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OCCUPATION MISMATCH IN BRAZILIAN METROPOLITAN AREAS: COMPARING IMMIGRANTS AND NATIVES

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Resumo

Pretende-se analisar o mercado de trabalho e os efeitos de *mismatch* ocupacional, no contexto de migração internacional. *Mismatch* ocupacional ocorre quando trabalhadores qualificados são ocupados em trabalhos que não necessitam de suas qualidades e vice-versa. Os resultados mostram que: i) subeducação é, em média, menor entre os imigrantes, enquanto sobreeducação é maior; ii) imigrantes são mais propensos a estarem empregados; iii) *mismatch* é importante para explicar diferenciais de salários; iv) existe diferença regional nos efeitos do *mismatch* ocupacional; v) o local de origem do imigrante não é importante para explicar status ocupacional, mas importa para explicar diferenciais de rendimentos.

Palavras-chave: Brasil; imigrantes; *mismatch* ocupacional.

Abstract

We aim to study the role of labor market mismatch in the context of international migration. Mismatch employment occurs when high-skill workers are employed in occupations that do not need such education and vice versa. The results show: i) undereducation is on average lower among immigrants, while overeducation is higher among immigrants; ii) immigrants are more likely to be employed than natives; iii) mismatch is important in explaining wages; iv) there are differences in occupational mismatch effects; v) the immigrant's place of origin is not important to explain occupation status but it is very important to explain differences in wages.

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1 Introduction

The importance of international migration is evident. In the context of globalization, it has been the subject of a significant number of important contributions to theoretical and empirical analysis (PATARRA, 2005).

In Brazil, it is evident that a large amount of consideration is being given to Brazilians who migrated and are living in other countries, mainly the United States. However, not enough awareness is given to the opposite direction: migrants who went to Brazil. One of the objectives of this study is to reduce this gap.

The 2009 Human Development Report (KLUGMAN, 2009) shows that there were 50 million immigrants living in irregular conditions around the world at the time. According to available information, the discussion about unauthorized immigrants in Brazil is still incipient. Therefore, statistics about the numbers of illegal immigrants are diverse.

According to a national entity in Brazil linked to the National Conference of Bishops of Brazil (CNBB), in 2008 there were around 600 thousand illegal immigrants in Brazil. For the same year, the Ministry of Labor attests that in Brazil there were around 180 thousand immigrants. Additionally, in 2014, according to the Sao Paulo Government and the Labor Public Ministry (MPT), the state had at least one million illegal immigrants[1]. However, according to the Federal Police, in 2012, there were less than one million legal immigrants in the entire country (Table 1). Subsequently, it becomes apparent that there is no clear understanding of these numbers and, besides, none of the datasets available asks the question about legal status. Therefore, this research will not distinguish between unauthorized and authorized immigrants.

Sassen-Koob (1981) argues that state formation creates the mechanisms to consider immigration labor as a different category in the labor process. In posterior work, the author (SASSEN-KOOB, 2008) attested that labor migrations are not simply about the survival strategies of migrants and their households. They are also micro-level enactments of larger processes of economic restructuring in sending and receiving countries. In this paper, we analyzed only the micro-level effects, such as individual wage and occupation.

Scholars (mostly economists) indicate that migrants are positively selected in both unobserved and observed characteristics. In addition, they address the issue of the migration process as a generator of economic improvements (SJAASTAD, 1962; BORJAS, 1990). Most migrants are seeking better opportunities. In other words, most of them migrate to pursue income improvements. Therefore, it is expected that they would be allocated in better positions and receive better wages, compared to natives with the same level of education.

Nevertheless, what about occupation mismatch? Given that some immigrants might face problems with a new language, they may suffer prejudice, etc., which can lead them to occupying jobs that are below their skills, i.e., their educational attainments are underutilized. Hartog (2000) argues that this can be a short or long-term issue, since mismatch may be temporary or permanent. Baker and Benjamin (1994), Chiswick (1978), and Chiswick and Miller (2008) affirm that the partial effect of a year of schooling is lower for immigrants compared to natives, considering US labor market.

[1] http://noticias.terra.com.br/brasil/cidades/sp-tem-ao-menos-1-milhao-de-imigrantes-ilegais-diz-governo,1dc08e57fbf4a410VgnVCM5000009ccceb0aRCRD.html.

Overeducation occurs when a worker is in an occupation that requires less than the education this individual possesses. The opposite of overeducation is undereducation, i.e., the worker is in an occupation that requires more education than he/she has. The total number of overeducated and undereducated workers will result in the rate of occupation mismatch, while the differences in remuneration will provide the loss or gain due to occupation mismatch.

The aim of the present study is to examine the differential in income and occupational status of international immigrants and natives in Brazil, using 2010 Census data. More precisely, the data utilized in this research is from a sample survey conducted during the Census, in which one in every ten households enumerated answers to a long questionnaire (the "Long Form Census"). The census itself has little information on income.

Furthermore, to understand this phenomenon, it is important to look at the country of origin of the immigrant. This influences the assimilation and the way migrants are perceived. For example, in the Brazilian labor market, immigrants from Paraguay and Bolivia usually work in low-wage positions that do not require high skills. On the other hand, e.g., migrants from Germany usually work in better-paid jobs, such as mechanical engineers. Nevertheless, if they have the same skills, are they going to have similar wages? Same probabilities of being employed? This study intents to answer those questions.

This paper analyzes Brazil's metropolitan regions. The reason being that most immigrants consider those destinations when they first arrive in a new country. A model similar to the one by Kler (2003) was applied in this study. Also, Heckman's selection bias correction was used for each metropolitan region in the sample. The reason being to estimate wage gains for immigrants and natives. The methodology is suitable since the wages analyzed were from different groups, in which it is clear that a selection bias can emerge, since immigrants must endure difficulties that natives may not, such as: language barrier, costs of moving and adaptation, etc.

The empirical relevance of the paper is to apply a well-known methodology to two issues less explored in Brazil: occupation mismatch and wage differences between natives and immigrants. Analyzing the 2010 Census data, it appears that no paper addressing such a matter was made in Brazil. As one can see in the results section, combining these two topics is highly relevant, since there are differences in the distribution of natives and immigrants between over and undereducated groups.

The article is structured as follows: besides the introduction section; section 2 presents a brief description of immigration history in Brazil, as well a discussion about migration issues; section 3 brings the discussion of over and undereducation literature; section 4 contains the methodology; section 5 presents the results; and finally, in the last section, the final remarks are presented.

2 International Migrants in Brazil

As shown in table 1, data provided by the Brazilian Federal Police (PF) states that there are less than one million immigrants in Brazil, which corresponds to less than 0.4% of the migrant population in the world.

Table 1: Ranking of immigrants by origin country - 2012

Portugal	277 727	29.58%
Japan	91 042	9.70%
Italy	73 126	7.79%
Spain	59 985	6.39%
Bolivia	50 240	5.35%
Argentina	42 202	4.50%
China	35 953	3.83%
Germany	29 224	3.11%
United States	27 953	2.98%
Uruguay	26 271	2.80%
Remainder	225 110	23.98%
Total	938 833	100.00%

Source: Adapted from http://oestrangeiro.org/2013/05/22/exclusivo-os-numeros-exatos-e-atualizados-de-estrangeiros-no-brasil-2/

Table 1 also shows the first three sending countries are Portugal, Japan and Italy. In 1850, under British pressure, Brazil passed a law that effectively banned the transatlantic slave trade. Therefore, the discussion about immigration to Brazil became a priority for Brazilian landowners, who knew they would need to replace the labor force in the next years.

Starting with Portugal, the relationship with Brazil started with colonization. The country received the majority of Portuguese immigrants in the world. However, the huge flow of migrants came only later. Nowadays, the Portuguese constitute the biggest group of foreigners living in the country.

The first Japanese immigrants arrived in Brazil in 1908. Brazil is home to the largest Japanese population outside of Japan, having in 2012, according to official records, 91,042 individuals. Poverty in rural areas was the main cause of Japanese migration. In addition, the US were not accepting non-white migrants[2], as well as Australia. Brazil needed more labor force, mainly people to work in country towns. The beginning of World War I was also one of the reasons for the increase in Japanese migration to Brazil.

The first groups of Italians arrived in 1875, but the boom of Italian immigration in Brazil happened in the late 19th century, between 1880 and 1900, when almost one million Italians arrived. Most of the migration was concentrated in the state of São Paulo. The main reasons for this flow of immigrants are similar to the ones that led to the Portuguese migration.

However, in the last decades, immigration from those countries has become scarce. For example, a ranking made by MTE (Ministry of Labor and Employment) shows that in 2010 the five original countries with more working visa requests were the United States, Philippines, United Kingdom, India and Germany. Besides, many illegal immigrants came from other South American countries and China. Nevertheless, the importance of the countries presented above is still substantial.

[2]See for example the 1924 Immigration Act. http://history.state.gov/milestones/1921-1936/immigration-act.

A pioneering study on migration is due to Sjaastad (1962), in which he states that a worker faces monetary and non-monetary costs while migrating in order to maximize their utility over the life cycle. The author views the migration process similarly to the educational background, i.e., individual investment. It is largely known that the higher the earnings in a given locality, the less likely workers will quit their jobs and migrate to another region. However, the higher the total income of the workers, the more conditions they have to support their migration costs, which could increase their likelihood of migration (PEREIRA, 2000).

According to Sasaki and Assis (2000), recent research has challenged assumptions and conclusions of neoclassical theory. Among them, the decision to migrate would not be an individual decision, but a joint decision, a family decision, not being only related to monetary reasons. In this article, variables related to family characteristics are used as controls in the estimates.

As stated above, it is clear that migrants are different and face different scenarios compared to non-migrants. Therefore, it is also expected that education status could have a distinct return, in terms of wage and occupation status, for those two groups.

3 Background

Different approaches exist to measure overeducation. McGuinness (2006) attests that the phenomenon has been interpreted in the literature in three perspectives on the labor market: the Human Capital Theory, Job Competition Model, and Assignment Models. This research is addressed from the perspective of Human Capital Theory.

Diaz and Machado (2008) argue that the compatibility between the existence of overeducation and Human Capital Theory can be defended on the argument that occupation mismatch is transitory, in which the duration is subordinated to the time the worker would take to find a more suitable job to their potential or the time required for firms promote an adjustment in production processes to adapt them to the full use of human capital available. Another explanation is that the additional education would just compensate for the lack of training in companies (on-the-job training), and/ or some degree of inferiority in terms of skills to carry out the activities performed.

The level of education has improved considerably in Brazil in the last decades (PINTO, 2004; BASSO, 2017; MARIONI, 2021). Therefore, according to Borjas (2009), in theory, this development should cause an improvement in the stock of human capital and productivity. Thereby, it increases the competition for jobs, which can lead to overeducation in a scenario with scarce high-skill jobs, as the combination of unemployment and search for qualification seem to generate an incompatibility between occupation and education, in the sense that workers have not been used according to their academic ability (ALVES; MONSUETO, *et al.*, 2014). In Brazil, a surge in this phenomenon has recently been observed, with mean wages decreasing and an increase in overe-ducation (as example, the increase in people with a college degree working as uber drivers).

Reis (2017) presents evidence for Brazil that educational incompatibility would be related to job income, even with a well-done methodological treatment for non-observable effects that do not vary over time. The author points

out that this result is similar to that observed in developed countries. Still, in the perspective of this educational mismatch for Brazil, in an analysis based on employee / employer longitudinal monitoring, Marioni (2021) finds that a quarter of the Brazilian formal labor market would be overeducated and a quarter would be undereducated, with undereducated earning significantly more than those who would be adequately occupied and the overeducated earning significantly less than those who were properly educated. Despite the "penalty" in the income of the overeducated, these results suggest that, from an individual perspective, it is worth investing in higher education.

Many empirical papers, for different countries, find significant under and overeducation rates. Robst (1995) found that male overeducation in the USA stands at 45%. In Greece, Patrinos (1997) found overeducation to be 16%, with fluctuations depending upon the subject matter studied by the graduate. For the United Kingdom, Battu, Belfield, and Sloane (2000) found tjat males had better chances of being adequately matched after graduation. However, the female group did manage to improve their matching over time. Kler (2003) found that the rates of graduate overeducation in Australia vary between 16% and 22%, by both gender and time – 1991-1996. For Germany, Buchel and Mertens (2001) found overeducation to be about 13% and undereducation about 2%.

For Brazil, Machado, Oliveira, and Carvalho (2009) using data from the National Household Sample Survey (PNAD) for the period 1981-2001, presented evidence that more qualified people were employed in occupations that were previously occupied by workers with a lower level of education. According to the authors, this trend can be generated in two ways, via underutilization of work or by increasing the qualifications of the same. Thereby, an oversupply of qualified workers arises, leading to overeducation in the labor market. The results show a mean occupational mismatch of about 21%.

Monsueto (2006), also using PNAD data, however, for the period 1992-2001, notes that a substantial part of workers with graduate degrees are being absorbed by sectors in which the qualification required to execute the tasks is lower than demanded. Alves, Monsueto, *et al.* (2014), analyzing Brazilian cross-section data for 2002 and 2012 (also PNAD) for graduates, found out that there is high occupation mismatch in Brazil, about 50%. Finally, Diaz and Machado (2008), using the 2000 Census, found out that overeducation in Brazil is about 17% and undereducation is about 53%.

Analyzing the impact of overeducation on wages, Duncan and Hoffman (1981) were one of the first economists to study the subject, concluding that returns to required schooling in employment are higher than the returns of education possessed by the individual. Hartog (2000) also affirms that returns are positive for education, but smaller than the required education. In general, approximately half to two thirds of the return of the latter.

Works of this nature are scarce in Brazil. Santos (2002), who used data from PNADs 1992, 1995, 1997, and 1999, and discovered, using two different criteria of classification, undereducation to be between 17 and 32% and overeducation between 19 and 25%. For 1999, overeducated earned about 21% less than adequate, while overeducated earned about 30% more than adequate workers. Also, Diaz and Machado (2008), using the methodology of Job Analysis, found out that, among regions in Brazil, overeducation rates vary between 14 and 19%, undereducation between 49 and 58%, the returns of being overeducated were 13,8% for women and 12,1% for men, while un-

dereducation reduces the return in 10,1% and 9,1% for men and women respectively.

Last, but not least, it is important to highlight that none of the papers above used the 2010 Brazilian Census data.

4 Methodology

4.1 Migration

Castles, Hass and Miller (2014) affirm that the fields of research in migration can be divided into two types: those that deal with the determinants, process and patterns of migration, and those that focus on how the incorporation of the migrants in the receiving countries takes place. In this study, the focus is on the second approach.

To try to understand the migrant's assimilation and if there is discrimination against immigrants, for some countries, the main variable analyzed is wages in the main work. However, it is also important to analyze the probability of being employed, because some migrants can present some observed or unobserved characteristics that enhance the probability of finding a job. This can lead to the so-called selection bias. If it is not taken into account, it can lead to biased results. Therefore, the Heckman correction is applied (HECKMAN, 1979).

The term immigrant is defined as the individual who was born in one country and moved to another, in this case, Brazil, despite if he/she is naturalized or not.

4.2 Undereducation and Overeducation

According to the existing literature, overeducation is defined as the level of education possessed by an individual that is higher than required by their occupation. Similarly, undereducation occurs when a worker has less formal education than is required. It is considered as labor mismatch, when controlled by occupation, the individual who is allocated in an occupation that does not require the qualifications or requires more than the one he/she has. The method used is via job analysis, which means that the required schooling is based on a classification made by professional job analysts, coding occupations in the labor market, specifying the appropriate schooling for each occupation (HARTOG, 2000; VERHAEST; OMEY, 2006; DIAZ; MACHADO, 2008).

Some limitations brought by this definition can be cited. Firstly, according to Verhaest and Omey (2006) and Diaz and Machado (2008), there is a risk of random errors in the measurement of education required as well in the classification of occupations, depending on how the activities of experts have been held. Secondly, another possible limitation is related to the low frequency of updates in occupation requirements, as a result of the complexity and high costs involved in producing this type of work. Thus, the long-term monitoring of the occupation mismatch phenomenon is compromised, because the dynamics of the labor market can cause profound changes in educational requirements for the performance of various activities, making obsolete the information in table occupations (DIAZ; MACHADO, 2008).

Despite the second limitation cited, the 2002 Brazilian Occupation Classification (*Classificação Brasileira de Ocupações* – CBO) is used to define the necessity of a certain amount of formal education to assert the job.

This paper investigates under and overeducation in a similar way as Duncan and Hoffman (1981), i.e., using augmented human capital modeling. The augmented human capital regression takes the following form:

$$\ln Y_i = \alpha_0 + \alpha_1 Sr_i + \alpha_2 Ss_i + \alpha_3 Sd_i + \alpha_4 Z_i + \alpha_5 I_i + \alpha_k X_{ik} + \varepsilon_i \quad (1)$$

where $\ln Y_i$ is the logarithm of monthly income for individual i, Sr captures the return to required education, Ss represents the return to surplus education – i.e, overeducated for an occupation –, Sd captures the return to deficit education – i.e., undereducated for an occupation –, Z represents the qualification attainments, I is a dummy variable equal to 1 if the worker is an immigrant and equal to 0 otherwise, X is a vector of individual, familiar, and regional characteristics, while ε is the error term.

Chiswick and Miller (2008) attests that undereducation is associated with self-selection in migration. Therefore, it is expected better wages amongst those individuals. In other words, overeducation amidst immigrants is associated with less-than-perfect international transferability of human capital. Finally, if this is the case, one should expect lower wages for those individuals.

4.3 Heckman Correction

The Heckman correction is a two-stage method applied to account for selection bias. Selection bias arises when the sample studied is non-randomly selected. More specifically, regarding wages, selection bias arises possibly because it is only being selected those individuals who have jobs, not taking into account those that probably failed in the process. Therefore, naturally, the present sample has bias. In his seminal paper, Heckman (1979) argued that statistical analyses based on non-randomly selected samples could lead to erroneous conclusions. Hence, he suggests a two-stage estimation method to correct the bias.

In order to estimate the determinants of wage gains, obviously, data is available only for those who work, as in formula (1). Since people who work are selected non-randomly from the population, estimating the determinants of wages from the subpopulation who work may introduce this bias. In this case, in the first stage, the probability of working is estimated, using a probit regression, as:

$$E_i = \alpha_0 + \delta_k Z_{ik} + \varepsilon_i \quad (2)$$

where E indicates employment ($E = 1$ if the respondent is employed and $E = 0$ otherwise), Z is a vector of explanatory variables and ε_i is the error term. An estimate of the inverse of mills ratio[3] is derived and included in the second stage equation to correct the selection bias.

$$\ln Y_i = \alpha_0 + \alpha_1 Sr_i + \alpha_2 Ss_i + \alpha_3 Sd_i + \alpha_4 Z_i + \alpha_5 I_i + \alpha_k X_k + \rho \hat{\lambda}_i + \varepsilon_i \quad (3)$$

[3]The formula is $\lambda_{ki} = \frac{\phi(Z_{ki})}{1-\Phi(Z_{ki})} = \frac{\phi(Z_{ki})}{\Phi(-Z_{ki})}$. Where ϕ and Φ are, respectively, the density and distribution function for a standard normal variable. For more details see Heckman (1979).

If this variable in the second stage is significant, the model has a sample selection bias, which is corrected, and unobserved characteristics that influence the decision to work or success in finding a work also influence yields. This correction must be applied, because otherwise, the estimates become inconsistent and biased (TIENDA; WILSON, 1992).

4.4 Data

The dataset used in this study is the microdata from the 2010 Brazilian Demographic Census. The Census is conducted by the (IBGE) and occurs every 10 years. It was surveyed 185,712,713 people around the country. The Census is the most comprehensive database and with larger samples found in the country. In addition, it is the main reference source for the knowledge of people's living conditions in all municipalities in Brazil (IBGE, 2013). Information about the individuals and their relatives was used.

The Demographic Census is characterized as a large portrait in extension and depth of the Brazilian population, with a series of socioeconomic information. This characteristic gives it a great influence on the orientation of public and private planning for an entire decade. Along with all this particularity of the database, it is important to point out the relevance of the period analyzed.

After the 2008 crisis, 2010 was a year of substantial growth for Brazil, ending a decade of important changes in the Brazilian economy. This has a clear impact on the labor market and the attractiveness of migrants. Another relevant point is that, in addition to the economic growth, there was a faster growth in the offer of vacancies in Higher Education Institutions, with a consequent increase in the supply of more educated workers in the labor market. This greater supply of vacancies tends to have an important impact on underoccupation, mainly due to the sectorial characteristic of Brazilian growth, led by the agricultural and mining sectors[4].

The sample was restricted to individuals between 25 and 65 years old in order to study those who are or were supposed to be in the labor market. Besides, this age cut-off was chosen in order to exclude workers who possibly had a part-time job while attending university at the regular age and to avoid retirees affect the education mechanisms, as in Marioni (2021). Even so, people who studied and people retired were still in the sample. So, it excluded the retired people and, for sample size reasons, those still studying were not removed but a dummy variable was included in the estimations.

It is considered as migrants those people who were not born in Brazil (foreigners). Some groups of occupations were excluded due to the fact that it was difficult to assert the necessary education to perform the jobs and others were excluded because of misspecification. The necessary training for each occupation was defined using the 2002 CBO. As stated before, the time gap between 2002 and 2010 could be a drawback, since some occupations' requirements might have changed.

Besides, we consider three regions: metropolitan area of São Paulo (RMSP); metropolitan areas of Southeast (RMSE), excluding RMSP; and metropolitan areas of South (RMS). The reason we chose those regions was due to sample

[4]Considering that the industry and the productive service sectors have a greater offer of vacancies in occupations that demand a higher level of education and also that these sectors did not show important dynamics over the decade, despite an important role in 2010, it is likely that this more qualified workforce would be absorbed in jobs that did not require this level of training.

Table 2: Sample of immigrants and natives in each region

	São Paulo	Southeast	South
Immigrants	3155	1939	1678
Natives	419318	592511	538707

Source: Own elaboration using 2010 Census data.

Table 3: Variables Description

Age	age in years
Age2	squared age
Sex	dummy equal to 1 if female and 0 if male
Work	dummy equal to 1 if works and 0 on the contrary
Spouse	dummy equal to 1 if the individual has a spouse
Kids	dummy equal to 1 if the individual has kids
Educ	Categorical variable equal to 0 if less tha high school; equal to 1 if high school; and 2 if college or more
School	dummy equal to 1 if enrolled in school and 0 on the contrary
Time	Time living in Brazil in years
Time2	squared time living in Brazil
Advanced	dummy equal to 1 if the individual is from a advanced economy
Retired	dummy equal to 1 if the individual is retired
Region	Categorical variable equal to 1 if the individual lives in RMSP; 2 if RMSE; 3 if RMS
Wage	wage in reals

Source: Own elaboration using 2010 Census data.

size, since North, Northeast and Midwest present short sample size. Additionally, we applied estimations to a sample of only immigrants, to better understand this group of workers.

Our final sample has 6779 immigrants and 1553931 natives. Table 3, presents the variables that are going to be used in our estimations.

Different sub-samples are used, instead of a sample for all Brazil, since there are disparities in each region, which attracts immigrants for different reasons. In the next section, we present the results.

5 Results

5.1 Descriptive Statistics

First, it is compared some characteristics of the immigrants in the three regions and also against the natives. In Table 4, one can see that the mean age is lower among natives compared to immigrants. Besides, in the RMSE are older immigrants, with a mean age of 46.64 years, almost ten years above natives from the same region. This result shows that the entrance of immigrants in the last years does not follow the growth in Brazil's population, and/or that the entry of immigrants into the labor market is lower than natives. About

Table 4: Descriptive Statistics

	Natives			Immigrants		
	RMSP	RMSE	RMS	RMSP	RMSE	RMS
Age (mean)	39.11 (9.83)	39.57 (9.95)	39.25 (9.76)	43.78 (11.69)	46.64 (11.15)	44.66 (10.79)
Time living in Brazil (mean)				23.78 (18.16)	27.14 (18.34)	21.51 (15.34)
Woman (%)	46.54	45.95	45.55	36.26	33.53	32.1
Spouse (%)	65.94	65.72	72.86	73.70	72.75	74.57
Working (%)	93.56	93.61	96.43	96.89	96.53	96.81
Studying (%)	11.54	8.71	8.61	6.98	5.86	6.44
Income from main job (mean)	1907.69 (4356.99)	1592.72 (2783.72)	1578.56 (3553.86)	4427.41 (8551.00)	4487.4 (9075.16)	3324.92 (6912.52)
Hours worked in the main job per weak (mean)	40.92 (14.40)	40.76 (14.43)	41.94 (13.13)	42.62 (15.93)	42.45 (16.62)	42.48 (14.96)
College education or more (%)	20.67	17.92	17.28	38.65	51.12	41.95

Source: Own elaboration using 2010 Census data.
Note: In parentheses standard deviations are reported.

Table 5: Occupation mismatch by sex

	Natives			Immigrants		
	RMSP	RMSE	RMS	RMSP	RMSE	RMS
			Undereducation			
Man	27.82	27.71	30.10	22.94	21.58	30.89
Woman	19.79	18.90	22.37	26.55	18.86	22.29
Total	24.16	23.74	27.03	24.25	19.16	19.46
			Adequate			
Man	55.85	56.47	54.71	57.88	58.81	54.52
Woman	59.84	60.57	58.78	54.66	61.33	59.49
Total	57.67	58.65	56.75	56.71	60.59	57.36
			Overeducation			
Man	16.33	15.82	15.19	19.19	19.61	14.59
Woman	20.36	20.53	18.85	18.80	19.81	18.22
Total	18.17	17.61	16.22	19.04	20.25	23.18

Source: Own elaboration using 2010 Census data.

the time living in Brazil, since RMSE presents the older ones, it is expected that they would have those living in Brazil for longer times. Among the three groups, RMS presents the younger ones, with the mean of time living in Brazil being around 21.5 years.

The prevalence of women is higher among natives in all regions. This result was also expected since the literature shows that men usually present higher probabilities of migration than women (CHANT, 1992; COOKE, 2008). Besides, the percentage of individuals living with spouses is higher among immigrants compared to natives.

One can see that the unemployment is higher among natives, suggesting a positive selection in favor of the immigrants. Besides, among those that actually work, the income of immigrants is much higher than the income of natives, in RMSP it is 132% higher, in RMSE it is 182% higher, and in RMS it is 111% higher. The percentage with a college degree helps to explain those differences since, among the immigrants, the percentage of individuals with such education degrees is much higher than among the natives.

Table 5 presents occupation mismatch by sex and immigration status. Comparing the results of Diaz and Machado (2008), who used the 2000 Census data, one can see that undereducation is considerably lower in our data, while overeducation is almost the same. The numbers found here are closer to the ones found by Santos (2002).

Focusing on undereducation first, one can see that, among natives, the percentage of women compared to men is considerably lower. Among immigrants, some interesting results arise. In RMSP, women present higher percentages of undereducated than men; in RMSE and RMS, it is the opposite. About overeducation, again we see that native women are in worse position than men, since their rates of overeducation are high in the three regions analyzed. Among immigrants, the conditions are similar in RMSP and RMSE, while women are worse off in RMS.

Table 6: Origin of international migrants

	RMSP	RMSE	RMS
Western, Middle, Eastern and Southern Africa	2.86	6.65	3.19
Northern Africa	0.8	0.81	0.49
South America	41.34	26.85	58.95
North America (Canada and United States)	2.44	5.16	2.82
Central America, Caribbean and Mexico	1.33	2.53	2.41
Central, South and Western Asia	4.81	2.17	4.16
Eastern and Southeast Asia	20.36	7.5	8.43
European Economic Area and Switzerland	25.74	47.28	18.72
Non-European Economic Area	0.2	0.57	0.36
Oceania	0.13	0.48	0.47
Advanced	39.18	54.5	26.4

Source: Own elaboration using 2010 Census data.

Still considering Table 5, comparing immigrants and natives, in the three regions analyzed, immigrant men present lower percentages of undereducation and higher of overeducation. However, they are more adequate. Among women, we see the same results in RMSE and RMS. However, in RMSP, the percentage over undereducated is higher among immigrants and the percentage of overeducated is higher among natives.

Finally, as in Nieto, Matano, and Ramos (2015), for RMSE and RMS regions, overeducation is more prevalent among immigrants than natives.

Table 6 presents the origin of the immigrants. In RMSP, most immigrants came from South America's countries. Besides, a good proportion came from countries belonging to the European Economic Area and Switzerland, and Eastern and Southeast Asia. In RMSE, almost half of the immigrants came from the European Economic Area and Switzerland, followed by South America. In the South, or more specifically, RMS, mostly came from other South American countries (almost 59%). The proximity to South American countries like Argentina, Uruguay and Paraguay is probably the main reason for such a result. Notwithstanding, it is in RMS where the prevalence of those who came from non-advanced countries is higher, about 74%. In RMSP the non-advanced countries are also the majority. Only in RMSE the majority of immigrants came from advanced countries, about 54,5%. Those results can help to explain the difference in education and wages between those regions. For this reason, the variable advanced will be considered in our econometric analysis.

According to Baeninger and Antico (1996), since the 1980's, Brazil has been characterized bya new kind of immigrants coming from Latin America. In big cities – such as São Paulo, Rio de Janeiro and Porto Alegre – growing the services sector has been growing, which demands workers with technical knowledge to work, for example, in sectors like telecommunications and finance. This demand is parallel with the demand for workers who generally exercise manual activities, less paid and with low qualifications. In this context, there are occupations that attract both immigrants with low and high education, both willing to accept the salary premium for taking the risks of migrating.

5.2 Econometric Results

As in a selection model, one or more variables must be chosen to be instrument(s). In other words, they must be included in the equation of choice (1st stage), but not in the earnings equation (2nd stage). The ideal is to select the ones affecting the decision variable in the first stage, but that do not influence the dependent variable in the second. Therefore, two variables are possible good instruments in our estimation: if the individual has kids (PASTORE; SATTAR; TIONGSON, 2013) and if it is married (GAMA; MACHADO, 2014). The idea implicit here is that having kids or being married will probably influence the individual's decision about getting a job, but not the earnings. It is hard to believe that those characteristics will influence how much the employer is willing to pay the employee.

The results of the estimations are presented in tables 7 and 8. In Table 7 are presented the results of the first stage, i.e., the selection equation. The first three columns compare immigrants and natives for each region. The last column compares immigrants only. Marginal effects are presented because they are easily interpretable.

Starting with immigrants and natives' estimations, one can see that married people are more likely to be employed. Having kids has the same result, although the coefficients are smaller. Being an immigrant increases the probability of being working by 2.4 percentage points in RMSP. The coefficients are not significant in RMSE and RMS. As expected, age has a positive impact on employment (except in RMS), women are less likely to be working, as well as people with less than high school education. Years living in Brazil have no impact on RMSP and a positive impact on the other two regions.

About the last column on Table 7, it is worth noting that, among immigrants, having kids and age do not influence the probability of an immigrant working. Besides, the coefficients for region of residence are also not significant, suggesting that there is no difference in assimilation – in terms of labor market absorption – among those regions. Again, women are less likely to be employed, but the magnitude of the coefficients are smaller. Since immigrants are known to be positively selected, when we compare a sample only of them, it is expected the differences to be smaller for some demographic characteristics (DRINKWATER; EADE; GARAPICH, 2009). Level of education has no impact on the probability of being employed – this may be a consequence of the Brazilian relative position compared to countries of origin, in which or no formal education is necessary, or it is important only to have higher education, since college education does not make any difference compared to no education.

Focusing on Table 8, the inverse of Mills ratio is a measure of the probability of participating in the labor market. The coefficient is negative and significant in estimates (RMSE) and (RMS), which suggest that some unobservable characteristics make the individual more propense to work, but at the same time influence he/she to has a smaller wage; and non-significant and negative in estimates (RMSE) and (Immig), suggesting no selection.

In all regions, the negative occupation mismatch (overeducated) has a significant impact on wages. The effect is highest on RMSP and the lowest in RMS. Being an immigrant increases the wages by 31.5%[5] in RMSP, by 21% in

[5] $\exp 0.274 - 1$

Table 7: Selection Equation, Model Probit: Marginal Effects Reported

	RMSP	RMSE	RMS	Immig
Spouse? (No omitted)	0.015 ***	0.017 ***	0.014 ***	0.010 *
	(0.0009)	(0.0008)	(0.0007)	(0.0058)
Kids? (No omitted)	0.005 ***	0.007 ***	0.005 ***	0.000
	(0.0009)	(0.0007)	(0.0006)	(0.0049)
Immigrant? (No omited)	0.024 ***	0.008	0.008	
	(0.0071)	(0.0103)	(0.0069)	
Immigrant Region (RMSP omitted)				
RMSE				0.005 ***
				(0.0053)
RMS				−0.004
				(0.0061)
Age in Years	0.005 ***	0.002 ***	0.001	−0.001
	(0.0008)	(0.0009)	(0.0006)	(0.0017)
Squared age	−0.000 ***	−0.000	−0.000	0.000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Sex (male omitted)	−0.039 ***	−0.045 ***	−0.026 ***	−0.012 **
	(0.0008)	(0.0007)	(0.0005)	(0.0049)
Level of education (Less than High School omitted)				
High School	0.012 ***	0.014 ***	0.007 ***	−0.005
	(0.0008)	(0.0006)	(0.0005)	(0.0056)
College or more	0.048 ***	0.044 ***	0.018 ***	0.005
	(0.0007)	(0.0006)	(0.0005)	(0.0053)
Attends school? (No omitted)	−0.001	0.000	−0.002 **	−0.016
	(0.0012)	(0.0011)	(0.0009)	(0.0105)
Years living in Brazil	−0.001	0.003 ***	0.001 **	0.001 ***
	(0.0007)	(0.0008)	(0.0006)	(0.0005)
Squared years living in Brazil	0.000 **	−0.000 **	−0.000	−0.000 **
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Advanced country? (No omitted)				−0.003
				(0.0050)
Observations	417 337	587 699	529 431	6671

Source: Own elaboration based on the estimations.

RMSE, and by 15,3% in RMS. These results go along with the self-selection hypothesis attested by Chiswick and Miller (2008).

As expected, age has a positive effect on wages, but the effect presents the inverse U-shape; women gain less than men on average, the difference in South being smaller, and more formal education increases wages. Those that study receive better wages as soon as those living longer in Brazil (RMSE and RMSP). In other words, experience has a positive effect on wages, as expected.

Now, paying attention to the last column in table 8, one can see that the effects of job mismatch is even higher among immigrants than for all samples, results similar to Nieto, Matano, and Ramos (2015). Overeducated workers receive about 51.6% less than undereducated, controlling for other characteristics. It is expected that those in occupations below their education receive less, as found by Sicherman (1991) but the difference is higher than expected. Sloane, Battu, and Seaman (1996) argue that workers with more education than required in a particular occupation are simply compensating for a lack of other forms of human capital, such as less experience, for example. In this case, undereducated people could be considered more productive, and, for this reason, they are better paid.

The place of residence, age, years living in Brazil and if attends school are not significant influencing differences in wages among immigrants. Again, immigrant women are less paid than immigrant men (RUIZ, 2016; KHAN, 2016), yet the wage gap is smaller than for the other groups; finally, as expected,

Table 8: Second Stage: Wage Equation

	RMSP	RMSE	RMS	Immig
Job Mismatch (undereducated omitted)				
Adequate	−0.208 *** (0.0027)	−0.142 *** (0.0022)	−0.137 *** (0.0050)	−0.297 ** (0.1340)
Overeducated	−0.526 *** (0.0038)	−0.440 *** (0.0032)	−0.403 *** (0.0077)	−0.725 *** (0.1646)
Immigrant? (No omited)	0.274 *** (0.0227)	0.191 *** (0.0276)	0.142 * (0.0765)	
Immigrant Region (RMSP omitted)				
RMSE				0.201 (0.1319)
RMS				0.153 (0.1441)
Age in Years	0.033 *** (0.0020)	0.038 *** (0.0022)	0.031 *** (0.0058)	0.071 * (0.0408)
Squared age	−0.000 *** (0.0000)	−0.000 *** (0.0000)	−0.000 *** (0.0001)	−0.001 (0.0005)
Sex (male omitted)	−0.385 *** (0.0046)	−0.401 *** (0.0038)	−0.358 *** (0.0080)	−0.331 ** (0.1628)
Level of education (Less than High School omitted)				
High School	0.559 *** (0.0030)	0.560 *** (0.0025)	0.525 *** (0.0058)	0.544 ** (0.1479)
College or more	1.473 *** (0.0062)	1.405 *** (0.0044)	1.190 *** (0.0086)	1.373 *** (0.1525)
Attends school? (No omitted)	0.055 *** (0.0035)	0.052 *** (0.0033)	0.064 *** (0.0083)	0.190 (0.2729)
Years living in Brazil	0.017 *** (0.0016)	0.004 * (0.0021)	0.007 (0.0055)	−0.002 (0.0161)
Squared years living in Brazil	−0.000 *** (0.0000)	−0.000 *** (0.0000)	−0.000 (0.0001)	−0.000 (0.0003)
Advanced country? (No omitted)				0.252 ** (0.1176)
Lambda (Inverse of Mils ratio)	−0.016 (0.0565)	−0.418 *** (0.0397)	−1.562 *** (0.1260)	−4.014 (4.8042)
Constant	(0.0281)	(0.0232)	(0.0487)	(1.0378)
Observations	417 337	587 699	529 431	6671

Source: Own elaboration based on the estimations.

more formal education leads to better wages.

Even controlling for education, sex, age, region of residence and so on, the difference in wages considering the immigrant's place of origin still persists, as found by Nieto, Matano, and Ramos (2015), indicating a worse scenario – maybe discrimination – against immigrants from non-advanced countries. Immigrants from advanced countries are expected to gain 28.7% more than immigrants from non-advanced countries. Therefore, in the battle for getting a job, the origin of immigrant does not seem to matter. However, in the battle for wage it does matter.

6 Final Remarks

Brazil is a country that presents a lot of dissimilarities and inequalities, but at the same time, it is also a place for opportunities for migrants. In this study, the main objective was to test if there are differences in assimilation and wage gains based on the country of origin, and also how occupation mismatch affects wages and the differences when we compare immigrants and natives. Estimates were made for three different regions: Metropolitan Area of São Paulo; Metropolitan Areas of Southeast (without São Paulo); and Metropolitan

Areas of South.

It is important to notice that, in the period chosen, Brazil was experiencing expressive growth, with a low unemployment ratio, after two complicated years. Nowadays, Brazil and the rest of the world are facing an expressive crisis, in which it could be expected a dynamic adjustment that tends to differentiate the migrant from the native, especially the migrant in precarious situations.

Undereducation was found to be between 19.2 and 24.3% among immigrants and between 23.7 and 27% among natives, while overeducation varies between 19 and 23.2% among immigrants and between 16.2 and 18.9% among natives, suggesting some regional differences. The main results show that immigrants are more likely to be working than natives. Besides, there is no difference in the probabilities of finding jobs between those from advanced countries and those from non-advanced countries. However, at the same time, workers from non-advanced countries receive worse wages, even controlling for education, sex, age, etc., which could indicate discrimination. There is expressive literature in Brazil addressing this issue (VILELA, 2011; SOUCHAUD, 2012).

Occupational mismatch is very important in explaining the difference in wages. Besides, there are some significant regional differences. For all samples, adequate individuals earn about 13% less than their undereducated counterparts in RMS and RMSE and about 19% less in RMSP. Among immigrants, the difference is even higher, about 26%. When comparing overeducated and undereducated workers, one can see that the first group earns, on average, much less than the second. Again, for the total sample, the difference is higher in RMSP (41%), followed by RMSE (36%) and RMS (33%). Among immigrants, overeducated workers earn on average about 52% less than undereducated workers do.

Considering the fact that a large number of immigrants coming from developing countries are not legal and they work in service and manufacturing sectors, recent crises (2014, COVID-2019) has possible implications that go beyond our approach in this paper, but it should be considered in future work. Since Brazil is still in better condition than its neighbors, crises like that are likely to even expand the immigration from those countries.

It is worth mentioning that Brazil experienced in the last 20 years expressive expansion of university vacancies, not necessarily along with improvement in quality. Consequently, it is expected that overeducation, among immigrants and natives, has grown in recent years, since the country is facing several crises. One example is the rapid growth of uber drivers, a lot of them with college degrees.

Lastly, the high coefficients for the mismatch can be due to unobservable characteristics, as for example, discrimination, as cited above. Specifically, for estimations RMSP, RMSE and RMS, the selection bias of migrants (harder, more productive) can also help to explain those high coefficients, which is a limitation of the present paper.

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Appendix A

Table A.1: List of Advanced countries

Andorra	Greece	New Zealand
Australia	Holy See	Norway
Austria	Hong Kong	Portugal
Belgium	Iceland	San Marino
Bermuda	Ireland	Singapore
Canada	Israel	Slovakia
Cyprus	Italy	Slovenia
Czech Republic	Japan	South Korea
Denmark	Jersey	Spain
Faroe Islands	Liechtenstein	Sweden
Finland	Luxembourg	Switzerland
France	Malta	Taiwan
Germany	Monaco	United Kingdom
Guernsey	Netherlands	United States