Educational Mismatch and Occupational Mobility in Metropolitan Brazil

Ana Hermeto[ϒ]

Luciano Machado[√]

Summary

This article seeks to analyze educational mismatch and occupational mobility in metropolitan labor market in Brazil, considering a supply and demand framework. We focus on four types of occupational mobility: upward mobility for the overeducated, downward mobility for the undereducated and upward and downward movements for the matched workers, using panel data from the Monthly Employment Survey (IBGE) over the 2002-2008 period, based on the birth-cohort synthetic panel estimation.

Particularly, we intend to analyze how cyclical conditions in the labor market, captured by the unemployment rate, are related to upward and downward movements determined in the context of the education-occupation mismatch at the individual level occupations. The study addresses the effects of economic cycles, composition of supply, period and cohort to explain the behavior of mobility considered.

Results show that the cycles faced by individuals in the labor market are relevant to their propensity to occupational mobility, impacting both upward and downward movements. Thus, theories focusing only on individual attributes to explain the behavior of educational mismatch in occupations over time fail to take into account the role of business cycles in facilitating or not the occupational matching process in terms of schooling. Regarding cohort effects, it was found that the possibilities of adjustment are associated with early stages of the careers of individuals in the labor market, for the over and under-educated workers. The pro-cyclical behavior of upward mobility of the over-educated is explicit evidence that conditions in the labor market influence the matching of workers in occupations. The fact that the unemployment rate affects the mobility decisions also impacts the duration of over-education in the labor market, so this situation may have occupational characteristics of short or long term depending on the cyclical conditions of the economy.

Introduction

The educational mismatch in the labor market is characterized by the existence of individuals with higher education than that required by the occupation, the over-educated; and individuals with lower education than required by the occupation, under-educated (Rubber, 2005). This phenomenon becomes more important as it impacts the individual income, as shown by the considerable number of empirical regularities in the literature of over-education[1], as well as its allocation process of workers in occupations[2].

[ϒ] Assistant Professor at CEDEPLAR/UFMG, Brazil (ahermeto@cedeplar.ufmg.br).

[√] BNDES, Brazil.

[1]The literature of over-education is well documented in developed countries. Groot and van den Brink (2000) and Rubb (2003b) provide a comprehensive meta-analysis of the results on the incidence and impact of educational mismatch in these countries.

[2] Shimer (2005) discusses the mechanisms of adjustment between supply and demand for labor in the light of the mismatch theory, in comparison with other existing theories, as the search theory. The author develops a dynamic model of mismatch that is consistent with empirical evidence on the dynamics of the labor market for different movements of workers, which are the aggregate rates of entrance and exit of unemployment and labor turnover.

In Brazil, this literature has developed more recently and has some important contributions to the debate, especially in relation to the discussion of the empirical evidence on the subject - Santos (2002), Schwartzman (2004), Machado et al (2004), Diaz and Machado (2008), Esteves (2009) and Viana and Hermeto (2010). The high incidence of educational mismatch in the Brazilian labor market and the consequent impact on productivity show the need to monitor the evolution over time of this phenomenon. Additionally, the labor market has gone through several transformations in recent years, as the declining trend in unemployment, from 2004 up to 2009, and a considerable increase in the proportion of individuals who have secondary and higher education in the labor force, as data from the Monthly Employment Survey (PME) of IBGE shows. These changes have clearly impacts on the framework of educational mismatch in Brazil.

The importance of educational matching of individuals in occupations is associated with the quality of the allocations in the labor market, to the extent that matched individuals have higher returns to education than the over-educated, that is, the over-educated face a barrier in the level of the occupation to a higher productivity and making full use of accumulated human capital (Hartog, 2000). Thus, it is expected that the over-educated have a higher propensity to change jobs compared to matched individuals, searching for an occupation that matches their level of education.

From these observations, the question that arises is of which factors may explain the decision to change occupation, towards educational matching, of over and under-educated individuals. This issue is related, in some degree, to the interpretation of the causes of over and under-education, since it allows characterizing the choice between jobs of these workers. In this regard, we note that the literature has focused only on the supply side factors work to explain the causes and effects of educational mismatch, although the labor demand-side factors are relevant to the allocation decisions of individuals, as Moscarini and Vella argue (2008). These authors show a pro-cyclical behavior of the quality of the allocation of workers, so that low unemployment rates may increase the importance of the characteristics of individuals in the choice of occupations. According to Moscarini (2001), when the number of jobs available is relatively small, individuals are more willing to accept any job in the labor market and the quality of allocation tends to be lower. On the other hand, when the number of jobs available is relatively extended, individual characteristics become more relevant and individuals look for jobs more suited to their human capital.

The purpose of this study is to explain the socio-occupational mobility in the context of educational mismatch in Brazilian metropolitan labor market, from a model that considers factors of supply and demand for labor. Specifically, the objective is to analyze the relationship between the educational mismatch process in the occupations and cyclical conditions in the labor market for the following occupational transitions: the upward mobility of over-educated, the downward mobility of the under-educated, and upward or downward mobility for the matched workers. Data from Monthly Labor Survey (PME), from 2002 to 2008, were used to generate occupational transitions throughout this period and the identification strategy was based on the construction of a pseudo-level panel of cohorts for the estimations of the models.

The paper is divided into four sections, besides the introduction. The second section presents a review of theoretical and empirical issues of over-education and occupational mobility. The third section deals with methodological issues of preparation of the database and on the econometric strategy adopted. The fourth section presents the analysis of results of estimations of the models and, in the last section, concluding remarks are made.

Literature Review

The rapid growth of the educational levels of the population was the starting point for the over-education literature, which has sought to assess the conditions in which the additional supply of relatively educated individuals is being absorbed by the labor market. It was verified the existence of over-educated and under-educated workers in developed countries and, especially, a growing trend in the incidence of over-education[3].

Duncan and Hoffman (1981) were the first to estimate the effects of educational mismatch on income. The ORU specification of the model, introduced by the authors, has been the most used function of income in the literature to estimate these effects[4]. Hartog (2000) presents the regularities in the results obtained from the estimation of this model for developed economies, showing that mismatched individuals are penalized with respect to returns to education[5].

Diaz and Machado (2008) measure the incidence of educational mismatch in the labor market in Brazil, from the 2000 Census (IBGE) and the 2002 Brazilian Classification of Occupations (CBO), and estimate their effects on income based on the ORU model. The authors show a significant mismatch between educational supply and demand in Brazil, revealing an incidence of 53% of under-education and 17% of over-education, so that the matched workers account for only about 30%. Regarding the effects on income, the authors show results in line with the regularities obtained for developed countries. The returns to required schooling, over-education and under-education for men are 16.2, 12.1 and -10.1 percent, respectively. The study also points to some regional differences in the incidence of educational mismatch. Among the regions, the level of matching varies from 25 to 31 percent and over-education ranges from 14 to 19 percent. The Southeast and South have slightly better results compared to other regions and the Northeast has the highest under-education (almost 60% of the labor force).

Vianna and Hermeto (2010) develop towards the measurement of mismatch in the labor market of Brazil to carry out an analysis focused on the evolution of the characteristics of labor supply in the period 1981 to 2005. The authors characterize the evolution of over-education in relation to three demographic dimensions, age, period and cohort, by gender[6]. On this basis, they estimate the effects of life cycle, generation and context on the incidence of over-education over the period analyzed using data from the National Household Sample Survey (PNAD) of IBGE. Results demonstrate that the effects of time may explain the growth of over-education among men, suggesting that the evolution of education demanded in the labor market has followed the evolution of education offered. Among women, the effects of generation are significant and show a higher probability of over-education for younger cohorts.

Some authors have turned to the interpretation of the stylized facts of literature, to explain its causes and effects. McGuinness (2006) points out that empirical evidence has been interpreted

[3] Freeman (1976), Tsang and Levin (1985).

[4] "Overeducation, Required education and Undereducation", which are explanatory variables of this model to replace the variable years of study used in the model of Mincer (1974).

[5] Marginal returns for each year of over-education are positive but smaller than the marginal returns for each year of required schooling in the occupation, while the returns for each year of under-education are negative.

[6] The results show a growth trend in the incidence of over-education for both gender groups in the period and that over-education is found more among women than men. The proportion of over-educated women has risen from 18% in 1981 to 45% in 2005, while the proportion of over-educated men ranged between 16 and 42% in the same period.

mainly in three theories: the Model of Competition for Employment, Assignment Models and the Theory of Human Capital. The model of competition for jobs is based on the assumption that individuals compete for jobs based on the costs associated with training to fill those posts, not the remuneration that they would be willing to accept. Thus, the greater the number of individuals relatively more educated, the greater the individual need to invest in education as a way of preserving their occupation or to get new jobs, resulting in the process of over-education of the labor supply. The assignment models are based on the analysis of the allocation of heterogeneous workers to heterogeneous jobs, admitting the possible existence of equilibrium points with allocations that have some degree of deviation between individual attributes and the attributes required for the occupation in which may occur over or under-education. The Theory of Human Capital can be defended on the grounds of transience of mismatch, whose duration is determined by the time required for the worker to find a position best suited to its potential or the time necessary for firms can promote an adjustment of production processes to tailor them to the full utilization of human capital available. Another line of defense argues that the over-education may be compensating for the lack of training in companies and / or some degree of inferiority in terms of ability to perform the occupation.

McGuinness (2006) argues that the inconsistency of the Theory of Human Capital in relation to the results of the literature is justified if it is proven that the mismatch persists in the long term and / or its effects remain unchanged when other controls are included, for example, human capital investments made in firms and workers' skills[7]. In this line, Bauer (2002) estimated the impacts on income of over and under-education from a panel of individuals in the period 1984-1998 in Germany. The results show, for women, the differences between the returns to required schooling and over and under-education decrease over time for both the fixed effects model as for the random effects. On the other hand, Korpi and Tahlin (2006) show that these differences remain the same after controlling for ability, despite finding in data that the over-educated have lower skills than the matched workers[8]. Together, these analyses leave open the question of the validity of the Theory of Human Capital in the context of educational mismatch, in addition to highlighting the need for additional empirical studies, especially in relation to other theories that seek to interpret the phenomenon of over-education.

Interestingly, the debate in the literature has few studies that analyze the dynamics of occupational movements of individuals from the perspective of educational mismatch, as Sicherman (1991) and Rubb (2003a). However, it is clear that the understanding of how individuals make decisions to change their occupations, from educational match or mismatch, can contribute significantly to the interpretation of the causes and effects of over and under-education. Thus, the phenomenon of over-education suggests the need for disaggregation of occupational mobility from situations match or mismatch between education supply and demand for workers in order to model the behavior of these mobilities. Based on these models, it is possible to separate the types of effects that can explain the occupational changes of the over or under-educated.

In addition, it should be noted that the debate has focused the characteristics of individuals, observed or not observed, in an attempt to explain the causes and effects of mismatch, highlighting the importance of labor supply for interpretation of the stylized facts of the literature. Despite the unquestionable importance of individual attributes in this debate, it should be noted that the business cycle significantly affect the labor market and should therefore be taken into

[7] Rubb (2003) shows that about 20% of over-educated in a given year leaves this condition the following year towards matching, which provides evidence for the hypothesis of persistence of the inconsistency in the long run.
[8] Esteves (2009) conducts a similar empirical analysis, applied to the Brazilian case.

account in the analysis along with individual characteristics. Thus, fluctuations in aggregate employment in the short run may be influencing the decisions of individuals to change their occupations, making them relatively more (or less) prone to this decision, as shown Moscarini and Vella (2008). This, in turn, directly impacts the duration of over-education on individual careers, to the extent that a higher unemployment rate means that individuals are more willing to stay in their jobs rather than change their occupation, which may involve the risk of unemployment. It is therefore necessary to control for these fluctuations in economic models of occupational mobility to be estimated, so that the effects of cycles are captured and support the interpretation of the mismatch.

Moscarini and Vella (2008) theoretically model the decision to change occupation based on ex-ante choice, given the prevailing conditions of the labor market. From this model, the authors test empirically whether the unemployment rate for specific groups of workers affects the occupational mobility, which means control by changes in labor demand over this period. These authors show the existence of a pro-cyclical pattern of occupational mobility and quality of the allocation of workers with respect to the unemployment rate in the United States. The pro-cyclical pattern of mobility is interpreted, for example, as the possibility of obtaining better jobs at favorable cyclical conditions in the labor market. With respect to the pro-cyclical pattern of the quality of allocations, Moscarini (2001) explains this result on the grounds that individuals are more willing to accept any position available in the labor market to remain employed when the number of jobs available is relatively low, resulting in a lower quality of allocations. On the other hand, when the number of jobs available is relatively extended, individual characteristics become more relevant, so that individuals search jobs more suited to their accumulated specific human capital.

These results together reflect a plausible explanation for the phenomenon of educational mismatch in occupations. Following the line of these authors, the existence of over-education and under-education can be explained in part by fluctuations in aggregate employment in the economy, which may change the occupational choices of individuals. Thus, it is understood that the mismatch of education may be the result of a cycle of higher unemployment, which has affected the decisions of participation in the labor market and occupational mobility decisions. In other words, a recession may have forced the unemployed to accept any position available to enter the labor market and at the same time, may have caused changes of occupations only to maintain a job, so that educational mismatch had reduced its importance. Similar reasoning can be done in case of an expansion cycle, which should lead to a relative growth of the search for matched education, both for unemployed and employed individuals.

In Brazil, the issue of socio-occupational mobility has been treated in Hermeto and Machado (2000). The authors examine occupational transitions according to race, age and education, using the SMEs for the period 1991-1996, focusing on gender differences. These transitions are characterized according to changes in occupational status of workers between the socio-occupational categories defined (upper, middle and manual). On this basis, models are estimated for the probability of upward and downward transition, conditional on characteristics of individuals. Following Machado and Hermeto (2000), socio-occupational movements analyzed in this study are classified in upward or downward according to occupational status resulting from the change of occupations. The over-education literature provides a means to qualify these movements, as characterized in an objective way, the change in occupational status of the individual, through comparison between the education levels required in initial and last occupations.

Finally, we emphasize that occupational mobility is a process of reallocation of production factors, which has relevant economic and social implications. Analyzed in aggregate terms, such mobility can explain the actual fluctuations in aggregate output and affect the distribution of income among the population, it consists of a form of socio-economic mobility of individuals, as discussed in Antigo (2010). These observations show the importance of the issue and its implications on key variables of public policy in order to contextualize the objective of the study.

Methodology

Definitions and database

Our objective is to explain the role of cyclical conditions in the labor market on the upward and downward occupational mobility in metropolitan Brazil in 2002-2008, controlling for the effects of changes on the supply side of labor. More specifically, we intend to model the socio-occupational movements from the perspective of the incidence of educational mismatch in occupations, which classifies individuals as in over-educated, under-educated and matched. Based on these definitions, the possible socio-occupational transitions are obtained for these individuals in the labor market, which are grouped as follows:

1. upward mobility of the over-educated: over-educated individual change occupation in which he (she) is matched or under-educated;

2. downward mobility of the under-educated: under-educated individual changes to an occupation in which he (she) is matched or over-educated;

3. upward mobility of the matched: matched individual changes to an occupation in which he (she) is under-educated; and

4. downward mobility of the matched: matched individual changes to an occupation in which he (she) is over-educated.

The focus is on mobility of employed individuals, so unemployed individuals are not part of the sample. The upward and downward concepts used to describe the movements are associated with occupational education required of occupations, which translates into a way to measure the occupational status of the individual. Thus, as the individual moves to an occupation that requires more education, he (she) is moving upward, even if this implies a mismatch between the required schooling of occupation and the education of the individual. On the other hand, as the individual moves to an occupation that requires less education, he (she) is moving downward, even if it implies matching between the required schooling of occupation and the individual education.

The definition adopted in this study to characterize the socio-occupational movements in the labor market represents a refinement of the traditional definitions of socio-occupational mobility, as used in Hermeto and Machado (2000) and other studies of this literature. Because it is based on a previous classification in relation to the quality of the allocation of the individual in occupation, occupational movements can be analyzed and interpreted not only characterized by the difference of occupational status between the jobs, but also in terms of implying in educational mismatch or not. Thus, the results obtained from the empirical approach can contribute to issues raised in the literature of economic mobility and over-education.

We used data from the Monthly Employment Survey (PME) of IBGE, for the period 2002-2008[9]. This survey provides longitudinal microdata containing information on workers of formal and

[9] The objective of the PME is "to produce monthly indicators of the labor force to assess the fluctuations and the medium and long-run labor market trends." Since 2002, PME adopted a new methodology.

informal sectors of the economy, to enable the analysis of occupational transitions of the economically active population, which provides greater generalization of results.

PME is a rotating panel at the individual level, which covers the urban area of six metropolitan areas, whose sample design was intended to ensure the results for the geographic levels in which it is based[10]. A sample survey of households is distributed across the four reference weeks of the month to compose the result. Data collection follows a methodology in which each household is selected for four consecutive months of interviews, eight months out of interviewed sample, and after this period it is interviewed again for another four months, and finally excluded from the sample. The monthly sample of PMEs is divided into eight groups of rotation, so that every month 25% of the sample of households is replaced, following a scheme of rotation groups and panels. Each panel corresponds to a set of households and the rotation groups are sets of sectors. Thus, for the same month in consecutive pairs of years, it is guaranteed 50% of the common part of the sample[11].

These characteristics of the survey restrict that the individuals can be accompanied only by a maximum of one year, allowing the construction of only one occupational transition in the period. This implies a restriction for the proposed analysis, because it does not guarantee a minimum temporal variability to estimate consistently the parameters of the models for panel data, which is the most appropriate methodological approach to the issue. An alternative is the construction of a pseudo-panel, which is based on following homogeneous groups of individuals or cohorts repeated over time[12]. The characteristics of the PME allow its construction, from the generation of homogeneous groups for each transition analyzed in order to enable the estimation of models for specified types of occupational mobility. The next step is to describe the identification strategy for the estimation of consistent pseudo-panel models.

Identification Strategy

The problems of identification of effects are related to a possible sample selection bias, as pointed out in Moscarini and Vella (2008). On this issue, the authors argue that the problem of endogeneity in the analysis of mobility of workers arises because the sample was restricted only to individuals employed in both periods of each transition. This fact can only result in consistent estimates for the employed and not necessarily for the entire workforce. Thus, the unobserved factors (endogenous) to the level of individuals, explaining the decision to be employed, resulting in the endogeneity of the regressors in the model for the decision to change jobs, via selection of the sample that is restricted to them. Thus, it is necessary to assume an identification hypothesis that deals with the endogeneity of the characteristics of individuals in these models.

To address this issue, a conventional strategy is to estimate using panel techniques, such as the fixed effects model, with a representative sample of large, high frequency of individuals over time. Given the unavailability of such data, Moscarini and Vella (2008) suggest an alternative strategy based on the construction of a pseudo-panel in terms of birth cohorts, of individual data from the Current Population Survey in the period 1979-2004. The construction of the pseudo-panel is based on the assumption that the unobserved factors in the estimated model are specific to the birth cohort. This seems plausible, since it appears that individuals born in the same year are subject to

[10] Recife, Salvador, Belo Horizonte, Rio de Janeiro, São Paulo and Porto Alegre.

[11] Due to attrition effects in samples of pairs of consecutive years, we got about 25% of common part for the transitions considered.

[12] It may be cited as advantages of using pseudo-panel: the solution of the attrition problem of attrition in longitudinal microdata and the fact that it permits the combination of different surveys in the construction of the cohorts.

similar unobservable factors like, for example, the same changes in the educational system. Thus, the hypothesis of identification of these authors consider that the unobserved characteristics of specific birth cohorts, which affect both the decision to be employed as a change of occupation, do not vary over time.

The identification strategy based on a pseudo-panel deals with the issue of endogeneity in two stages. At first, much of unobserved heterogeneity at the individual level is eliminated to get the average of the variables of interest among members of the cohort. Second, the residual effects of this heterogeneity in the cohorts, by assumption contained in the constant part of their error terms, are properly captured by cohort dummies[13]. In the models estimated in this paper, the same source of endogeneity of the regressors may be present, since the sample is also restricted to individuals employed in both periods of transitions. Thus, the same identification strategy and estimation was adopted, based on the construction of a pseudo-panel at the level of birth cohorts.

Preparation of the database

Initially, we selected the months of the survey to be used to generate occupational transitions. In order to control the presence of seasonality in the samples of PME, we selected the months of March, July and November to form the database of each transition, in order to obtain samples with completely different households each month and avoid dependence among observations. We then selected the employed individuals in these months for each year of the period 2002-2008. We considered only individuals between 25 and 54 years for each transition, with individuals born between 1948 (they had 54 years of age in 2002) and 1982 (who were 25 years old in 2007)[14]. Thus the study sample consists of 128,392 observations distributed among the six transitions analyzed.

Individuals in the sample were, in the next step, classified into over-educated, under-educated and matched by comparing their actual schooling with the required schooling in the occupation for each year of the period 2002-2008. The PME allows this procedure because it uses a version of the Brazilian Classification of Occupations (CBO) in the definition of individual occupations, which has a correspondence with the CBO in 2002, of Ministry of Labor, responsible for encoding and describing the occupations of the Brazilian labor market. Thus, the required schooling of occupations was obtained from the CBO in 2002, which is the more objective method considered in the literature for setting this variable[15]. The 2002 CBO is structured as follows: ten major groups (Chart 1), 47 major subgroups, subgroups 192 and 596 groups or families based occupational level (to which the descriptions are made in the CBO 2002), which grouped 2,422 occupations.

In PME, individual occupations are classified according to the main subgroup to which they belong. Thus, to obtain the education required of occupations, it was necessary to adopt a criterion that would give the required schooling of the occupational families for major subgroups to which they refer. For this, we used a measure of central tendency of the distribution of required schooling families in a given occupational subgroup key. The measure adopted was the mode of the distribution, since the goal is to capture the most common education level required for each major subgroup.

[13] This estimation procedure follows the fixed effects model discussed in Deaton (1985).

[14] This age range includes adults of working age, who have completed their educational cycles, because the sample was restricted to individuals who were not attending school. Thus, it is reasonable to consider schooling as fixed over the period.

[15] Verhaest and Umayyad (2006) make a detailed comparative analysis over existing methods for determining the required schooling in the literature of over-education, considering the method adopted here the most appropriate for calculating the effect of mismatch.

Chart 1: Large group occupational titles in CBO 2002

0 – Armed Forces, Police and Fire Brigade
1 – Senior members of government, leaders of public interest organizations and companies and managers
2 – Professionals in the sciences and arts
3 – Medium level technicians
4 – Administrative services workers
5 - Workers in services, trade sales in shops and markets
6 - Agricultural workers, forestry, hunting and fishing
7 - Workers in the production of industrial goods and services
8 - Workers in services, trade sales in shops and markets[16]
9 – Maintenance and repair workers

Source: CBO 2002 documentation.

Whereas the large groups of CBO in 2002 use the concept of competence level in their aggregation, we chose to use the determination of required schooling for occupational families proposed by Diaz and Machado (2008). In this article, the authors determined the required schooling to 84 occupational families based on CBO 2002. Thus, we use the mode of schooling required of these families as the primary education required the subgroup to which they belong. For cases where it was not possible to determine a unique education required for mode, we used the average of the values that represent the trend in the subgroup. From this, schooling in years of study required for the performance of the occupation for each individual was attributed.

Then we generated the variables of over-education (SOE) and under-education (SUE) for individuals, which are obtained according to the following definition in the literature of over-education:

$SOE = AE - ER$ if $AE > ER$, otherwise $SOE = 0$ (1)

$SUE = ER - AE$ if $ER > AE$, otherwise $SUE = 0$ (2)

where *AE* are individual years of study and *ER* represents the required schooling of the occupation. In cases where the variable of required education includes a range of years of study, the variables are defined as follows:

$SOE = AE - \max(ER)$, where $\max(ER)$ is the maximum of the range of years of study required for the occupation. The definition of the calculation of the variable remains as (1).

$SUE = \min(ER) - AE$, where $\min(ER)$ is the minimum values of the range of years of study required for the occupation. The definition of the calculation of the variable remains as (2).

Based on these variables, individuals were classified as over-educated, under-educated or matched for the period 2002-2008. The next step was to follow them in relation to occupational changes for each transition observed in this period, i.e. 2002-2003, 2003-2004, 2004-2005, 2005-2006, 2006-2007 and 2007-2008. From this following, we obtained the binary variables that identify the type of socio-occupational mobility undertaken by individual, as defined above.

[16] In group 7, workers in production systems that tend to be more discreet and dealing with the shape of the product than with its physical and chemical content were grouped. In group 8, workers of production systems that are or tend to be continuous (chemical, steel, among others) were grouped.

Following the strategy of identification, the variable that identifies the birth cohort of individuals aged 25 to 54 years for each year of the period 2002-2007, was generated, as presented in Table 5 of Appendix, in order to yield the cohort dummies. To capture the effects of composition of the supply, the birth cohorts were identified according to gender, race and education, individual attributes that are invariant over time. The gender variable classifies individuals in either men or women, the race variable classifies them in white or non-white, and the education variable aggregates individuals into five groups: 0-3, 4-7, 8-10, 11-14 and 15 or more. Moreover, the birth cohorts were identified according to the year of the sample to which they belong (2002-2007), to capture the effects of time. The effect of cyclical conditions in the labor market on mobility was obtained from the variation in the unemployment rate among the cohorts. This rate was calculated as the ratio of the unemployed population and economically active population in each cohort in the early years of each transition observed, using the PME. Then, we obtained the mean of the modeled variables among individuals identified in the cohorts, or groups of individuals generated from combinations of variables that characterize the cohorts (gender, race, education, birth cohort and period), the order to reach the pseudo-observations of the panel. Thus, the number of observations in the sample is a combination of the number of categories of variables that identify the cohorts, resulting in a total of 3,600 observations[17].

Specification of models

From the constructed pseudo-panel, the next step is the estimation of models of socio-occupational mobility. Based on the variables above, the specifications of estimated equations are:

$$mob\_SOE_{c,t} = \beta_o + \beta_1 unemployment_{c,t} + \beta_2 gender_c + \beta_3 race_c + group\_AE'_c \delta + year\theta + cohort'_c \gamma + u_t \quad (1)$$

$$mob\_SUE_{c,t} = \beta_o + \beta_1 unemployment_{c,t} + \beta_2 gender_c + \beta_3 race_c + group\_AE'_c \delta + year\theta + cohort'_c \gamma + u_t \quad (2)$$

$$up\_mob\_MATCH_{c,t} = \beta_o + \beta_1 unemployment_{c,t} + \beta_2 gender_c + \beta_3 race_c + group\_AE'_c \delta + year\theta + cohort'_c \gamma + u_t \quad (3)$$

$$down\_mob\_MATCH_{c,t} = \beta_o + \beta_1 unemployment_{c,t} + \beta_2 gender_c + \beta_3 race_c + group\_AE'_c \delta + year\theta + cohort'_c \gamma + u_t \quad (4)$$

In these models, the dependent variables are: $mob\_SOE_{c,t}$ is the mean of the upward occupational mobility of the over-educated in cohort c between years t and t +1, $mob\_SUE_{c,t}$ is the mean of the downward occupational mobility of the under-educated in cohort c between years t and t +1, $up\_mob\_MATCH_{c,t}$ is the mean of the upward occupational mobility of the matched in cohort c between years t and t +1 and $down\_mob\_MATCH_{c,t}$ is the mean of the downward occupational mobility of the matched in cohort c between years t and t +1.

The independent variables are the same for the four equations. The variable $unemployment_{c,t}$ is the unemployment rate of cohort c at t, which captures the effects of business cycles in the labor market over the period analyzed. To control for the effects of composition of the labor supply, we

 Two for gender, two for race two, five for schooling group, thirty cohorts per transition and six transitions. Multiplying these values results in the total sample of observations.

used the following variables: $gender_c$ is a dummy for the female cohort (reference category: male cohorts); $race_c$ is a dummy for cohorts of individuals of other races (reference category: cohorts for whites) and $group\_AE_c$ are dummies for the cohorts according to defined levels of schooling (reference category: cohorts of individuals with 0 to 3 years of study). To control for the effects of time, the vector *ano'* contains dummies for each year in the range 2002-2007 (reference category: 2002) and, finally, cohort effects are captured by the vector *cohort'* containing dummy variables for birth cohorts defined (reference category: cohort of individuals aged 25 years in 2007, the youngest cohort of the sample). Still, it is the average of the error term in the cohort, which captures unobservable effects that vary over time.

It can be seen that the specification of models for the analysis of occupational mobility takes into account variables on the supply side and the demand for labor, which is fundamental for proper identification of the effects modeled. Thus, models were estimated to assess how the effects of economic cycles, of period, of supply composition, and of cohort are related to socioeconomic mobility in Brazilian metropolitan labor market in the period 2002-2008.

Results

This section presents the results of the estimated models, whose analysis is focused on interpretation of the role of supply and demand for labor in explaining the occupational transitions modeled in order to relate them to the stylized facts of over-education literature and socioeconomic mobility. The purpose of the analysis is to compare the effects of economic cycles, of the composition of the supply, of period and of cohort among the estimated models. Before that, some descriptive statistics are shown over the period 2002-2008.

Descriptive statistics

Table 1 shows that female participation has increased slightly over time in Brazilian metropolitan labor market. In 2002, about 44% of the labor force in the sample were women, and in 2007, this proportion reached 46%, showing a trend of balance between men and women in this market. With respect to race, the proportion of individuals in the non-white group is stable over time and can be seen that there is a slight predominance in the proportion of whites for the occupations studied. The distribution of educational levels of workers varied considerably over the period. While the proportion of educated individuals in the group with 0-3 years of study was reduced by more than 30% between 2002 and 2008, the proportion of individuals over 15 years increased by 15% in the same period, reaching approximately 16% of the labor force. Analyzing the evolution of the proportion of individuals in age from 4 to 7 and 8 to 10 years of study, there is a reduction in the composition of these groups in the sample in 2007, mainly for the group of 4 to 7, which still represents around 25% of the labor force in that year. On the other hand, the group of individuals with 11 to 14 years of study has the largest growth in the period (almost 20%), and the category that contains the highest proportion of individuals for all years of the sample and about 36% of labor force in 2007.

It can also be seen that the average required schooling in occupations has increased slowly over time, from 9.43 years of study in 2002 to 9.52 years in 2007, so we obtained an average of 9.5 required schooling years of study throughout the period. There was an increase in the average education of individuals, which increased from 8.61 years of study in 2002 to 9.25 years in 2007, representing a 7.4% increase. The supply of education has grown far more than demand, leading to lower levels of the difference of the two variables throughout the period, which increased from 0.6 years in 2002 to 0.3 years in 2007, approximately. This result implies a tendency to better match between supply and demand for schooling in occupations over the period, evidenced in the

increasing incidence of matching between 2002 and 2007, which increased from approximately 34% to almost 37%. The increase in average schooling of the employed also relates to the behavior of the incidence of over-education. Over this period, the over-education has increased from about 26% to just over 30%, with a more significant increase (around 19%) than that shown for the adequacy (around 7%). Finally, the analysis of trends in supply and demand for occupations in education leads to an expected reduction in the incidence of under-education. This result is confirmed in the table, since under-education decreased from about 40% to 33% over the period, representing a fall of around 18% in this type of mismatch.

It can be argued that the allocation process of workers in occupations did not show a significant evolution in terms of matching between educational supply and demand in the period. In fact, we observe a growing trend of over-education as opposed to a reduction in under-education with only a slight increase in matching. Thus, the mismatch is still prevalent in the metropolitan labor market, with more than 60% of employed individuals in this situation in 2007. Compared to the results obtained in the incidence of mismatch based on Census 2000 for all of Brazil, there is a considerable reduction in under-education which decreased from 53% to 33% in the sample of PME in 2007.

Table 1: Evolution of the attributes of the labor supply and the educational matching of occupations, 2002-2008, Metropolitan Brazil (in %)

	2002-2003	*2003-2004*	*2004-2005*	*2005-2006*	*2006-2007*	*2007-2008*
Women	43,5	44,2	45,2	44,9	45,2	46,0
Non-white	46,2	45,7	46,6	45,1	46,5	46,8
0-3 years of study	9,7	8,7	8,8	7,5	7,3	6,7
4-7 years of study	28,5	28,5	27,7	26,9	25,5	24,8
8-10 years of study	18,2	17,9	17,3	17,6	17,7	17,3
11-14 years of study	30,0	30,5	31,8	33,5	34,9	35,7
15 or more years of study	13,6	14,4	14,4	14,5	14,7	15,5
Age (mean)	38,4	38,7	38,9	38,8	38,8	39,0
Required Schooling (mean)	9,43	9,46	9,45	9,48	9,49	9,52
Years of study (mean)	8,61	8,74	8,80	8,98	9,09	9,25
Over-education	25,5	26,1	26,8	28,1	29,2	30,3
Matching	34,2	34,7	34,8	35,8	36,4	36,7
Under-education	40,3	39,1	38,4	36,1	34,4	33,0

Source: PME, IBGE, 2002-2008.

With respect to the occupational movements analyzed, Table 2 shows that the mobility observed in most metropolitan labor market is the upward mobility of the over-educated, followed by downward mobility of the matched, proportion that is close to that of downward mobility of the under-educated. Comparing the movements up and down throughout the period, the upward mobility predominated slightly over the downward. In comparison with the initial occupational status, the movements from the mismatch clearly predominate over the movement from the matching. These results indicate that, during the period analyzed, there was relatively more upward mobility in the labor market of the main Brazilian metropolitan regions, which occurred mainly due to the higher propensity of the over-educated to change of occupation, which also explains why the movement from the mismatch is more significant.

This table also shows that the upward mobility of the average over-educated reasonably varied during the period. In 2005-2006, it showed its lowest value, 4.5%, and in 2007-2008, it reached its maximum of 5.1%. The downward mobility of the under-educated shows a declining trend from

the 2003-2004 transition, from 3.4% to 2.8% in the 2007-2008 transition. These trends of the mobilities of the over and under-educated taken together imply that in the period, individuals now have a more beneficial pattern of mobility from the standpoint of individual returns, based on the results obtained for the ORU model. Upward mobility of the matched shows a slight downward trend until the 2006-2007 transition, while downward mobility of the matched does not present a clear trend in the period, with an average rate of 3.1% between 2002-2008. Taken together, we can say that the matched individuals have preferred to stay in their jobs over the period.

Finally, it is observed that average unemployment in the period of twelve months has considerably reduced, from 12.4% in 2003 to 9.1% in 2007, representing a drop of more than 25% of this rate in five years . Average unemployment showed an increase between 2002 and 2003, falling from this year, with a significant decrease between 2004 and 2005. Thus, there was a trend of relative expansion of the Brazilian economy from 2003 that has increased in the last year of the series. We could say that the mobility considered in this study was analyzed in a period with a slight predominance of the cycles of expansion in the metropolitan labor market, as identified by fluctuations in aggregate unemployment rate. The increasing trend in the upward mobility of over-educated, from 2005, should be linked to lower rates of unemployment observed from this year (around 9%). The downward mobility of the under-educated reduced from 2003, coinciding with the fall in unemployment, as expected. On the other hand, with respect to the mobility of the matched, we can not establish a pattern of behavior in relation to the variation in unemployment in the period.

Table 2: Evolution of occupational mobility, by type, and unemployment, 2002-2008, Metropolitan Brazil (in%)

	2002-2003	*2003-2004*	*2004-2005*	*2005-2006*	*2006-2007*	*2007-2008*
Upward mobility of the over-educated	4,9	4,7	4,6	4,5	4,6	5,1
Downward mobility of the under-educated	3,3	3,4	3,0	3,0	2,8	2,8
Upward mobility of the matched	2,0	1,9	1,8	1,7	1,6	1,6
Downward mobility of the matched	3,3	2,9	3,0	3,0	3,1	3,1
Unemployment rate(annual)	11,6	12,4	11,3	9,7	10,0	9,1

Source: PME, IBGE, 2002-2008.

Some interesting conclusions are obtained from the joint analysis of descriptive statistics. First, the observed changes in the profile of labor supply over the period are relevant to explain the behavior of mobility considered, since different profiles tend to have different propensities to change jobs from the matching or mismatch of schooling demanded and supplied. From Table 1, the main trends of growth were observed in groups of middle-level education and above, accompanied by a reduction in other groups of schooling, reflected in a increase of the supply of schooling of the workers. As the demand for education has remained virtually stable in the period, there was an increase in over-education equivalent to a reduction in under-education (in percentage), which may be related to significant growth in higher levels of education (upper and middle). This increase in levels of schooling should also affect the occupational mobility of over-educated: it is expected that more educated individuals are relatively more willing to search occupations that match their schooling, especially those with college education. It is also

important to note that the behavior of analyzed movements impacts the match between supply and demand for schooling in the labor market over the period. As noted above, the movements from the mismatch predominate in relation to movements from matching.

Analysis of results

This subsection initially analyzes the results of the estimates for occupational mobility from the mismatch, and after, for mobility from the matching. The cohort effects, as captured through dummies, are shown separately, after consideration of the effects of cycles, of composition of the supply and of period in order to give greater clarity to the presentation of results.

Table 3: Results of models for the estimation of occupational mobility from the educational mismatch

	Upward mobility of the over-educated	Downward mobility of the under-educated
Unemployment	-0,0407***	-0,0114
	(0,0127)	(0,0107)
Women	0,0032**	-0,0105***
	(0,0013)	(0,0011)
Non-white	0,0085***	-0,0042***
	(0,0012)	(0,0010)
4-7 years of study	0,0064***	0,0331***
	(0,0022)	(0,0019)
8-10 years of study	0,0253***	0,0644***
	(0,0024)	(0,0020)
11-14 years of study	0,0770***	0,0157***
	(0,0022)	(0,0019)
15 or more years of study	0,0905***	-0,0052**
	(0,0027)	(0,0022)
2003	-0,0029	0,0004
	(0,0021)	(0,0018)
2004	-0,0049**	-0,0030*
	(0,0021)	(0,0018)
2005	-0,0086***	-0,0037**
	(0,0021)	(0,0018)
2006	-0,0088***	-0,0051***
	(0,0021)	(0,0018)
2007	-0,0070***	-0,0049***
	(0,0022)	(0,0018)
Constant	0,0293***	0,0325***
	(0,0083)	(0,0070)
N	3.597	3.597
R^2	0,52	0,39

Source: PME, IBGE, 2002-2008.
Notes: Standard error in parentheses. Significance level: * 10%, ** 5%, *** 1%.

Table 3 shows that the upward mobility of over-educated has a pro-cyclical pattern in relation to unemployment in the labor market for the metropolitan regions in Brazil. Thus, the upward occupational mobility of the over-educated occurs in larger extent when unemployment rates observed prior to the occupational transition are smaller. On the other hand, when the labor market offers fewer opportunities, the over-educated tend to match less often. This result implies a higher demand for educational matching when the labor market is more favorable. The pro-

cyclical pattern of mobility of the over-educated is in line with the results obtained in Moscarini and Vella (2008) who showed evidence of pro-cyclicality of the quality of allocations in the labor market in the U.S.

With respect to downward mobility of the under-educated, it is observed that the coefficient of the unemployment variable was not statistically significant, showing that economic cycles are not relevant to explain this type of mobility for the period analyzed. This behavior may be due to the fact that the under-educated present, on average, higher earnings than they would receive if they were matched, as the empirical regularities of the literature point out, which creates an incentive to stay in the occupation regardless of the cycles.

The effects of composition of the labor supply shows that women present on average more the upward movement in comparison to men. This result must be related to the higher returns obtained for the required schooling among women than among men, and to a smaller decrease in returns for under-education. The non-white over-educated present upward mobility above whites. The effects of education show that individuals with 4-7 years of study had slightly higher mobility than the group of individuals up to three years of study. As expected, the differentials of that mobility increase with the level of schooling of cohorts. The cohorts with high school show mobility 7.7 percentage points higher than the reference group and the cohorts with higher education reach a gap of 9.1 percentage points.

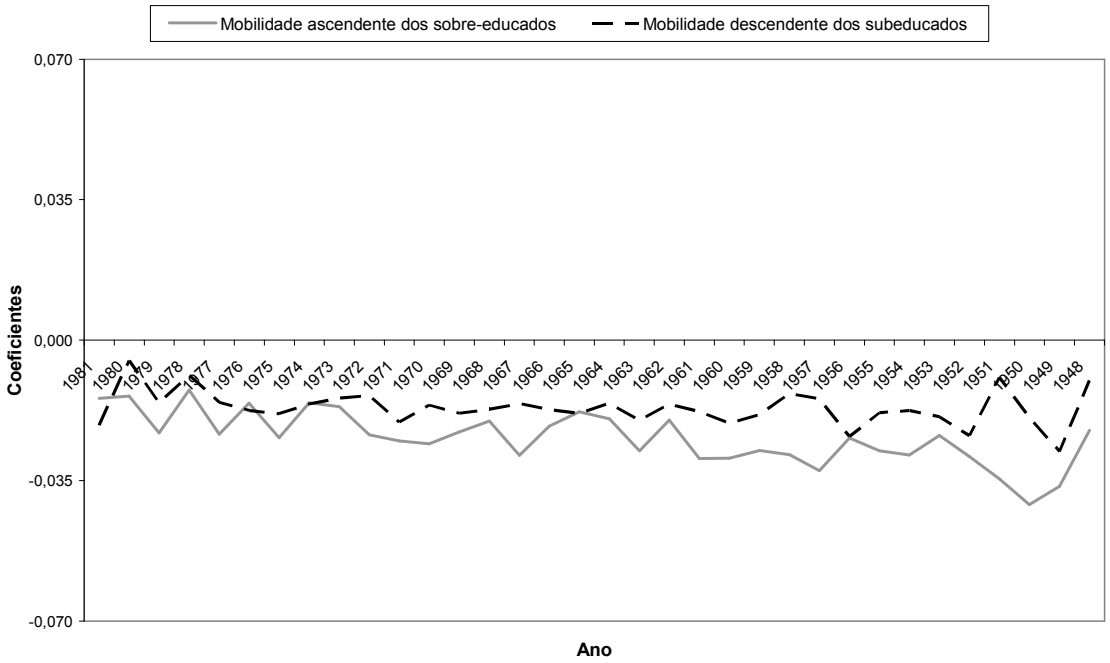
On the other hand, for downward mobility of the under-educated, women do less movements than men. This result, contrasted with that for upward mobility, evidences more favorable occupational movements of women compared to men in the period, as they perform on average more the upward than the downward movement from the situations of mismatch. As for race, it was found that non-white under-educated show, on average, less downward mobility than whites. Like women, non-whites have mobility from the mismatch relatively advantageous compared to whites. The effects of education show that under-educated with between 4 and 7 years of study have reasonably high mobility than those with up to three years of study. Yet individuals with 8-10 years of education have the highest differential of downward mobility, about six percentage points above the average mobility of the reference group. Thereafter, the effects of schooling on mobility start showing a decreasing pattern for the groups of schooling. These results show that the downward movement from the under-education does not present a monotonic behavior as the mobility of over-educated for the years of study.

The period effects tend to reduce the upward mobility of the over-educated over 2002-2008. In comparison to 2002, except for 2003 which showed no significant coefficient, the other years had increasing negative effects on mobility up to 2006, the effect was almost one percentage point lower than the reference year. For the downward mobility of the under-educated, these effects also show a downward trend, which becomes more evident throughout the period. Comparing the results for the two mobilities, it can be argued that the effects of these conditions have led to a downward trend in occupational mobility from the mismatch in metropolitan labor market, which may imply a reduction in mobility toward matching. However, the evolution of mobility rates of over-educated over 2002-2008 shows a break in this mobility drop from 2006, which should be associated with a reduction in unemployment observed since 2004, so that the business cycle seem to explain this mobility fluctuations around the trend.

The estimated cohort effects tend to mainly capture life cycle effects on the mobility instead of capturing the effects of generation. This is due to the lack of control for age in the estimated models and the short time that the cohorts are followed in the pseudo-panel. Thus, the hypothesis

tested is that the younger cohorts tend to present more of the occupational upward and downward movements starting from the mismatch in relation to older cohorts, which should reflect a higher propensity of young people to pursue different opportunities in careers. The following figure compares the effects obtained for the cohort dummies for these mobilities, which have mostly significant coefficients. Table 6 in the Appendix reports the estimated cohort effects for all models estimated.

Figure 1: Coefficients estimates of cohort dummies for the mobilities from the mismatch



Source: PME, IBGE, 2002-2008.

It is observed that the upward mobility of the over-educated has a tendency to reduction from the younger cohorts to the older. The same pattern is noted for the downward mobility of the under-educated, but in a less obvious way than for upward mobility. These behaviors confirm the hypothesis, that both mobilities occur less as individuals become older in the labor market in order to capture the effects of expected life cycle. Comparing the estimates between the models for the upward mobility of over-educated, the cohort effects are more pronounced, so that cohorts born before 1960 have much less mobility than those born after that period. For the cohorts 1950 to 1953, the reduction in mobility is approximately two times greater than the reduction in the cohorts from 1976 to 1979. For the downward mobility of the under-educated, the declining trend is very subtle, becoming evident only for the cohorts of the 1950s. The strong relationship between the propensity for upward movement of the over-educated and the early stages of his career may be associated with over-interpretation of education as a short term phenomenon. On the other hand, the behavior shown for the under-educated can be explained by factors such as work experience or training in offsetting the deficit of education of these workers (Sicherman, 1991).

The unemployment rate had no significant effect on the upward mobility of the matched, contrary to what was obtained for the downward mobility, which has a pro-cyclical behavior in relation to this rate (Table 4). Despite this effect on the downward movement is not expected, it is possible

that the result is explained by the higher propensity to move upward of the over-educated in periods of economic boom, which may mean greater competition for jobs with higher educational requirements, resulting in some degree of loss of matching.

Table 4: Results of models for the estimation of occupational mobility from the educational matching

	Mobilidade ascendente do adequado	Mobilidade descendente do adequado
Unemployment	-0,0011	-0,0258***
	(0,0081)	(0,0099)
Women	-0,0131***	-0,0024**
	(0,0008)	(0,0010)
Non-white	0,0012	0,0031***
	(0,0008)	(0,0010)
4-7 years of study	0,0257***	0,0002
	(0,0014)	(0,0017)
8-10 years of study	0,0412***	0,0076***
	(0,0015)	(0,0018)
11-14 years of study	0,0017	0,0592***
	(0,0014)	(0,0017)
15 or more years of study	-0,0003	0,0600***
	(0,0017)	(0,0021)
2003	-0,0016	-0,0038**
	(0,0013)	(0,0016)
2004	-0,0023*	-0,0042***
	(0,0013)	(0,0016)
2005	-0,0034**	-0,0066***
	(0,0013)	(0,0016)
2006	-0,0042***	-0,0062***
	(0,0013)	(0,0016)
2007	-0,0036***	-0,0069***
	(0,0014)	(0,0017)
Constant	0,0158***	-0,0018
	(0,0053)	(0,0064)
N	3.597	3.597
R^2	0,39	0,53

Source: PME, IBGE, 2002-2008.
Notes: Standard error in parentheses. Significance level: * 10%, ** 5%, *** 1%.

With regard to the characteristics of the cohorts, women make the upward movement relatively less than men. Non-whites did not show this mobility significantly different from that of the whites. The effects of education show that this type of mobility is most common in the cohorts of school groups between 4 and 10 years of study, i.e., among those with intermediate levels of education. For downward mobility, women tend to perform relatively less movement than men, showing, along with the results for the upward movement, that the matched women are less willing to change their occupation than the matched men. Matched non-whites show more downward mobility than whites, a result that contrasts with the pattern for mobility from the mismatch. Finally, those matched with levels of secondary and higher education show significantly more downward mobility than individuals in groups with less than 11 years of study. This means that this matched profile tends more difficultly to remain in their jobs than the less educated, which may be related to greater competition for jobs with higher demands of schooling. Evidence

supports the argument for the inverse relationship between downward mobility and cycles, showing that downward mobility is more prevalent among the most educated, a group that faces competition from more educated over-educated in the economy boom.

The effects of period tend to reduce the upward mobility of the matched in the period 2005-2007, about the same magnitude for each year in that range. There is also a trend of reduction in downward mobility for the matched from 2002 to 2008, which increases during the period considered. Taken together, these results imply a tendency to maintain the matching of education, which can be interpreted as a trend toward a higher quality of allocations in the metropolitan labor market. This behavior is in line with the periods effects on mobility of over and under-educated, which also showed a downward trend, indicating a greater difficulty in leaving the educational mismatch in the period.

The effects of cohort dummies were not significant to explain the mobility of the matched, so that mobility from the matching does not seem to show different effects throughout the life cycle of these individuals, possibly because it represents allocations that have relatively higher quality (see Table 6 in Appendix). One hypothesis to explain the positive effects in younger cohorts on the downward mobility of the matched is the competition for jobs with the over-educated, since they show considerably higher mobility for younger cohorts. This result further confirms the interpretation that the pro-cyclical behavior of downward mobility of the matched is associated with competition for more educated jobs with the over-educated, as the effects of education on this mobility point.

Final Remarks

The educational mismatch in the labor market, resulting in over-education and under-education of workers, is seen from the comparison between education supply and demand in occupations. This phenomenon becomes more relevant in the Brazilian case, due to its significant incidence (above 60%) and the growth trend of over-education observed in the metropolitan labor market in the analyzed period (around 20%). In this context, the objective of the article was to analyze occupational mobility in metropolitan Brazil, from changes in occupational status in terms of schooling required of individuals, based on the PMEs in the period 2002-2008. To this end, the empirical approach sought to identify effects associated with variations in the composition of labor supply and effects associated with economic conditions, especially those related to variations in the unemployment rate of the cohorts on occupational upward and downward movements. The main evidence obtained shows that the decision of individuals to change their occupation in occupational upward movement has a pro-cyclical behavior in relation to fluctuations in the unemployment rate in metropolitan labor market.

Cohort effects on mobility from the mismatch tend to reduce these movements as the cohorts get older. This pattern is much clearer for the over-educated, showing that the chances of matching are associated with early stages of the careers of individuals, which may be linked to the transience of over-education for younger cohorts. In turn, this transience must be related to greater difficulty, at the time of entry into the labor market, to find an occupation that reconciles the education of the individual with the required schooling, given the costs of search for this ideal job. The effects of composition of supply evidence that women show a pattern of occupational mobility more advantageous compared to men in the period analyzed, especially for movements from the mismatch. In addition, it was found that the upward mobility of over-educated is growing

among educational groups, with the top-level cohorts showing a mobility almost ten percentage points higher than the reference group.

The results of this study show that the quality of allocations in the labor market can be directly associated with the favorable conditions at the side of the demand for labor, because it was found that the over-educated tend to match relatively more in periods of economic expansion. The relationship obtained shows pro-cyclical effects also on the duration of such a mismatch in individual careers, which may have characteristics of short or long run depending on, among other factors, fluctuations in the aggregate economy. In this regard, the conjuncture effects declined between 2002 and 2008, during which there was a growth of over-education. Therefore, it is reasonable to assume that the labor supply in metropolitan areas is increasing their level of education at a greater rate than demanded by occupations in the labor market and / or greater than the speed of matching in the occupations of individuals, taking into view the declining trend in unemployment during the period.

This study raises questions regarding the trends to be observed in the coming years in Brazil and in developed countries. While Brazil shows that the labor market is going through a boom period, Europe and the U.S. market conditions indicate an opposite situation. In this context, it is expected an increase in the speed of the matching of education in Brazil, while in these countries, the over-education should continue to grow. These predictions, if confirmed, may have impacts on the trajectory of the cohorts entering the labor market or even on the intergenerational decisions of individuals in relation to investment in human capital. Another relevant question concerns the relative scarcity of skilled labor in Brazil, which has been identified recently as a possible restriction on the supply side of labor. The statistics presented here indicate that these limitations should be more related to some specific types of training than in terms of formal schooling. The next step of this study is to extend the analysis to the economic mobility of individuals, measured by the mobility of income and its relation to educational mismatch in occupations.

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APPENDIX

Table 1: Identification of birth cohorts

Period Age	2002	2003	2004	2005	2006	2007
25	C30	C31	C32	C33	C34	C35
26	C29	C30	C31	C32	C33	C34
27	C28	C29	C30	C31	C32	C33
28	C27	C28	C29	C30	C31	C32
29	C26	C27	C28	C29	C30	C31
30	C25	C26	C27	C28	C29	C30
31	C24	C25	C26	C27	C28	C29
32	C23	C24	C25	C26	C27	C28
33	C22	C23	C24	C25	C26	C27
34	C21	C22	C23	C24	C25	C26
35	C20	C21	C22	C23	C24	C25
36	C19	C20	C21	C22	C23	C24
37	C18	C19	C20	C21	C22	C23
38	C17	C18	C19	C20	C21	C22
39	C16	C17	C18	C19	C20	C21
40	C15	C16	C17	C18	C19	C20
41	C14	C15	C16	C17	C18	C19
42	C13	C14	C15	C16	C17	C18
43	C12	C13	C14	C15	C16	C17
44	C11	C12	C13	C14	C15	C16
45	C10	C11	C12	C13	C14	C15
46	C9	C10	C11	C12	C13	C14
47	C8	C9	C10	C11	C12	C13
48	C7	C8	C9	C10	C11	C12
49	C6	C7	C8	C9	C10	C11
50	C5	C6	C7	C8	C9	C10
51	C4	C5	C6	C7	C8	C9
52	C3	C4	C5	C6	C7	C8
53	C2	C3	C4	C5	C6	C7
54	C1	C2	C3	C4	C5	C6

We obtained 35 cohort categories, corresponding to the number of diagonals of the table, which contains 30 categories of age (lines) and six periods (in columns). Individuals who recently entered the age set to denote the sample cohort 35 (C35 in the table), so that other individuals are categorized according to this logic.

The following table presents the estimates of the coefficients of cohort dummies for all models estimated.

Table 2: Effects of birth cohort dummies on occupational mobility

	Upward mobility of the over-educated	Downward mobility of the under-educated	Upward mobility of the matched	Downward mobility of the matched
1981	-0,0145	-0,0212***	-0,0011	0,0104
1980	-0,0139	-0,0051	-0,0056	0,0175***
1979	-0,0231***	-0,0156**	-0,0017	0,0168**
1978	-0,0124	-0,0087	-0,0006	0,0125*
1977	-0,0234***	-0,0155**	-0,0025	0,0145**
1976	-0,0157*	-0,0175**	-0,0048	0,0117*
1975	-0,0243***	-0,0183***	-0,0046	0,0139**
1974	-0,0156*	-0,0159**	-0,0058	0,0103
1973	-0,0166**	-0,0144**	-0,0030	0,0075
1972	-0,0236***	-0,0138**	-0,0078	0,0072
1971	-0,0251***	-0,0204***	-0,0041	0,0084
1970	-0,0258***	-0,0162**	-0,0074	0,0101
1969	-0,0229***	-0,0182***	-0,0033	0,0083
1968	-0,0201**	-0,0172**	-0,0057	0,0109*
1967	-0,0287***	-0,0158**	-0,0054	0,0113*
1966	-0,0214***	-0,0173**	-0,0044	0,0125**
1965	-0,0178**	-0,0182***	-0,0029	0,0081
1964	-0,0196**	-0,0157**	-0,0061	0,0067
1963	-0,0276***	-0,0200***	-0,0074	0,0053
1962	-0,0199**	-0,0159**	-0,0057	0,0053
1961	-0,0295***	-0,0178***	-0,0071	0,0101
1960	-0,0294***	-0,0207***	-0,0056	0,0102
1959	-0,0275***	-0,0186***	-0,0063	0,0096
1958	-0,0285***	-0,0133*	-0,0082	0,0043
1957	-0,0325***	-0,0146**	-0,0036	0,0087
1956	-0,0244***	-0,0240***	-0,0064	0,0087
1955	-0,0276***	-0,0181***	-0,0076	0,0070
1954	-0,0286***	-0,0175**	-0,0099*	0,0043
1953	-0,0238***	-0,0191***	-0,0102*	0,0052
1952	-0,0290***	-0,0238***	-0,0025	0,0093
1951	-0,0346***	-0,0093	-0,0119**	0,0052
1950	-0,0410***	-0,0193**	0,0013	0,0072
1949	-0,0364***	-0,0277***	-0,0089	-0,0009
1948	-0,0225*	-0,0100	-0,0133*	0,0065

Source: PME, IBGE, 2002-2008.

Notes: Standard error in parentheses. Significance level: * 10%, ** 5%, *** 1%.