and standard deviation of the mark-downs in the Colombian manufacturing sector by economic activity. Source: Own estimates based on EAM data from DANE.

These values are in line with the labor economics literature estimating mark-downs in different countries of the world. For instance, for the case of the US, Yeh et al. (2022) estimate and average mark-down in the manufacturing sector of 1.53. In the case of developing countries, for instance, Estefan et al. (2024) estimate an average mark-down of 1.49 for the manufacturing sector in Mexico. Finally, for the case of Colombia and by using an alternative methodology, Amodio and De Roux (2024) estimate a labor supply elasticity of 2.5, which implies a wage mark-down of 1.4.

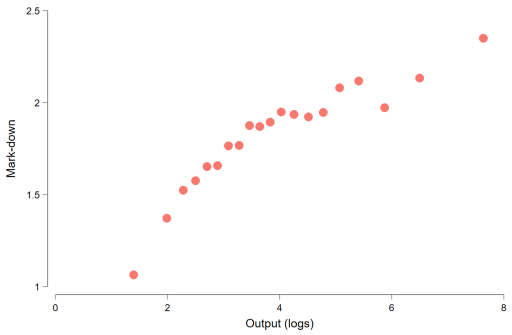
Regarding product mark-ups, my estimates are consistent with mark-up estimations for the case of developed and developing countries. For instance, in the case of developing coun-

tries, Tortarolo and Zarate (2018) estimates a median mark-up for Colombia manufacturing firms equal to 1.78, De Loecker et al. (2016) find a median mark-up for the Indian economy of 1.34, and an average of 2.70.

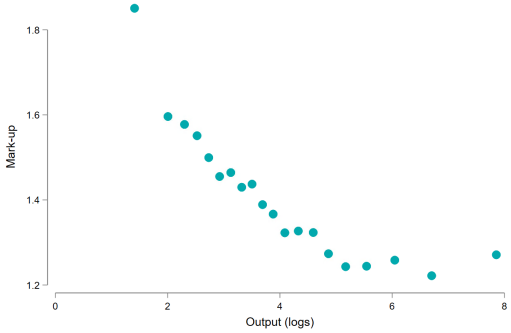
Furthermore, when analyzing the relationship between the labor market power of the firms and their size, Figure C.1 shows that the larger the firms are in terms of output, the lager the mark-down they can impose. This result is consistent with other papers in the labor market power literature of developing countries (Estefan et al., 2024). Additionally, my estimates suggest that larger firms are also able to impose lower mark-ups, on average.

Figure C.1: Firms' Market Power and Size

(a) Mark-downs




(b) Mark-ups




Notes. The figures show the relationship between sales (in logs) of firms and their wage mark-down (Panel a) and product mark-up (Panel b). Source: Own elaboration based on EAM data from DANE.

# D Technical Appendix

## D.1 Construction of the Dataset

I follow standard data-cleaning procedures for the EAM dataset, as commonly practiced in the economic literature (see, e.g., Eslava et al., 2013; Fieler et al., 2018; Tortarolo and Zarate, 2018). First, I retain single-plant firms, and for multi-plant firms, I keep only the plant with the largest number of employees throughout the analysis period. I exclude firms classified as cooperatives, religious or solidarity organizations, third-sector organizations, or State-owned commercial and industrial companies, as well as those with any State capital ownership. Additionally, I drop firms with negative or zero values for capital, raw material consumption, intermediate consumption, production, total wage bill, or energy consumption. Firms with fewer than 10 employees in any year within the analysis period are also excluded. Finally, I remove firms with extreme outlier values for main variables (capital, employment, materials consumption, energy consumption, and production) where any values exceeds the median of the same variable by a factor of 8.

When estimating the wage mark-downs and product price mark-ups, I further exclude observations with mark-downs or mark-ups beyond the 1st or 99th percentiles.

## D.2 Methodology for Price Indices Construction and Deflation Procedure

To construct plant-level price indices for materials and output, I followed the methodology of Eslava et al. (2013), utilizing a distinctive characteristic of the EAM: the provision of plant-level prices for each product produced and each material used in the production process, with a level of detail comparable to the 6-digit Harmonized System.

I calculated unit prices by dividing the total production value by the quantity for each product, then determined the average share of each product in the total output or materials over the analysis period. For each firm-product, I calculated the log change in price year-over-year, with extreme values truncated at the 1st and 99th percentiles. Missing values were imputed using product-industry-year, product-year, or industry-year averages, when available, in that order. I computed firm-level weighted averages of log price changes, using product

shares as weights, and calculated within-year price deviations from the economy-wide average. The base-year price index was set to one plus the deviation from the industry average, with subsequent years calculated by adding the average log price change. I normalized the indices to set the base year to 100, excluding outliers beyond the 1st and 99th percentiles.

Finally, I used the indices for output and materials to deflate firm-level outputs and inputs, DANE's capital price index for capital deflation, and the national CPI for wages.

# E Production Function, Mark-down, and Mark-up estimations

In this section, I go over the production function estimation methods used in this paper. Then, I will explain how the wage mark-down, marginal productivity of production inputs, and profits were calculated.

## E.1 Production Function Estimation

In this subsection, I will provide details on the estimation of firms' production function and the corresponding output elasticities. This section closely follows the details provided by Yeh et al. (2022). For the production function estimation, I will follow the proxy variable method proposed in the literature by Olley and Pakes (1996), Levinsohn and Petrin (2003), De Loecker and Warzynski (2012), and Ackerberg et al. (2015).

Consider the production function of the firm which is given by $Q_{it} = \Omega_{it} F(L_{it}, K_{it}, M_{it}, E_{it})$, where $L_{it}$ represents labor, $M_{it}$ are the intermediate materials used by the firm, $K_{it}$ is capital, and $E_{it}$ is the energy consumed by the firm. We have that $\Omega_{it}$ enters in a multiplicative way to the production function, which is observed by the firm before choosing their inputs but not by the econometrician. Then, taking into account measurement errors, we assume that the logged output of the firms is given by $y_{it} = ln(Q_{it}) + \omega_{it} + \varepsilon_{it}$, where $\varepsilon_{it}$ represents the measurement error in the production function. This error term is not observed neither by the firm when they have to make production decisions nor the econometrician. Then, considering $\beta$ as parameters in our production function, we have that the logged production function of the firm is given by:

$$y_{it} = f(l_{it}, k_{it}, m_{it}, e_{it}, \beta) + \omega_{it} + \varepsilon_{it}$$

This element $\omega_{it}$ is the main source of endogeneity when estimating production functions and output elasticities of production inputs. Following the "proxy method" we can consider materials as our proxy variable which is going to be an invertible function of each period's productivity and the other inputs in the production function, therefore $m_{it} = m_{it}(\omega_{it}, l_{it}, k_{it}, e_{it})$. Therefore, there is a function $h_{it}$ such that $\omega_{it} = h_t(m_{it}, k_{it}, l_{it}, e_{it})$.

Then, we have that

$$y_{it} = f(l_{it}, k_{it}, m_{it}, e_{it}) + h_t(m_{it}, k_{it}, l_{it}, e_{it}) + \varepsilon_{it}$$

Which implies that

$$y_{it} = \varphi_{it} + \varepsilon_{it}$$

Then, to estimate the production function parameters $\beta$ we follow Ackerberg et al. (2015). We assume that $m_{it}$ is our proxy variable or flexible input, whereas $(l_{it}, k_{it}, e_{it})$ are not fully flexible. With this at hand, we first estimate $\varphi_{it}$ and $\varepsilon_{it}$ non-parametrically by approximating $y_{it}$ with a third degree polynomial with interaction terms. Then, once we estimate $y_{it}$ we can estimate $\hat{\varphi}_{it}$ as the fitted values of that estimation, and $\hat{\varepsilon}_{it}$ as the corresponding residuals.

An additional assumption of the "proxy variable" method is the process under which we assume productivity evolves over time. We assume this is going to be a Markovian stochastic process, such that $E[\omega_{it}|\omega_{i,t-1}] = g_t(\omega_{i,t-1})$, such that $\omega_{it} = g_t(\omega_{i,t-1}) + \zeta_{it}$, where $\zeta_{it}$ is going to be the productivity innovation of period $t$, such that $E[\zeta_{it}|\omega_{i,t-1}] = 0$, which indicates that on average, the innovations to productivity today do not depend on the productivity in the previous period. Given this, we can approximate $\omega_{it}(\beta)$ in our data by:

$$\omega_{it}(\beta) = \hat{\varphi}_{it} - f(x_{it}; \beta)$$

Then, we can approximate $g_t(.)$ with a $P^{th}$ order polynomial (in our case a third-order

polynomial) such that

$$\omega_{it}(\beta) = \Omega_{it-1}(\beta)'\rho(\beta) + \zeta_{it}$$

$$\omega_{it}(\beta) = \sum_{p=0}^{P} \rho_p \omega_{it-1}^{p} + \zeta_{it}$$

Then, $\zeta_{it} = \omega_{it}(\beta) - \Omega_{it-1}(\beta)'\hat{\rho}(\beta)$. Where $\hat{\rho}(\beta)$ is just the set of coefficients we obtain from running a regression of $\Omega_{it-1}(\beta)$ on $\omega_{it}$.

Finally, we know by assumption that capital is predetermined at each period, then we know that $k_{it}$ should be not correlated with $\zeta_{it}(\beta)$, and we also know that the input decisions in period $t$ should not be correlated with productivity innovations $\zeta_{it}$. Therefore, we can use the set of lagged inputs and current capital as instruments for current input decisions in our production function (with their corresponding polynomials and interactions). Then, to obtain $\beta \in R^Z$ we estimate it through a traditional GMM estimation, by defining the following system of moment conditions

$$E(\zeta_{it}(\beta) z_{it}) = 0$$

Therefore, our estimated coefficients are going to be given by

$$\hat{\beta} = \text{argmin}_{\beta \in R^Z} \sum_{m=1}^{Z} \left( \sum_{i=1}^{N} \sum_{t=1}^{T} \zeta_{it}(\beta) z_{it}^{m} \right)^2$$