ESSAYS ON MOBILITY AND INTERNAL LABOR MARKETS

Marisa Fernanda Figueiredo Tavares

TESE DE DOUTORAMENTO EM ECONOMIA

Orientada por:

Professora Doutora Anabela Carneiro

Professor Doutor José Varejão

Porto, 2012

Biographical Note

Marisa Fernanda Figueiredo Tavares was born on 24 January, 1979, in Porto, Portugal.

In 2002 she concluded her first degree in Economics (*licenciatura*) at Faculty of Economics of the University of Porto (FEP) with an overall mark of 17 out of 20. She was awarded with the Merit Scholarship from the University of Porto in 2001, the prize Eng.^{o} António de Almeida offered by the Eng. António de Almeida Foundation and the prize Bank of Portugal granted for obtaining the highest grade point average in Economics.

She performed a brief internship at PriceWaterHouseCoopers before being admitted as an Assistant Teacher at the Portuguese Catholic University, Faculty of Business Management and Economics, where she remains until today.

In October 2003 she was admitted to the PhD program in Economics, at the Faculty of Economics of the University of Porto (FEP). She concluded the curricular part of the program with an overall mark of 18 out of 20. She presented articles in international scientific meetings: NIPE Workshop 2009 - Economic Analysis Using Linked Employer and Employee Data with David Card, Braga, ZEW/IAB Workshop on "Spatial Dimensions of Labor Markets", Mannheim, 2009 and the 5th Portuguese Economic Journal annual meeting, Aveiro, 2011.

Acknowledgement

Writing a doctoral thesis is a demanding and challenging journey and there are many people to whom I owe my eternal gratitude. To all of them, thank you!

A very special thanks to my supervisors, Anabela Carneiro and José Varejão, for their guidance, reassurance and friendship over these years.

I thank to all the people that supported and helped me at Catholic University and without whom this thesis wouldn't have been possible.

I thank the Fundação para a Ciência e Tecnologia (FCT) for their financial support through a PhD scholarship with reference SFRH / BD / 18156 / 2004. I'm grateful to Gabinete de Estratégia e Planeamento (GEP) for providing the data for this research

Finally, I want to thank all my Friends and Family for always being there for me. An endless "thank you" to my Mother and to my Father for helping me become the person I am today and to my husband, Manuel for taking this journey along with me. I thank my children, Diogo and Inês (yet to be born) for being who they are!

Above all, I thank for the greatest, most beautiful and sole source of Love that always looks after us, no matter how demanding and challenging the journey may seem in our eyes...

FCT Fundação para a Ciência e a Tecnologia
MINISTÉRIO DA EDUCAÇÃO E CIÊNCIA

Abstract

This work discusses the importance of worker's mobility to workers and firms and is organized in two independent parts.

The first essay explores workers' mobility within and across regions and within and across employers, emphasizing the importance of space for intra-firm mobility in multi-establishment firms that have units in different locations. Our results seem to suggest that mobility across establishments within the same employer is a channel to improve wage growth opportunities. This is consistent with our hypothesis that in multi-plant firms the internal labor market is based on the firm as a whole. We also suggest a new strategy to estimate returns to migration by looking at the wage premiums of workers that migrated without changing employer. We conclude that there exists a larger wage premium when employees have to incur in additional costs such as those involved in migration and that premiums for transfers to recently opened and to non-urban regions are higher.

In the second essay we analyze the recruitment policies and the survival of newly created establishments that are affiliated with pre-established firms. We suggest a channel for knowledge transfer that has not been addressed in previous literature: within-firm and across establishments mobility. As firm-specific knowledge is mainly embodied and non tradable we suggest that it can be successfully transferred from the parent firm to the new unit embodied in the group of employees that are internally hired. We find that internally transferred workers, particularly skilled workers play an important role in improving the survival of newly created establishments.

Resumo

Esta dissertação discute a importância da mobilidade dos trabalhadores para os próprios trabalhadores e também para as empresas onde estes trabalham e está organizada em duas partes independentes.

O primeiro capítulo analisa a mobilidade dos trabalhadores sob várias vertentes: mobilidade dentro da mesma empresa e entre empresas e também dentro da mesma região e entre regiões. O nosso objectivo é enfatizar a importância do espaço na mobilidade interna em empresas multi-estabelecimento que detêm filiais em diferentes localizações geográficas. Os resultados obtidos parecem sugerir que a mobilidade entre estabelecimentos da mesma empresa é um canal para melhorar as oportunidades de crescimento salarial dos trabalhadores. Este resultado é consistente com a nossa hipótese de que, em empresas multi-estabelecimento, o mercado interno de trabalho é organizado tendo em conta toda a empresa e não apenas um estabelecimento. Sugerimos também uma nova estratégia para estimar os retornos à migração comparando o prémio salarial dos trabalhadores que são transferidos internamente e migram face aos que apenas são transferidos localmente. Concluímos que existe um prémio adicional quando os trabalhadores têm de suportar os custos associados à migração e também que os prémios por transferências para novos estabelecimentos e para zonas rurais são mais elevados.

No segundo capítulo analisamos a política de recrutamento e a sobrevivência de novos estabelecimentos criados por empresas pré-estabelecidas no mercado. Neste contexto, sugerimos um canal de transferência de conhecimento para o novo estabelecimento que não foi abordado previamente na literatura existente: a transferência interna de

trabalhadores para o novo estabelecimento. Como o capital-humano específico existe incorporado nos trabalhadores sendo, por isso, dificilmente transaccionável, sugerimos que este pode ser transferido com sucesso da empresa-mãe para o novo estabelecimento através da transferência interna de trabalhadores. Concluímos que o grupo de trabalhadores contratados internamente, particularmente no caso dos trabalhadores mais qualificados, desempenha um papel positivo importante na sobrevivência dos novos estabelecimentos.

Contents

Intoduction **1**

1 The Spatial Dimension of Internal Labor Markets **3**

1.1 **Introduction** 4

1.2 **The Data** 7

1.2.1 **Description** 7

1.2.2 **Sample Design, Treatment Groups and Control Group** 8

1.2.3 **Characterizing the Data** 13

1.3 **Intra-firm and Inter-firm Mobility: Who Moves?** 19

1.3.1 **Empirical Methodology: Discrete Choice Model** 19

1.3.2 **Empirical Results** 20

1.3.2.1 **The Independence of Irrelevant Alternatives** . . 25

1.4 **Returns to Mobility: The Effect of Worker's Mobility on Wages** 27

1.4.1 **Empirical Strategy** 27

1.4.1.1 **Model Specifications** 27

1.4.1.2 **Selectivity Problems** 28

1.4.1.3 **Fixed Effects Approach** 30

1.4.2 **Empirical Results** 32

1.4.2.1 **Returns to mobility: Same Employer Transfers and Migration Premiums** 32

1.4.2.2 **Returns to mobility: Same Employer Transfers to New vs Old Establishments** 36

1.4.2.3 **Returns to mobility: Same Employer Transfers to Urban vs Non-urban Areas** 36

1.5 **Conclusion** 40

Appendix **42**

References **50**

2 Internal Hirings and the Survival of New Establishments **56**

2.1 **Introduction** 57

2.2 **The data** 61

2.2.1 **Data description and sample design** 61

2.2.2 **Identifying internal hires** 64

2.2.3 **Characterizing the data** 67

2.2.3.1 **The establishment sample** 67

2.2.3.2 **The worker sample** 72

2.2.3.3 **Establishment's survival statistics** 75

2.3 **Empirical Methodology: Duration Models, unobserved heterogeneity and frailty models** 75

2.4 **Estimation Results** 79

2.5 **Conclusion** 85

Appendix **88**

References **90**

List of Figures

1.1 Different mobility types 10
1.2 Mobility path for Worker A 11
1.3 Mobility path for Worker B 12
2.1 Firm characterization by number of establishments 65
2.2 Identifying the type of hiring. 66
2.3 Kaplan-Meier survival estimate. 76
2.4 Unconditional hazard 82
2.5 Individual hazard 83

List of Tables

1.1 Single-establishment and multi-establishment firms: 1999-2005 9
1.2 Identification of the treatment groups and control group 11
1.3 Proportion of region changes according to both definitions: 2000-2005 . 13
1.4 Number of observations in the treatment groups: 2000-2005 14
1.5 Number of observations in the control group, treatment groups and all sample: 2000-2005 14
1.6 Workers and firms' characteristics: 2000-2005 17
1.7 Evolution of real hourly earnings (in logs): 2000-2005 18
1.8 Region changes to Porto or Lisboa for same employer transfers: 2000-2005 18
1.9 Region changes to Porto or Lisboa for employer changes: 2000-2005 . . 18
1.10 MNL model categories 19
1.11 MNL regression: 2000-2005 21
1.12 Average probabilities of choosing each mobility type, 2000-2005 22
1.13 Regressions for wages, 2000-2005 33
1.14 FE and two FE regressions for wages distinguishing moves to new and pre-existing establishments: 2000-2005 37
1.15 Two FE regression for wages distinguishing moves to Lisboa or Porto . 39
1.16 Mixed Logit Model 46
1.17 Wage regressions using the first definition of region change: 2000-2005 . 47
1.18 Wage regressions using only regular earnings: 2000-2005 48
1.19 Wage regression with worker and establishment fixed effects: 2000-2005 49
2.1 Characterizing new establishments 62
2.2 Characterizing firms 62
2.3 Sample design 63
2.4 Sample characterization: establishments 64
2.5 Sample characterization: firms 64
2.6 Type of hiring according to the worker's origin 67
2.7 Workforce composition (by establishment): 2003-2005 68
2.8 Characterizing establishments: 2003-2005 69

2.9 Type of hiring per year 70
2.10 Type of hiring by hierarchical level: 2003-2005 71
2.11 Type of hiring by NCO: 2003-2005 71
2.12 Type of hiring by size of the new establishment: 2003-2005 72
2.13 Type of hiring by parent firm size: 2003-2005 72
2.14 Type of hiring by economic activity: 2003-2005 73
2.15 Workers' characteristics by type of hire: 2003-2005 74
2.16 Establishment's survival statistics 75
2.17 Parent firm characterization by number of establishments opend, 2003-2005 76
2.18 Duration model and shared frailty model: 2003-2008 81

Introduction

This dissertation discusses the importance of worker's mobility to workers and firms and is organized in two independent parts.

The first essay explores workers' mobility within and across regions and within and across employers. The main contribution of this chapter emerges from combining the firm and the spatial dimensions of mobility revealing the spatial dimension of internal labor markets. We emphasize the relevance of space for intra-firm mobility in multi-plant firms that have establishments in different locations. Our results seem to suggest that mobility across establishments within the same employer is a channel to improve wage growth opportunities. This is consistent with our hypothesis that in multi-plant firms the internal labor market is based and organized on the firm as a whole. Besides analyzing the determinants and the returns to different types of mobility we also suggest a new strategy to estimate returns to migration by looking at the wage premiums of workers that migrated without changing employer. Moreover, the longitudinal dimension of our survey also allow us to distinguish between immediate and lagged gains to mobility. We conclude that there exists a larger wage premium when employees have to incur in additional costs such as those involved in migration. However, we also find that individual and firm specific characteristics are extremely relevant for mobility decisions and that taking into account individual and firm unobserved heterogeneity considerably decreases the value of the premiums. We also find that premiums for transfers to recently opened establishments are higher and that to encourage intra-firm migration to non-urban regions, firms have to pay a considerably higher premium.

In our second essay we analyze the recruitment policies and the survival of newly created establishments that are affiliated with pre-established firms. For the new units, the existence of ports of entry as well as the importance of internal and external hires is assessed. Being affiliated with a pre-established firm may be a source of competitive advantage and improve the new establishment's chances of survival as the parent firm

may supply the newly created unit with expertise and firm-specific knowledge. In this chapter we suggest a channel for knowledge transfer that has not been addressed in previous literature: within-firm and across establishments mobility. As firm-specific knowledge is mainly embodied and non tradable we suggest that it can be successfully transferred from the parent firm to the new unit embodied in the group of employees that are internally hired. We find that internally transferred workers, particularly skilled workers hired at high-rank jobs play an important role in improving the survival of newly created establishments.

Both essays have an empirical nature and the data that we use was obtained from Quadros de Pessoal (QP), a matched employer-employee administrative record collected by the Portuguese Ministry of Labor. The dataset has a longitudinal dimension, which allows us to track firms, establishments and workers over time and to match workers with their firms and establishments.

1 The Spatial Dimension of Internal Labor Markets

* *The authors thank Mónica Costa Dias for extremely helpful comments and suggestions. Comments from Gábor Kátay and other participants in the NIPE 2009 workshop, comments from Nils Braakmann and other participants in the ZEW/IAB workshop on "Spatial Dimensions of Labor Markets" at Mannheim (November, 2009) and comments from participants at the 5th PEJ annual meeting (Aveiro, 2011) are gratefully acknowledge. We are grateful to Gabinete de Estratégia e Planeamento (GEP) for providing the data for this research.*

1.1 Introduction

Understanding factors that influence mobility is relevant for both organizations and individuals (Ostroff and Clark, 2001). From the firms' perspective, mobility will be an essential tool to internally achieve an efficient allocation of resources. From the workers' point of view, mobility may enhance wage perspectives in that firm or in another firm and it may be seen as an investment in human capital. Moreover, mobility also enhances labor market efficiency and promotes matching between individuals and firms.

Mobility is a broad concept and several dimensions may be considered. The novelty in our work results from combining the firm and the spatial dimension of mobility. Looking at the firm dimension we may distinguish movements between firms from movements inside the firm. The former type of movement implies mobility between the internal and the external labor market, while the latter is performed inside the internal labor market of the firm (Doeringer and Piore, 1971). But mobility also has a spatial dimension as it may require geographical moves. These moves may be local if the worker is moving to a nearby location or they may imply a migration that involves a region change. Compared with local moves migration decisions carry higher mobility costs that may be monetary (travel costs, lodging costs,...) or psychological (separation from family, getting familiar with a new environment,...). By bringing together these firm and spatial dimensions of mobility we will identify and distinguish between different types of moves and subsequently focus on the determinants and returns for intra-firm mobility that implies a geographical move. The analysis of the spatial dimension of internal labor markets is new, as previous works in this field tended to focus on movements within the same establishment ignoring the geographical dimension of intra-firm mobility. By introducing space we reveal the spatial dimension of internal labor markets that is relevant in multi-plant firms that own establishments in different locations. In these firms, workers may move to another establishment of the same firm experiencing a relocation of their workplace without changing employer. This transfer will be local, if the new establishment is close to the one where the individual previously worked but it will involve a migration if the change is performed to an establishment located in a different region. A tangible reward is expected to exist when employees

have to incur in additional costs such as those involved in migration[1]. Bearing in mind this importance of space within the context of internal labor markets, we will analyze the determinants and returns to mobility and propose a new strategy to isolate the returns for geographical mobility estimating returns to migration by looking at the wage premiums of workers that migrated without changing employer. Moreover, we will also be able to distinguish between the immediate and the future gains to mobility.

Analyzing internal mobility brings up the concept of internal labor markets and the seminal work of Doeringer and Piore (1971). Within internal labor markets pricing and allocation of labor is governed by a set of administrative rules and procedures, distinguishable from the rules of the external labor market where pricing, allocation and training decisions are influenced directly by economic variables. The creation of internal labor markets may be a response to the existence of specific human capital (Becker, 1962), to the presence of mobility costs or matching effects (Jovanovic, 1979) or it may draw from the firm's incentive strategies (Lazear, 1979). Internal labor market's literature explores the existence of an internal job ladder and extensive previous literature focus on promotion dynamics and returns to promotion inside the same establishment (McCue, 1996; Pergamit and Veum, 1999; Lima and Centeno, 2003; Lima, 2004; Lima and Pereira, 2003; Hegedus & Hartman, 1992; Lazear and Oyer, 2004; Silva and Klaauw, 2006)[2]. Our outlook on internal mobility includes the spatial dimension implied by an establishment change but, although with distinct features, these transfers may also be a way to move within the internal labor market of multi-establishment firms. Indeed, in these firms, the internal labor market may not be restricted to one particular establishment. When multi-plant firms decide to fill a vacancy through internal reallocation they may transfer an employee that works at that particular location or they may also transfer someone that works in a subsidiary of the same firm but in another location. Our hypothesis is that in multi-plant firms the organization of the internal labor market will be based on the firm as a whole, including all the establishments affiliated with that firm. Internal transfers can be promotions or reassignments, they can occur as a reward

[1] Several works report the search for better wages as one of the main forces driving migration (Shaw, 1991; Farber, 1983; Yankow, 2003).

[2] McCue (1996) and Pergamit and Veum (1999) use individual panel data while Lazear and Oyer (2004), Lima (2004) and Lima and Centeno (2003) explore the potential of matched employer-employee datasets.

for great work, to test potential for more senior positions, or because the worker is the best or most readily available candidate to fill an immediate need. Nevertheless, these moves will be an important device in guarantying an efficient allocation of resources inside the firm and may improve the worker's wage perspectives. For these transferred employees that, although remaining with the same employer, have to change job location, the spatial dimension of mobility is crucial because the transfer is accompanied by a geographical move. We can find only a few studies reporting results for this group of internal movers (Bartel, 1979; Hunt, 2004), however, as these works are grounded in migration literature they focus on workers that migrated without changing employer but don't analyze local internal transfers. Bartel's (1979) work refers the importance of jointly analyzing migration decisions, turnover and job mobility. She identifies three types of migrations: quits, layoffs and transfers and, this last group, includes the internally transferred workers that migrated without changing employer. She concludes that the different groups identified have different characteristics and that the determinants and returns to migration differ from one kind of mobility to the other. Using German data from 1984 to 2000, Hunt (2004) estimates migration probabilities for the group of non-local internal transfers restricting her analysis to inter-state movers. As the internal transfer goes hand in hand with the decision to migrate Hunt calls these workers "same employer migrants". Her work was a step forward in migration literature as Hunt's paper opens doors to the link between intra-firm mobility and migration while most of the previous literature focused primarily on the link between migration and employer changes (Schaeffer, 1985; Shaw, 1991; Krieg and Bohara, 1999).

Depending on the type of mobility considered, several issues arise while estimating returns. One strategy to estimate returns to migration compares the outcomes of movers that change employer with stayers in the same employer. The problem is that while mobile workers improve their wages through job change, at the same time, immobile workers experience wage gains as a result of specific training (Antel, 1986). Our approach to estimate the returns to migration develops on Yankow's (2003) work that compares the outcomes of individuals who change employer and migrate against the outcomes of those individuals changing employer within their current labor market.

Yankow's objective is to determine whether the returns to job change involving migration differ in important ways from local job changes. Our approach also allow us to compare local and non-local changes but will differ from Yankow's approach as we will compare individuals that perform these changes within the same employer. Comparing returns across job changers, as in Yankow (2003), may include greater uncertainty and several variables that affect returns may be difficult to control. We believe that comparing individuals that remain with the same employer while looking at the spatial dimension of internal labor markets will allow us to better isolate the additional premium for migration.

As intra-firm mobility may be driven by very different motivations we also examine the wage premiums for moves to new and to pre-existing establishments trying to assess if the possibly higher responsibility associated with a transfer to a recently opened establishment gives rise to a higher wage premium. On the other hand, different regions have different amenities (or disamenities) and, some destinations may be seen as more (or less) attractive. Exploring these regional differences we will also analyze how the returns for migration differ for moves to urban and to non-urban areas.

The paper will be organized as follows: section 1.2 describes the data and details the sample construction; sections 1.3 and 1.4 present the models and discuss the results for mobility propensities and returns, respectively; section 1.5 concludes and points out future research directions.

1.2 The Data

1.2.1 Description

The dataset used in this work was constructed using *Quadros de Pessoal (QP),* a matched employer-employee administrative record. *QP* is an annual mandatory employment questionnaire collected by the Portuguese Ministry of Labor that all firms with wage earners are legally obliged to fill in. The data include establishment-specific details (employment, location, economic activity), information on the firm with which the establishment is affiliated (location, economic activity, number of establishments, employment, sales, ownership, legal framework), and workforce characteristics (gender,

age, education, occupation, tenure, earnings, hours of work). Data are collected once per year in October.

Firms, establishments and workers entering the database are assigned a unique identifying number and the Ministry implements several checks to ensure that a unit that has previously reported to the database is not assigned a different identification number. The dataset has a longitudinal dimension, which allows us to track firms/establishments and workers over time and to match workers with their firms and establishments.

Although the dataset goes back to 1985, given that some variables that are relevant for our work are only available after 1999, in this chapter, we use the 1999 to 2005 waves of Quadros de Pessoal. For the year 2001, however, the only information available is on firms' and establishments' characteristics as data on workers is not available. As we will detail bellow this missing data poses some restrictions in the identification of workers' mobility.

1.2.2 Sample Design, Treatment Groups and Control Group

Our sample includes workers that appear in the QP dataset both in the years 1999 and 2000. In the year 2000 we identify the worker's first type of mobility and, then, we follow these workers until 2005. We kept all workers aging between 15 and 65, classified as wage earners and we excluded individuals with a wage equal to zero[3]. In order to clearly identify and classify the workers' mobility we dropped individuals working for more than one employer[4].

Workers can be employed in firms with only one establishment or in firms with more than one establishment. Table 1.1 details information on the number of single and multi-establishment firms in each year and also on the average number of workers by firm type.

As small and medium sized firms prevail in Portuguese economy, the predominance of single-establishment firms is expected. Across the years we observe that approximately 10% of the firms are multi-plant firms. The average multi-plant firm has 4

[3] We performed consistency checks on the panel data. If we found an inconsistency in the variables gender, age or tenure this was repaired, if possible or, otherwise, the worker was dropped from the data.

[4] Individuals working for more than one employer are less than 1% of the population.

Firm Type	Variable	1999	2000	2002	2003	2004	2005
Single-plant	Number of firms	143543	145331	120480	114805	112065	116800
	Average number workers	10	10	12	12	12	13
Multi-plant	Number of firms	12156	12955	12333	12634	12739	13704
	Average number workers	68	67	69	68	70	70
Total number of firms		155699	158286	132813	127439	124804	130504

Table 1.1: Single-establishment and multi-establishment firms: 1999-2005

establishments and, on average, they have approximately six to seven times more workers than single-establishment firms. In our final sample, we only kept individuals that were employed in multi-establishment firms in the year prior to mobility. We implemented this restriction in order to ensure that all the analyzed workers face the same set of mobility choices. Clearly, it would be impossible for an individual working in a single-establishment firm to perform an intra-firm mobility involving an establishment change. We also removed from the sample all moves that were caused by the closure of the establishment where the worker previously worked[5] because, under this circumstances, the worker is forced to move not being possible to remain in the same establishment. Once again, for these workers the set of mobility choices is restricted as the worker cannot choose not to move[6].

Combining the firm and spatial dimensions of mobility we identified four different types of moves:

1. Workers that remain with the same employer but are transferred to another establishment of the same firm in the same region;

2. Workers that remain with the same employer but are transferred to another establishment of the same firm in another region;

3. Workers that move to another employer in the same region;

4. Workers that move to another employer in a different region.

[5] We identify a closure in one year whenever information for the establishment is absent for that year and for all subsequent years, i.e., if the establishment is not present in any of the subsequent waves of the data until 2009.

[6] Around one third of all same employer transfers are due to an establishment closure.

These different types of mobility are depicted in Figure 1.1 and identified with the numbers 1 to 4. For comparison, we also identify a fifth type of individuals: workers that don't move, remaining in the same establishment of the same firm (identified as type 5 in Figure 1.1). Employer changes are identified when we observe a change in the firm's identification number while for same employer transfers we observe that the identification number of the firm does not change, but there is a change in the establishment's identification number.

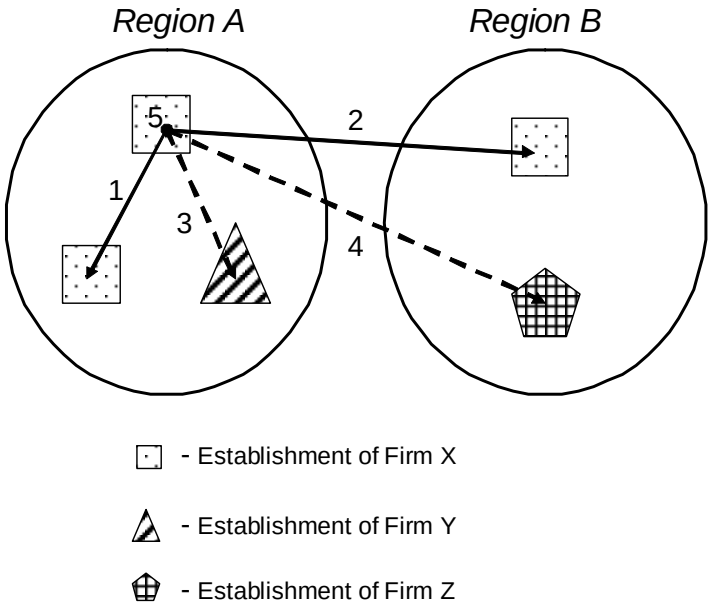

Figure 1.1: Different mobility types

One issue should be clarified before proceeding with the identification of the treatment and control groups. As we previously referred, we do not have data on individuals' characteristics for the year 2001. This limitation poses some restrictions on the identification and classification of the worker's mobility. For the year 2002, we can only classify workers using the available information for 2000 and 2002 but we don't have information about the worker's situation in 2001. For example, we may identify a worker as an internal transfer to another establishment of the same firm in 2002 but, with the information gap in 2001, we do not know if this internal transfer occurred in 2001 or in 2002. The same applies for the identification of employer changers in 2002.

Following directly from our previous classification of mobility, in Table 1.2 we identify

the treatment groups and the control group. The four types of mobility give rise to the four treatment groups, while the workers that remain in the same establishment of the same firm will be used as a control group.

Group	Mobility Type	Description	Multi-plant firm before the move?	Move driven by plant closure?
Treatment Group 1	SESR - Same Employer Same Region	Same employer transfers without region change	Yes	No
Treatment Group 2	SECR - Same Employer Change Region	Same employer transfers with region change	Yes	No
Treatment Group 3	CESR - Change Employer Same Region	Employer change without region change	Yes	No
Treatment Group 4	CECR - Change Employer Change Region	Employer change with region change	Yes	No
Control Group	NC - No change	Employees that remain in the same estab. of the same firm	Yes	No

Table 1.2: Identification of the treatment groups and control group

In order to analyze not only immediate gains but also lagged returns to mobility we follow the workers until 2005. If, within the analyzed time period, the worker performs another move, the new type of movement is identified and registered and the worker continues to be followed after this new move. To explain our methodology we discuss the hypothetical examples of two workers with different mobility paths. First, suppose Worker A that is a SESR mover in year 0 and henceforth the worker remains in the same establishment of the same firm. This worker will be identified as belonging to the first treatment group that includes workers that change establishment without changing region and, as shown in Figure 1.2, will be followed until 4 years after the move.

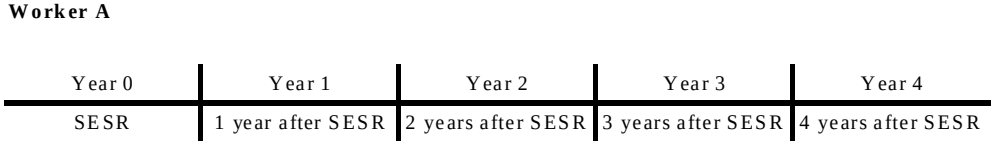

Figure 1.2: Mobility path for Worker A

Now let's suppose Worker B that is a SESR mover in year 0, but, unlike Worker A, she performs a new type of mobility and is a CECR in year 3. As we can see in Figure 1.3, this worker will be included in the first treatment group (workers that change establishment without changing region) and will be followed for two years in that group and, then, will move to the fourth treatment group (workers that changed employer and region) and will be followed for one year in that group.

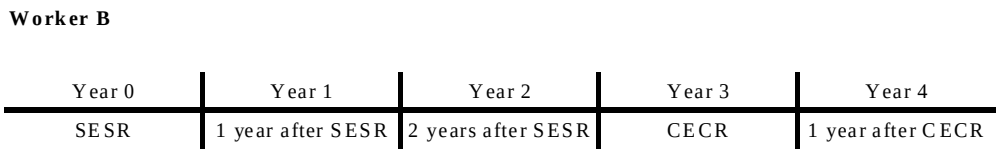

Figure 1.3: Mobility path for Worker B

As the assignment of workers to the treatment groups requires the distinction between local and non-local moves we need to clarify the definition of region change[7]. In our analysis we initially identified 21 regions:

- Foreign countries;
- The archipelagos Madeira and Açores;
- And the 18 Portuguese districts: Aveiro, Beja, Braga, Bragança, Castelo Branco, Coimbra, Évora, Faro, Guarda, Leiria, Lisboa, Portalegre, Porto, Santarém, Setúbal, Viana do Castelo, Viseu, Vila Real.

Then, we considered **two** possible definitions of region change. The first considers that a region change means that the worker is transferred to an establishment located in a different Portuguese district or to an establishment located in Madeira, Açores or abroad. However, given Portugal's geographical dimension changing district might not necessarily imply a migration or a residence change, therefore we also consider a second and more demanding definition that will only identify a region change when the worker changes to a non-contiguous district. Table 1.3 details the proportion of region changes using both criteria.

[7] We notice that, in the QP dataset, we do not have information about the workers' residence but only about the workers' workplace.

Type of region change	District change	Change to non-contiguous district
Same-employer transfers	19%	10%
Employer changes	16%	7%

Table 1.3: Proportion of region changes according to both definitions: 2000-2005

Considering our first and less restrictive definition, 19% of same employer transfers involve a region change while considering the second definition this proportion drops to 10%. Within the group of workers that change employer we find 16% and 7% of region changes considering the first and second definition of migration, respectively. As expected, we have a lower proportion of migrations when we use the second definition of region change. It is interesting to remark, however, that no matter the definition we use, we observe a higher proportion of migrants in the group of same employer transfers.

Adopting the more conservative and cautious strategy, in the present paper, we use the second and more demanding definition of region change. However, using the first definition of region change conclusions are quite similar and the results will be reported in appendix.

Our final sample includes 165743 workers that are locally transferred to another establishment of the same firm and 18072 that migrate without changing employer. We also identify 100278 individuals changing employer within the same region, while 8127 workers change employer and region. As can be seen in Table 1.4, our four treatment groups include a total of 670611 observations. Table 1.5 characterizes the control group that includes 324575 workers that remain in the same establishment and firm and that are followed until 2005 in a total of 904467 observations.

1.2.3 Characterizing the Data

In Table 1.6 we briefly characterize our treatment and control groups. Workers that change employer tend to be younger than the control group. When the move implies a region change women are less mobile than men and we find that the proportion of women in the group of internally transferred workers that change region is particularly low (23,1%). Foreign workers tend to be more mobile than natives. As expected, tenure is lowest for the group of employer changes but same employer transfers are also less

	Treatment Group				
	SESR	SECR	CESR	CECR	
Year of the move	165743	18072	100278	8127	
1 year after	95637	6440	81113	3721	
2 year after	50451	2985	52202	1909	
3 year after	27599	1622	31483	1080	
4 year after	8751	584	12529	285	
Total	348181	29703	277605	15122	670611

Table 1.4: Number of observations in the treatment groups: 2000-2005

	Control Group		
	NC		
2000	324575		
2002	188027		
2003	141877		
2004	128021		
2005	121967	Treatment Groups	All
Totals	904467	670611	1575078

Table 1.5: Number of observations in the control group, treatment groups and all sample: 2000-2005

tenured than the control group. We observe that same employer transfers show a higher proportion of workers with higher education. Nevertheless, for same employer transfers that change region we also observe a high proportion of individuals with 4 or less years of schooling. Apparently, in the group of internally transferred workers we can find very high but also very low educated workers. Around 70% of these low educated individuals work in the construction sector while the highly educated internal transfers prevail in financial activities. Our sample of employer changers also shows a high proportion of workers with more than 12 years of schooling.

In the QP dataset workers are assigned to eight hierarchical levels (these are defined by law in *Decreto-Lei n.º 121/78, de 2 Junho*[8]). Doing some aggregation, in this chapter, we define six levels:

- Top executives;
- Intermediary executives;
- Supervisors, team leaders and foremen;
- Highly-skilled and skilled professionals;
- Semi-skilled and non-skilled professionals;
- Apprentices, interns, trainees.

The proportion of top and intermediary executives in the group of same employer transfers is slightly higher than in the control group. In the group of internal transfers we also find a high proportion of supervisors, team leaders and foremen, 66% of which work in construction. Employer changes seem to be more frequent at the top and bottom hierarchical levels. Considering the Portuguese Classification of Economic Activity (cae)[9] we notice that internal moves prevail in construction (cae F), in hotels and restaurants (cae H) and in financial activities (cae J), while employer changes also predominate in construction (cae F) and in real estate, renting and business activities (cae K). Internal labor markets are more likely to be relevant in large firms, so it is not surprising that same employer transfers prevail in these firms. We also see that the

[8] See Appendix A.

[9] Equivalent to Standard Industrial Classification (SIC) codes. See Appendix B.

group of individuals that migrate within the same employer face a lower concentration of establishment affiliated to the parent firm in the region where they previously worked and thus faced a smaller set of choices for local internal transfers.

Table 1.7 details information on the real hourly earnings (in logs)[10] for the four treatment groups and the control group. Same employer transfers earn more than the control group and we observe the highest wages for the group of individuals internally transferred that migrate. Comparing with the control group, workers that change employer in our sample face a deep in earnings in the year of the move but this loss is recovered in the following years.

Internal transfers may be linked with the opening of new establishments[11]. In multi-plant firms the new vacancies created by the opening may be filled by hiring in the internal labor market or by external hires. In our sample, we observe that around one fourth of all same employer transfers were made to new establishments[12].

Same employer transfers may also be associated with promotion events (Bartel, 1979). Considering the information in our dataset, we have at least two ways to empirically identify a promotion. We may use the information reported by employers as the date of the last promotion or we may associate promotions with a change to a higher hierarchical level. Using the date of the last promotion reported by the employer, we found that around 20% of all same employer transfers were associated with a promotion event in the year of the transfer. Considering changes in hierarchical levels, we found that around 8% of internal transfers implied a change to a higher hierarchical level.

The same worker may change establishment within the same employer more than once. We observe that some of this repeated internal moves are return movers, which means that the worker returns to an establishment in which he has previously worked, showing that internal transfers can be merely temporary. Approximately one fourth of all internal transfers are return moves.

[10] Hourly earnings are defined as the ratio between total regular and irregular labour earnings and the total number of normal hours worked.

[11] The topic of internal transfers to newly-created establishments is further developed in the second chapter of this dissertation.

[12] We identify an opening whenever information for that establishment is reported to QP for the first time in the corresponding spell, i.e., if the establishment is not present in any of the preceding waves of the data (since 1985).

Variable		SESR	SECR	CESR	CECR	NC	All
Age (years)		40.3	40.6	36.1	35.9	41.4	40.8
Gender (proportion of female)		39.2%	23.1%	41.8%	33.7%	41.2%	40.2%
Tenure (months)		148.1	141.2	48.6	25.2	170.6	154.2
Education	4 or less years of schooling	25.8%	32.8%	20.8%	21.4%	28.5%	26.3%
	6 or 9 years of schooling	35.8%	33.5%	37.7%	35.7%	39.0%	38.4%
	12 years of schooling	24.7%	20.1%	25.4%	22.3%	21.8%	23.0%
	More than 12 years	12.8%	12.7%	14.3%	18.1%	10.2%	11.6%
Hierarchical level	Top executives	7.1%	7.7%	8.6%	10.6%	6.4%	7.2%
	Intermediary executives	7.4%	7.8%	5.1%	5.5%	5.6%	6.0%
	Supervisors, team leaders, foremen	8.3%	15.9%	3.9%	5.6%	6.4%	6.6%
	High-skilled, skilled professionals	53.5%	55.1%	47.1%	46.5%	53.3%	53.4%
	Semi-skilled, non-skilled professionals	19.6%	10.9%	26.4%	23.0%	24.7%	22.9%
	Apprentices, interns, trainees	1.3%	0.7%	4.7%	2.9%	1.3%	1.5%
CAE	A/B	0.5%	0.3%	1.0%	3.0%	1.0%	0.9%
	C	0.3%	0.3%	0.4%	0.4%	1.0%	0.7%
	D	11.7%	7.3%	0.4%	12.3%	27.8%	23.0%
	E	2.6%	1.0%	0.5%	1.5%	1.4%	2.4%
	F	11.9%	41%	6.2%	16.0%	3.9%	5.9%
	G	20.1%	18.9%	24.9%	19.8%	21.8%	21.5%
	H	6.1%	1.5%	6.0%	4.4%	3.2%	3.9%
	I	14.9%	10.9%	10.0%	7.1%	15.1%	14.9%
	J	17.1%	7.7%	6.2%	3.4%	8.6%	10.0%
	K	6.3%	6.3%	22.4%	27.4%	5.9%	7.7%
	L	0.1%	0.1%	0.3%	0.2%	0.3%	0.3%
	M	1.2%	1.0%	1.2%	0.7%	1.4%	1.3%
	N	4.4%	1.2%	2.1%	1.7%	5.2%	4.5%
	O	2.8%	2.4%	3.5%	2.0%	3.3%	3.2%
	P	-	-	-	-	-	-
	Q	-	-	-	-	-	-
Foreign workers		1.3%	1.7%	1.9%	2.0%	0.7%	0.9%
Firm size (log number of workers)		6.47	6.81	5.96	5.84	5.99	6.08
Concentration of estab. (before the move)		46.5%	23.3%	47.0%	43.5%	49.0%	48.8%

Table 1.6: Workers and firms' characteristics: 2000-2005

	N	SESR	N	SECR	N	CESR	N	CECR	N	NC	
Year of the move	162761	1.92	17835	2.05	98343	1.73	7935	1.77	324489	1.80	
1 year after	93445	1.93	6320	2.15	79064	1.93	3627	1.91	182796	1.87	
2 year after	49269	1.93	2933	2.22	51064	1.98	1857	2.01	138405	1.87	
3 year after	26949	1.95	1598	2.23	30854	1.97	1057	2.05	124794	1.88	
4 year after	8543	1.91	577	2.20	12337	2.11	279	2.08	118789	1.86	
Total	340967		29263		271662		14755		889273		1545920

Table 1.7: Evolution of real hourly earnings (in logs): 2000-2005

Being the two Portuguese main cities, the districts of Lisboa and Porto are expected to be important attraction poles. To appraise the importance of these two regions as a destination choice, in Tables 1.8 and 1.9 we identify the proportion of region changes that were made to Lisboa and Porto. Globally, we conclude that around 50% of all region changes have Porto or Lisboa as destinations.

Year	Porto (%)	Lisboa (%)	Total (%)
2000	20%	28%	48%
2002	19%	34%	53%
2003	20%	36%	56%
2004	20%	29%	49%
2005	25%	29%	54%

Table 1.8: Region changes to Porto or Lisboa for same employer transfers: 2000-2005

Year	Porto (%)	Lisboa (%)	Total (%)
2000	19%	31%	50%
2002	18%	27%	45%
2003	24%	27%	51%
2004	17%	33%	50%
2005	22%	29%	51%

Table 1.9: Region changes to Porto or Lisboa for employer changes: 2000-2005

1.3 Intra-firm and Inter-firm Mobility: Who Moves?

1.3.1 Empirical Methodology: Discrete Choice Model

To characterize workers that are more prone to mobility and to analyze mobility probabilities we use the **multinomial logit model** (MNL) (Schmidt and Strauss, 1975). The model extends the logit model when the response has more than two outcomes. Let y denote a random variable taking on the values $\{0, 1, ..., J\}$ for J a positive integer, and let X denote a set of regressors. In our model y will denote the type of mobility performed by the individual, while X will contain individual specific variables and firm/establishment characteristics. The choice of the regressors is based on the fact that demographic and other characteristics are believed to influence the costs of moving and therefore are related to the willingness to accept changes (Turban *et al.*, 1992). Education, for instance, is believed to have a positive impact on mobility as more educated individuals seem to have lower costs of migration and tend to be in "occupations that operate in a national labor market" (Bartel, 1979). Industry, size and the concentration of establishments of the same parent firm in the region are the variables used to characterize firms. These factors are believed to influence both intra-firm and inter-firm mobility. To characterize the quality of the match we included dummies for tenure and hierarchical level, hourly earnings and whether the worker was promoted in the last three years before moving. Naturally, mobility is expected to be less likely in a good job match. We are interested in how, *ceteris paribus*, changes in the elements of X affect the response probabilities, $P(y = j|X)$, $j = 0, 1, 2, ..., J$. Considering the four mobility types identified, in our model J equals 4. Table 1.10 clarifies the relation between the MNL five categories and our classification of mobility.

Mobility type	MNL category j
NC - No change	0
$SESR$ - Same Employer Same Region	1
$SECR$ - Same Employer Change Region	2
$CESR$ - Change Employer Same Region	3
$CECR$ - Change Employer Change Region	4

Table 1.10: MNL model categories

Let X be a $1 \times K$ vector with first-element unity, the MNL model has response probabilities:

$$P(y = j|X) = \frac{e^{x\beta_j}}{1+\sum_{h=1}^{J} e^{x\beta_h}} \text{ where } \beta_j \text{ is } K \times 1 \text{ , } j = 1, ..., J \text{ with } J = 4$$

Because the response probabilities must sum to unity, $P(y = 0|X)$ is determined once we know the probabilities for $j = 1, 2, ..., J$:

$$P(y = 0|X) = \frac{1}{1+\sum_{h=1}^{J} e^{x\beta_h}}$$

The model implies that we can compute J odds-ratios:

$\frac{P_j(x,\beta)}{P_h(x,\beta)} = e^{x(\beta_j - \beta_h)}$ and if $h = 0$, $\frac{P_j(x,\beta)}{P_0(x,\beta)} = e^{x\beta_j}$

The estimation of the MNL model is best carried out by maximum likelihood (McFadden, 1974).

1.3.2 Empirical Results

In Table 1.11 we report results for the MNL regression. In the estimation workers that remain in the same establishment of the same firm were considered the basecategory. The variables included in the MNL model are fully detailed and explained in Appendix C.

Following estimation, we began by testing whether the different types of mobility considered could be pooled together into common single status, i.e., we tested whether the coefficient estimates from the MNL model could be constrained to be the same. In particular, we investigated whether we could pool together internal transfers and employer changes not involving region change (mobility types SESR and CESR) and internal transfers and employer changes involving migration (mobility types SECR and CECR). Considering local changes we meant to test whether, at the eyes of the worker, performing the move within the same employer is viewed as different from moves that imply an employer change. Similarly, when considering mobilities that imply a region change, we wanted to test whether the worker views migration with employer change differently from migrations within the same employer. Performing a Wald test under the null hypothesis of equalizing regressors for mobility types SESR and CESR and for mobility types SECR and CECR, the hypothesis of pooling together these types of

	Type 1 - SESR		Type 2 - SECR		Type 3 - CESR		Type 4 - CECR	
Indep. var.	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio
Tenure36_p	0.2714***	(23.41)	0.5865***	(19.06)	1.6512***	(105.46)	2.5360***	(44.72)
Tenure96_p	0.0501***	(5.19)	0.1743***	(6.37)	0.3479***	(24.31)	0.9803***	(17.53)
Age_p	0.0142***	(4.68)	0.0586***	(6.34)	-0.0444***	(-12.31)	0.0092	(0.67)
Age squar_p	-0.0269***	(-7.39)	-0.0884***	(-7.97)	-0.0343***	(7.68)	-0.0302*	(-1.72)
Female_p	-0.0786***	(-9.74)	-0.2744***	(-10.43)	-0.1292***	(-11.66)	-0.2231***	(-5.52)
Educ4_p	0.0223	(1.30)	0.2960***	(5.75)	-0.1337***	(-5.46)	-0.3516***	(-4.17)
Educ9_p	-0.1126***	(-7.95)	-0.1213***	(-2.73)	-0.1529***	(-7.53)	-0.4744***	(-6.70)
Educ12_p	-0.0435***	(-3.34)	-0.1986***	(-4.59)	-0.0719***	(-3.82)	-0.3948***	(-6.14)
Nationality	0.3309***	(8.63)	0.3626***	(4.15)	0.4099***	(9.56)	0.1380	(0.88)
Prom [-3,0]	-0.0055	(-0.80)	-0.1544***	(-7.92)	-0.9711***	(-78.12)	-1.2659***	(-29.41)
$\ln w$_p	-0.2179***	(-21.54)	-0.0031***	(-3.11)	-0.1565***	(-11.41)	-0.2624***	(-5.17)
Size_p	0.1862***	(71.14)	0.0951***	(9.24)	-0.0180***	(-5.33)	-0.1218***	(-10.74)
Est.Conc._p	0.6158***	(44.45)	-2.8241***	(-53.31)	-0.2522***	(-12.76)	-1.2733***	(-18.37)
Constant	-3.2094***	(-46.04)	-4.6011***	(-21.19)	-0.9159***	(-11.17)	-3.8059***	(-12.82)
Log pseudL.	-630488.18							
Prob>X^2	0.0000							
Pseudo R^2	0.1002							
N	1164938							

Notes: NC workers is the base outcome;

Specification also includes a set of time dummies, industry dummies and controls for hierarchical levels;

Cluster-robust t statistics in parentheses (cluster variable: id_worker);

***, **, * denotes statistically significant at 1, 5, and 10%, respectively.

Table 1.11: MNL regression: 2000-2005

mobility was statistically rejected, strengthening the hypothesis that these categories should be analyzed separately.

In Table 1.12 we report the estimated average probabilities of choosing each type of mobility[13]. We observe that workers are averse to mobility and that most moves don't involve a change in region. Interestingly, we also conclude that same employer transfers are an important and rather common event for the group of mobile workers. We notice that around 64% of all local moves (SESR and CESR) are performed without changing employer and if we consider the group of moves that imply a region change (SECR and CECR) the proportion is even higher and we see that almost 77% of migrations are made within the same employer.

	Average Probabilities
NC - No Change	83.30%
$SESR$ - Same Employer Same Region	10.75%
$SECR$ - Same Employer Change Region	1.22%
$CESR$ - Change Employer Same Region	4.42%
$CECR$ - Change Employer Change Region	0.31%

Table 1.12: Average probabilities of choosing each mobility type, 2000-2005

Looking at Table 1.11 we see that women tend to be less mobile than men. Our results show a negative relation between pre-move wages and the probability of mobility both for employer changes and intra-firm mobility. For same employer transfers we find that lower pre-move wages increase the probability of being internally transferred which may be consistent with our hypothesis that same employer transfers are a way to improve future wage perspectives inside the firm. An employee that is being well rewarded in the establishment where he presently works has less incentives to move elsewhere. This hypothesis is also corroborated when we observe that having been promoted in the three years before the move also decreases the likelihood of being transferred to another establishment. These establishment transfers can be a different way to move within the internal labor market and to build a career inside multi-establishment firms. Apparently, our results show that these transferred individuals may be trying to climb

[13] These probabilities were computed as the average probabilities for all individuals in our sample.

the internal job ladder. We recall that 20% of same employer transfers were associated with a promotion event in the year of the transfer. This may signal that internal transfers are an investment that may result in better wage and career perspectives inside the firm. Bartel (1979) also conjectured that these transfers acted as a promotion within the firm. Our results support the hypothesis that in multi-plant firms there exists a global internal labor market which is built on the firm as a whole.

We also find a negative relation between pre-move wages and the probability of changing employer. Moreover, being promoted in the three previous years also has a negative effect on the probability of changing employer implying that promotion events reduce the probability of a job separation. Although this may seem evident, it might not be so because promotion also signals to the external market that the worker is valuable (Waldman, 1984). However, as long as some human capital is firm specific a promotion may signal that the worker is better suited to the current firm than to other firms (Lazear, 1999, Jovanovic 1979). Summing up, for the case of workers that are performing poorly at the firm, either by lower wages or by lower promotion rates, we observe that they are more likely to leave the firm (voluntarily or involuntary). We conclude that an unsuccessful track in the company increases the likelihood of changing employer, probably indicating the termination of a bad job match.

Job changers tend to be younger and may be searching for a better match, however, for the group of same employer changes, age seems to have a positive impact on the probability of being transferred. Although human capital theory states that younger workers tend to invest more in their careers and be more mobile, older workers can have more labor market experience which may be relevant for same employer transfers. This may be particularly relevant if the transfer is related to the opening of a new establishment, where a more experienced worker may be important.

Education is believed to have a positive impact on mobility as more educated workers tend to have lower mobility costs and adapt easily to changes. If the move involves an employer change more instructed individuals tend to have better information about job opportunities. On the other hand, if the move involves a migration, more educated individuals are also believed to have lower costs of migration and tend to be in "occu-

pations that operate in a national labor market" (Bartel, 1979). This last argument may also be crucial within the context of internal labor markets in multi-establishment firms. If educated workers are more likely to occupy jobs that operate in a national labor market, when they work in a multi-establishment firm, they may move within the firm's "national" internal labor market for more skilled professionals. For the worker, these transfers may constitute a less risky and less costly alternative to migrations in the external labor market. As in Hunt's (2004), our empirical results give substance to the conclusion that "skilled workers (...) have a low cost migration avenue that has not been considered in previous literature" which is "same employer migration". Nevertheless, for the group of same employer transfers, we also observe a higher probability of moving for workers with four or less years of schooling. Apparently, we are identifying two different kinds of same employer movers: high-skilled workers to whom these transfers may be seen as a way to enhance career perspectives and very low-skilled workers to whom this mobility may be a "requirement" to remain with the employer they are working for and a condition for keeping jobs in a particular industry. This hypothesis is corroborated if we analyze the sectors where same employer transfers prevail. We find that establishment transfers prevail in construction (cae F) and in hotels and restaurants (cae H) where we may find a higher proportion of low skilled workers, but they also prevail in financial activities (cae J) where a higher proportion of high skilled workers is present[14].

As job tenure may be a proxy for the accumulation of specific human capital, the firm might choose to transfer employees with higher tenure (Bartel ,1979). However, for same employer transfers, we find a positive signal for the group of less tenured employees. This finding complements our discussion about the impact of previous wages and previous promotions on the probability of being transferred. The transfer is in itself an investment that lower tenured workers may use as a tool to improve career perspectives. Apparently, we may conclude that transferred workers in multi-establishment firms may be looking for ways to increase the accumulation rate of specific human capital and improve career opportunities. We find that the likelihood of changing

[14] Hunt (2004) also finds some dichotomies concluding that "same employer migrants" prevail in certain job categories like cashiers for women and architects and engineers for men.

employer decreases with tenure, which is also consistent with the specific human capital theory. When there are important investments in specific human capital both the firm and the worker have an interest in preserving and maintaining the job relation. As it is reasonable to assume that firm specific capital increases with tenure, then, displacement probability will be higher for low tenured employees, being possible to observe that new jobs tend to end early (Farber, 1999).

We also notice that same employer transfers prevail in larger firms where internal labor markets are more likely to exist and to play an important role. On the other hand, workers in large firms are less likely to leave which is consistent with usual findings that large firms have lower turnover rates.

In the estimation we also included a variable measuring the proportion of establishment that the parent firm owns in the region where the individual was working before the move. We observe that the higher the concentration of establishments in the region where the individual is working the higher the probability of performing a same employer transfer without changing region and the lower the probability of changing to an establishment in another region. We also observe that the higher the concentration of establishments in the region of origin the lower the probability of changing employer.

1.3.2.1 The Independence of Irrelevant Alternatives

It is stated that the appropriateness of the multinomial logit model relies on the property whereby $\frac{P_j(x,\beta)}{P_0(x,\beta)}$ is independent of the remaining probabilities, known as the **independence of irrelevant alternatives assumption (IIA)**. The IIA means that, all else being equal, a person's choice between two alternative outcomes is unaffected by what other choices are available. This assumption is often illustrated by the commonly used example "Red bus/Blue bus" from McFadden (1974) although Train (2003) points out that this example is rather extreme and unlikely to occur in serious, substantive research. Implementing a Hausman test and comparing the estimation of the full model with a restricted model where we eliminate mobility type 3, CESR, we cannot reject the hypotheses that IIA holds. For the other mobility types (SESR, SECR and CECR) when performing the Hausman test to compare the full and the restricted models we obtain negative test statistics. Under these circumstances, extensive literature sug-

gests that we should also not reject the hypothesis that the IIA holds (Hausman and McFadden,1984, Cheng and Long, 2007). However, when performing the Small-Hsiao test (Small and Hsiao, 1985) we didn't get support for the IIA hypothesis**.** Long and Freese (2001) alert to the fact that these tests often give inconsistent results and may provide little guidance to violations of the IIA assumption. Fry and Harris (1996, 1998) explored the statistical properties of these tests discussing their size and power properties. Some recent literature argues that there may be some problems with these tests and Cheng and Long (2007) state that "even in well-specified models, IIA tests often reject the assumption when the alternatives seem distinct". They conclude that tests of the IIA assumption that are based on the estimation of a restricted choice set are unsatisfactory for applied work.

Multinomial probit model (MNP) is often proposed as an alternative to the MNL model as the error specification in MNP allow for correlations between the errors, potentially removing the IIA assumption. However, MNP presents difficult computational problems and some authors argue that there exists little evidence showing that MNP will provide more accurate results than MNL. Kropko (2008) conducts computer simulations to show that MNL nearly always provides more accurate results than MNP, even when the IIA assumption is severely violated. They suggest that researchers should not assume that MNP is the most reliable empirical model. Dow and Endersby (2004) suggest, as well, that, for most purposes, the simpler MNL is preferable to MNP[15].

As suggested by Cheng and Long (2007), it appears that the best advice regarding the IIA goes back to an early statement by McFadden (1974) who wrote that the multinomial and conditional logit models should be used in cases where the outcome categories "can plausibly be assumed to be distinct and weighed independently in the eyes of each decision maker" and that MNL works well when the alternatives are dissimilar (Amemiya,1981)[16].

[15] Although we find in Stata the command "mprobit", it assumes that the errors are uncorrelated estimating an exact counterpart to the MNL. Despite these facts, it is possible to find papers using "mprobit" command to estimate multinomial probit models and allegedly relaxing IIA (Jepsen, 2008 or Shi and Heerink, 2007).

[16] As an alternative to overcome the violation of the IIA hypothesis we explored the estimation of a **mixed logit model**. Mixed logit is a highly flexible model that can approximate any random utility model (McFadden and Train, 2000). We used the Stata module "mixlogit" (Train 2003; Hole 2007) to perform the estimation. Due to time and computational reasons we estimated a very parsimonious regression but the results we obtained appeared to validate the

1.4 Returns to Mobility: The Effect of Worker's Mobility on Wages

1.4.1 Empirical Strategy

1.4.1.1 Model Specifications

Exploring the outcomes of mobility, we want to analyze the returns to mobility identifying immediate and lagged returns to the different types of mobility identified:

1. $SESR$ - Same Employer Same Region;
2. $SECR$ - Same Employer Change Region;
3. $CESR$ - Change Employer Same Region;
4. $CECR$ - Change Employer Change Region.

To clarify our objective we start with a basic framework, based on the estimation of a simple OLS equation capturing the difference in earnings for the different types of mobility:

$$\ln W_{it} = \beta_1 X_{it} + \beta_2 Z_{it} + \sum_{k=0}^{4} SESR_{it}^{k}\delta_k + \sum_{k=0}^{4} SECR_{itk}^{k}\lambda_k + \sum_{k=0}^{4} CESR_{it}^{k}\alpha_k + \sum_{k=0}^{4} CECR_{it}^{k}\tau_k + \gamma_t + \varepsilon_{it}$$

where $\ln W_{it}$ is the logarithm of real hourly earnings for individual i at period t. Hourly earnings are defined as the ratio between total regular and irregular labor earnings and the total number of normal hours worked. We deliberately chose to include irregular earnings because some pay differentials for transferred employees may arise in the form of irregular benefits[17]. Wages were converted to constant 2005 euros, using the Consumer Price Index (CPI).

X_{it} is a vector of individual characteristics and Z_{it} includes a set of firm characteristics. The variable $SESR_{it}^{k}$ is a dummy variable that takes the value one if at time t worker i is k years after being transferred to another establishment of the same firm in the same region. The δ_k parameters reflect the difference in earnings k years after changing establishment within the same region and the corresponding control group, workers that don't change employer nor establishment (identified in previous sections

results obtained with the MNL model (**see Appendix D**).

[17] We also tested the specification using only regular labor earnings. The results were similar to the ones reported and are presented in Appendix F.

as NC). $SECR_{it}^{k}$ is a dummy variable that takes the value one if at time t worker i is k years after being transferred to another establishment of the same firm located in a different region. The λ_k parameters reflect the difference in earnings k years after changing establishment and region and the control group.

Similarly, the variable $CESR_{it}^{k}$ is a dummy variable that takes the value of one if at time t worker i is k years after changing employer within the same region. The α_k parameters reflect the difference in earnings k years after changing employer within the same region and the NC group of workers that don't change employer nor establishment. Finally, the variable $CECR_{it}^{k}$ is a dummy variable that takes the value of one if at time t worker i is k years after changing employer and region. The τ_k parameters reflect the difference in earnings k years after changing employer and region and the control group.

γ_t is a set of time dummies that control for year-specific effects and ε_{it} is a disturbance term which is assumed to have zero mean and constant variance.

Using this framework, our mobility dummies capture the wage premiums for the different types of mobility comparing with the control group, not only in the year of the move but also in the following years. This allows us to analyze the lagged effects of mobility on wages distinguishing between the immediate gains to mobility and the future gains to mobility and also to discriminate returns between the different types of mobility considered. This framework also allows us to suggest a new approach to estimate returns to migration. To estimate the wage growth that rewards migration we consider the group of individuals that are transferred to another establishment of the same employer identifying and comparing returns for local and non-local internal transfers. This strategy is implemented by comparing wage premiums for individuals with types SESR and SECR as the premium for mobility SESR will be linked to movements in the internal job ladder while the additional wage growth for mobility type SECR, when the transfer involves a region change, will be related with the migration premium.

1.4.1.2 Selectivity Problems

Mobility decisions raise selectivity problems. When selectivity problems are ignored we may get erroneous estimates of the parameters and biased estimation of returns.

Maddala (1978) points out that empirical data is the result of economic agents making choices and that this may lead to selectivity biases. The purpose of this section is to discuss the implications of selectivity in our analysis of the wage returns to mobility, particularly for the case of same employer movers.

The OLS estimation would only be appropriated if mobility could be seen as a quasi-experiment and if we could believe that mobile workers are a random sample of the population.

For same employer movers two types of selectivity biases may arise. First, the employee must be offered the opportunity to perform the transfer and this decision is made by the employer. Then, the worker will decide to accept or not the proposal and if the answer is positive we will observe that worker in our same employer treatment groups.

Considering the first kind of selectivity bias, the choice of which workers will receive the proposal to perform the move is not random but decided by the employer. This kind of selectivity is similar to the *program administrator selectivity*. For the case of public programs the assignment to the "treatment group" and "control group" is not random but dependent on the criterion decided by the program administrators. In our model we have an employer selectivity as the employer will firstly have to decide to which workers the proposal of internal transfer will be made. On the one hand, this decision may depend on the firm's strategy (for example, which establishments will open vacancies for internal transfers and which will not). On the other hand, this selection will also depend on the employer's perception of which employees will be the best suited for the open vacancy.

The second phase of the process consists on the worker's decision to accept or decline the employer's proposal. Considering competing alternatives the employee will agree or not to move to another establishment and this will generate a self-selection problem. The result is that workers selecting to perform the internal transfer tend to be non-randomly distributed within the population as a whole[18]. In the presence of self-

[18] Self-selection has been addressed in several labour market settings such as female labour force participation (Heckman, 1974), migration decisions (Nakosteen and Zimmer, 1980; Borjas, 1987), training program participation (Ham and LaLonde, 1996), choice of schooling (Willis and Rosen, 1979) and union versus nonunion employment (Lee, 1978).

selection, the worker can decide to participate or not in the "treatment group". This choice will be based on utility maximization where the utility is a function of expected incremental returns but also of individual observed and unobserved characteristics (such as risk aversion and other unobserved individual characteristics). The selection rule is so that returns are observed only for the individual's utility maximizing choice because the worker's returns are not observed for all alternatives but only for the alternative that he chooses. In the self-selected sample, the error term ε_{it} does not necessarily have zero mean and OLS estimation of the returns potentially yields biased estimates of the parameters. The bias arises as workers that perform a given mobility may behave differently from the rest because they have a comparative advantage for the mobility type they have chosen. In fact, workers choosing a given alternative do so because they have some tangible basis for perceiving a more favorable return for that alternative than those who choose otherwise. The presence of self-selected moves causes the observed returns to moves to differ from the returns we would expect a randomly chosen individual to earn.

1.4.1.3 Fixed Effects Approach

In this context, and because an instrumental variables approach was not feasible due to the lack of valid instruments to identify the moments of interest, we use a fixed-effects approach that accounts for unobserved (permanent) heterogeneity that is shared among groups of observations[19]. The decision to move may be strongly influenced by individual specific effects and also by firm and establishment specific characteristics. We start with an estimation controlling for worker specific-effects and, then, estimate a model that allows to account simultaneously for worker and firm fixed-effects following the

[19] To deal with the shortcomings of the fixed effects estimation we explored the use of an **instrumental variables estimator (IV)**. We used the establishment concentration in the region where the individual worked as a possible instrument (the higher the parent-firm's concentration of establishments in the region where the individual was working the higher the probability of performing a same employer transfer without changing region because, in that region, the worker has a larger set of possible destinations). Instead of a binomial treatment, we used a maximum simulated likelihood method to estimate a multinomial treatment effects model following the approach of Deb and Trivedi (2006a, 2006b). The obtained results were relatively similar to the OLS results leading us to conclude that, although the instrument is statistically significant in the MNL model and has the expected effect on the probability of being a same employer mover, apparently it seems not to be working well.

methodology explored by Guimarães and Portugal (2010) that implement a full Gauss-Seidel algorithm to estimate regression models with high-dimensional fixed-effects. The main advantage of the chosen procedure is the ability to estimate a very large number of two-way fixed effects under minimal memory requirements.

The standard within groups panel data estimator is analytically identical to the difference in differences (DID) estimator of the average effect on individuals that were assigned to treatments[20] (ATT) (Blundell and MaCurdy 1999) and so, the shortcomings of both methodologies are the same. Suppose m_{it} denotes the treatment status of individual i at time t where $m_i = 0$ accounts for our basecategory, the DID estimator is just the first differences estimator commonly applied to panel data in the presence of fixed effects. This means that a way of obtaining $\widehat{\alpha}^{DID}$ is to take the first differences and obtain:

$$W_{it_1} - W_{it_0} = \alpha_i m_{it} \ + (n_{t_1} - n_{t_0}) + (o_{it_1} - o_{it_0})$$

Where o_{it} represent the transitory idiosyncratic shocks and n_t is an aggregate macro shock. Under the DID assumptions, the above regression equation can be consistently estimated using OLS. Notice that the DID assumptions also imply that the transitory shocks o_{it} are uncorrelated with the treatments.

This allows the identification of the ATT between periods t_1 and t_0. For treatment group 1 we get:

$$\begin{aligned}\alpha^{ATT} &= E\left[\alpha_i \mid m_i \ = 1\right] \\ &= E\left[W_{it} \mid m_i \ = 1, t = t_1\right] - E\left[W_{it} \mid m_i \ = 1, t = t_0\right] - \\ &\quad - E\left[W_{it} \mid m_i \ = 0, t = t_1\right] - E\left[W_{it} \mid m_i \ = 0, t = t_0\right]\end{aligned}$$

The sample analog is the DID estimator:

$$\widehat{\alpha}^{DID} = \left[\overline{W}^1_{t_1} - \overline{W}^1_{t0}\right] - \left[\overline{W}^0_{t_1} - \overline{W}^0_{t0}\right]$$

where $\overline{W}^d_t$ is the average outcome over group d at time t. DID measures the excess outcome change for the treated as compared to the non-treated, this way identifying the ATT,

$$E\left[\widehat{\alpha}^{DID}\right] = \alpha^{ATT}$$

As the fixed effects panel data estimator is equivalent to the DID estimator it is relevant to briefly discuss the weaknesses of the methodologies (Blundell and Dias,

[20] We recall that the four treatments match with the four different types of mobility identified.

2009):

- **Selection on idiosyncratic temporary shocks**

The procedure doesn't control for unobserved temporary individual specific shocks that may have an influence on the mobility decision, therefore having an influence on the participation decision. If the transitory shocks o_{it} are not uncorrelated to the treatment then the DID estimator is inconsistent.

To illustrate this shortcoming we may recall the "Ashenfelter's dip" (Ashenfelter, 1978 and Heckman and Smith, 1999). If the enrollment in a training program is more likely to occur when the worker experiences a temporary dip in earnings then, a faster earnings growth is expected among the treated, even without program participation and the DID estimator is likely to over-estimate the impact of the treatment. Considering our mobility decisions, suppose that mobility is driven by a temporary change in the spouse's workplace. In this case we expect a lower or no wage premium and the DID estimator is likely to under-estimate the impact of the treatment.

- **Differential macro trends**

The identification of ATT using DID also relies on the assumption that treated and controls experience common trends or, in other words, face the same macro shocks.

1.4.2 Empirical Results

1.4.2.1 Returns to mobility: Same Employer Transfers and Migration Premiums

In the first column of Table 1.13 we report results for the wage equation using OLS. The second and third columns show the results for the worker fixed effects and for the worker and firm fixed effects, respectively. [21] [22]

[21] The reported estimations use the second and more demanding definition of region change. Results using the first definition are shown in Appendix E (we recall that the first and less demanding definition of region change identifies a migration by a change in the district where the individual works). We may observe that the results are similar to the ones reported although, as expected, the premiums for region change are slightly lower, consistent with the shorter distances implied by the first definition of region change.

[22] The reported estimations use average hourly earnings (including irregular earnings). Results using only regular wages are reported in Appendix F. We observe that the estimated wage premiums are slightly lower than the ones reported, particularly for region changes, which is consistent with the hypothesis that some pay differential for transferred employees take the form of irregular benefits.

	OLS		Worker FE		Worker and firm FE	
Variables	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio
$SESR_0$	-0.0047***	(-3.17)	0.0163***	(17.61)	0.0124***	(13.27)
$SESR_1$	0.0021	(1.26)	0.0245***	(21.85)	0.0206***	(18.57)
$SESR_2$	0.0002	(0.08)	0.0247***	(15.34)	0.0284***	(13.33)
$SESR_3$	0.0047*	(1.64)	0.0274***	(15.31)	0.0242***	(13.94)
$SESR_4$	-0.0230***	(-4.78)	0.0181***	(6.38)	0.0144***	(5.27)
$SECR_0$	0.1095***	(24.40)	0.0387***	(16.35)	0.0335***	(14.47)
$SECR_1$	0.1390***	(21.11)	0.0416***	(12.11)	0.0362***	(10.91)
$SECR_2$	0.1538***	(16.20)	0.0417***	(8.35)	0.0364***	(7.89)
$SECR_3$	0.1476***	(11.33)	0.0426***	(5.19)	0.0387***	(4.77)
$SECR_4$	0.1579***	(7.56)	0.0434***	(4.37)	0.0391***	(4.11)
Age	0.0470***	(104.04)	0.0475***	(88.39)	0.0449***	(78.10)
Age squared	-0.0418***	(-76.84)	-0.0351***	(-54.74)	-0.0317***	(-48.20)
Female	-0.2810***	(-217.48)				
Education 4	-1.1632***	(-450.60)	-0.0878***	(-26.62)	-0.0552***	(-16.19)
Education 9	-0.8687***	(-360.78)	-0.0770***	(-26.30)	-0.0505***	(-16.79)
Education 12	-0.5743***	(-226.02)	-0.0642***	(-23.73)	-0.0473***	(-17.14)
Tenure months	0.0010***	(47.44)	0.0002***	(13.85)	0.0002***	(11.87)
Tenure squared	-0.0001***	(-9.28)	-0.0000	(-0.46)	0.0000**	(-1.97)
Size	0.0355***	(110.51)	0.0271***	(138.80)	0.0327***	(29.57)
$CESR_0$	0.0553***	(29.08)	0.0120***	(9.37)	-0.0055***	(-3.29)
$CESR_1$	0.0589***	(32.01)	0.0226***	(17.28)	0.0017	(0.98)
$CESR_2$	0.0616***	(28.89)	0.0310***	(20.43)	0.0084***	(4.41)
$CESR_3$	0.0577***	(21.40)	0.0314***	(17.34)	0.0101***	(4.79)
$CESR_4$	0.0502***	(13.31)	0.0333***	(13.14)	0.0128***	(4.75)
$CECR_0$	0.0640***	(10.52)	-0.0113***	(-3.06)	-0.0117	(-0.55)
$CECR_1$	0.0980***	(11.48)	0.0145***	(3.06)	0.0600	(1.09)
$CECR_2$	0.1437***	(11.72)	0.0369***	(5.93)	0.0241***	(3.55)
$CECR_3$	0.1502***	(9.62)	0.0391**	(2.43)	0.0380	(0.47)
$CECR_4$	0.1674***	(5.52)	0.0351**	(2.47)	0.0254*	(1.83)
Constant	1.1801***	(131.57)	0.4076***	(34.12)		
$\overline{R}^2$	0.5649				0.9093	
N	1545920		1545920		1545920	

Notes: Dependent variable: Log of average real hourly earnings (regular and irregular);
Specification also includes a set of time and industry dummies;
Cluster-robust t statistics in parentheses for the OLS model: clustered (id_worker).
***, **, * denotes statistically significant at 1, 5, and 10%, respectively.

Table 1.13: Regressions for wages, 2000-2005

Analyzing the results obtained with the OLS and FE models we conclude that they are broadly consistent with usual findings. Wages increase with age, tenure and education, are higher for men and larger firms tend to pay higher wages.

Looking at the OLS estimation, we observe that the premiums for local same employer transfers are low and/or statistically insignificant[23]. However, for the group of same employer transfers involving region changes, premiums are large and statistically significant. In the year of the transfer these same employer migrants earn 11,6% more than the reference group[24] and, in the years that follow, the premium increases until 17,1% four years after the transfer. Using OLS we conclude that the reward for changes that imply a migration is considerably large.

Looking at the fixed-effects estimations we see that, although the estimated premiums are always statistically significant, the wage premium for migration is considerably lower than using OLS.

Unlike the OLS estimation, for the fixed effects regressions we find positive and statistically significant wage premiums even for same employer transfers without region changes. These wage premiums may result from the accumulation of firm specific human capital and progression in the firms' internal labor markets. Bartel (1979) also finds that the wage premiums of transferred workers are larger than the gains of employees that are not transferred. By accepting the change, an employee may show continued willingness to work on behalf of the organization and may gain skills that will lead to enhanced future opportunities (Ostroff and Clark, 2001). These effects may be reflected in the wage premiums that we observe for the group of locally transferred workers. Including worker FE, for local changes, premiums range from 1,6% in the year of the change to 2,8% in the third year after the change. For same employer migrants we observe a wage premium of 3,9% in the year of the change increasing to 4,4% four years after the change. Comparing the size of these premiums with the OLS results we conclude that individual unobserved heterogeneity is extremely relevant for mobility decisions. Still, we find that the reward is around 2 p.p. higher when employees have to

[23] In the fixed effects regression we find positive and statistically significant wage premiums even for same-employer transfers without region changes.

[24] To calculate the discrete percentage change in y induced by Δx the matematical transformation $\exp(coef.) - 1$ is employed.

incur in the additional costs involved in migration. When we observe a region change, the premium includes, not only the progression in the internal labor market but also the compensating differential for migration. The difference between the premiums for these two groups provides an estimation of the wage premium for migration. However, it may be argued that for same-employer transfers we should distinguish between firm-specific human capital and establishment-specific human capital. When workers are engaged in a same employer transfer, they are able to protect firm-specific human capital but loose their establishment-specific human capital. This loss may be particularly relevant in transfers to a more distant location and might lead to a negative wage premium after the change to an establishment in a different region. If this loss occurs, then, the observed differential will estimate a **lower bound for the migration premium** and the actual migration premium will be higher. Our results also appear to corroborate findings from migration literature pointing out that returns to migration are not limited to the migration year (Schaeffer, 1985 and Yankow, 2003) increasing the relevance of tracking individuals in the years that follow the transfer.

We might also look at the results for the two groups of employer changers estimating migration premiums by comparing the outcomes of individuals who change job and migrate against the outcomes of those individuals changing employers locally (Yankow, 2003). However, the interpretation of these results demands additional caution as the information contained in our dataset does not allow us to separate voluntary quits from involuntary layoffs. Some of these migrants that change employer, particularly those for whom the separation is involuntary, may fail to obtain better wages at the new employer and the observed premium will depend on this proportion of individuals that fail to obtain better wage opportunities.[25]

As firm specific effects may also be relevant for the determination of labor market outcomes in the third column of Table 1.13 we observe the results for the worker and firm fixed effects estimation.[26]

[25] We also estimated a more parsimonious regression not controlling for employers' characteristics. This regression showed considerably larger premiums for all groups. This finding is in line with recent empirical work on wage determination showing that employers' characteristics are a crucial determinant of workers' wages (Carneiro and Portugal, 2006).

[26] Results with worker and establishment specific effects are quite similar and are reported in Appendix G.

With the two FE most of the conclusions previously obtained with the worker specific effects remain valid. We conclude that even though firm specific effects are also relevant, controlling for unobserved worker heterogeneity is of utmost importance. With two FE, although we observe a slight decrease in the premiums, the migration premium measured by the differential between local and non-local same-employer transfers continues to be around 2 p.p.

1.4.2.2 Returns to mobility: Same Employer Transfers to New vs Old Establishments

We have previously discussed that same employer transfers may have different motivations and the opening of a new establishment is one of those motivations. When the firm opens a new plant, it may consider hiring in the internal labor market and we recall that around 30% of all same employer moves are made to new establishments. Table 1.14 reports the difference in the wage premiums for transfers to new and to pre-existing establishments. Wage premiums seem to be higher for workers that are transferred to new establishments which is consistent with the higher responsibilities that may be demanded from workers that are transferred to a new establishment and therefore may be responsible for its success or failure.

1.4.2.3 Returns to mobility: Same Employer Transfers to Urban vs Non-urban Areas

When analyzing wage premiums, the region of destination may also matter as the wage differential can depend on the local amenities and disamenities of regions.

We may distinguish moves to rural areas from moves to urban areas. Urban areas have a higher cost of living and workers transferred to these regions may demand a higher wage premium to compensate for the higher prices. The existence of a larger compensating differential for moves to large urban areas might also arise from other disamenities such as pollution or excessive traffic. On the other hand, as urban areas ensure proximity to services and infrastructures, workers transferred to rural areas may also demand a larger compensating differential to balance for regional asymmetries, disparities and travel costs.

It may be interesting to scrutinize which of these effects prevail. In Portugal we identify two large urban areas: Lisboa and Porto. Further developing our analysis, in

	Worker FE		Worker and firm FE	
Variables	Coef.	t-ratio	Coef.	t-ratio
new_SESR$_0$	0.0284***	(19.81)	0.0256***	(18.18)
new_SESR$_1$	0.0346***	(18.70)	0.0318***	(17.73)
new_SESR$_2$	0.0340***	(7.46)	0.0169***	(6.86)
new_SESR$_3$	0.0329***	(9.20)	0.0308***	(8.99)
new_SESR$_4$	0.0290***	(5.39)	0.0263***	(5.11)
new_SECR$_0$	0.0409***	(8.23)	0.0427***	(8.86)
new_SECR$_1$	0.0619***	(6.93)	0.0583***	(6.80)
new_SECR$_2$	0.0614**	(2.34)	0.0313**	(2.44)
new_SECR$_3$	0.0657	(0.91)	0.0147	(0.88)
new_SECR$_4$	0.0675	(0.29)	0.0070	(0.28)
old_SESR$_0$	0.0114***	(11.12)	0.0068***	(6.59)
old_SESR$_1$	0.0202***	(16.22)	0.0157***	(12.77)
old_SESR$_2$	0.0214***	(13.67)	0.0176***	(11.52)
old_SESR$_3$	0.0249***	(12.76)	0.0212***	(11.21)
old_SESR$_4$	0.0235***	(4.22)	0.0093***	(3.02)
old_SECR$_0$	0.0381***	(15.09)	0.0312***	(12.71)
old_SECR$_1$	0.0385***	(10.57)	0.0326***	(9.28)
old_SECR$_2$	0.0411***	(8.07)	0.0366***	(7.49)
old_SECR$_3$	0.0449***	(5.22)	0.0303***	(4.72)
old_SECR$_4$	0.0493***	(4.60)	0.0442***	(4.31)
Age	0.0476***	(88.50)	0.0450***	(78.19)
Age squared	-0.0351***	(-54.77)	-0.0317***	(-48.21)
Education 4	-0.0877***	(-26.60)	-0.0551***	(-16.15)
Education 9	-0.0770***	(-26.28)	-0.0503***	(-16.74)
Education 12	-0.0642***	(-23.72)	-0.0473***	(-17.13)
Tenure months	0.0002***	(13.94)	0.0003***	(11.97)
Tenure squared	-0.0000	(-0.65)	-0.0000**	(-2.20)
Size	0.0270***	(69.48)	0.0327***	(29.51)
CESR$_0$	0.0116***	(9.04)	-0.0064***	(-3.77)
CESR$_1$	0.0221***	(16.85)	0.0007	(0.40)
CESR$_2$	0.0305***	(20.20)	0.0074***	(3.91)
CESR$_3$	0.0309***	(17.10)	0.0093***	(4.40)
CESR$_4$	0.0329***	(12.96)	0.0119***	(4.43)
CECR$_0$	-0.0113***	(-3.06)	-0.0116**	(-2.55)
CECR$_1$	0.0143***	(3.01)	0.0056	(1.02)
CECR$_2$	0.0367***	(5.91)	0.0239***	(3.51)
CECR$_3$	0.0189**	(2.41)	0.0036	(0.44)
CECR$_4$	0.0349**	(2.46)	0.0251*	(1.81)
Constant	0.4056	(33.94)		
$\overline{R}^2$			0.9093	
N	1545920		1545920	

Notes:

Dependent var.: Log of average real hourly earnings (reg. and irreg.)

Specification also includes a set of time and industry dummies;

***,**,* denotes statistically significant at 1, 5, and 10%, respectively.

Table 1.14: FE and two FE regressions for wages distinguishing moves to new and pre-existing establishments: 2000-2005

Table 1.15 we report a specification that distinguishes transfers to Lisboa or Porto, the largest urban areas, from transfers to other regions. With this estimation we observe that, for the group of workers that are transferred without changing region, those moves that are performed outside the two largest cities have slightly higher premiums. The most striking result obtained with this specification is that considering the group of workers that change region, those **workers migrating to inner areas show a considerably larger premium** when compared to workers that migrate into the districts of the two Portuguese largest cities, Lisboa and Porto. Looking at the results for the two fixed effects estimation, we see that migrations to Lisboa and Porto have premiums that range from 1,2% in the year of the change to 3% two years after the change, while for workers that move to other less central areas, the wage premiums are significantly higher and range from 6,4% in the year of the change to 8,4% four years after the change. To interpret these results we should be aware that Lisboa and Porto exert strong attraction on the rest of the country and that considerable regional disparities are still prevalent. We recall that, in Portugal, almost one half of all region changes are made to Lisboa or Porto. We have more workers willing to migrate to Lisboa or Porto than to other destinations and to encourage migration to other regions workers need to be paid a considerably higher compensating differential. We observe that, in order to move into inner and less developed regions of Portugal, workers demand an additional wage premium of around 5 p.p..

	Worker FE		Worker and firm FE	
Variables	Coef.	t-ratio	Coef.	t-ratio
PL_SESR$_0$	0.0130***	(11.67)	0.0083***	(7.42)
PL_SESR$_1$	0.0208***	(15.01)	0.0162***	(11.81)
PL_SESR$_2$	0.0210***	(11.24)	0.0164***	(9.42)
PL_SESR$_3$	0.0295***	(12.91)	0.0258***	(11.68)
PL_SESR$_4$	0.0176**	(2.06)	0.0132	(0.89)
PL_SECR$_0$	0.0174***	(5.96)	0.0121***	(4.27)
PL_SECR$_1$	0.0255***	(5.75)	0.0209***	(4.90)
PL_SECR$_2$	0.0258*	(1.83)	0.0291	(1.47)
PL_SECR$_3$	0.0291	(0.84)	0.0262	(0.51)
PL_SECR$_4$	0.0215	(0.24)	0.0203	(0.02)
Ot_SESR$_0$	0.0221***	(16.33)	0.0193***	(14.39)
Ot_SESR$_1$	0.0302***	(18.88)	0.0213***	(17.49)
Ot_SESR$_2$	0.0349***	(12.43)	0.0223***	(11.49)
Ot_SESR$_3$	0.0361***	(10.35)	0.0237***	(9.74)
Ot_SESR$_4$	0.0319***	(7.84)	0.0293***	(7.50)
Ot_SECR$_0$	0.0638***	(20.81)	0.0617***	(19.75)
Ot_SECR$_1$	0.0649***	(12.94)	0.0684***	(12.11)
Ot_SECR$_2$	0.0756***	(11.02)	0.0709***	(10.77)
Ot_SECR$_3$	0.0853***	(7.23)	0.0714***	(6.99)
Ot_SECR$_4$	0.0861***	(6.52)	0.0808***	(6.40)
Age	0.0476***	(88.44)	0.0449***	(78.09)
Age squared	-0.0351***	(54.77)	-0.0317***	(-48.21)
Education 4	-0.0879***	(-26.65)	-0.0554***	(-16.23)
Education 9	-0.0771***	(-26.34)	-0.0506***	(-16.85)
Education 12	-0.0642***	(-23.76)	-0.0475***	(-17.19)
Tenure months	0.0002***	(13.84)	0.0003***	(11.89)
Tenure squared	-0.0000	(-0.48)	-0.0000**	(-2.00)
Size	0.0270***	(69.46)	0.0328***	(29.65)
CESR$_0$	0.0118***	(9.20)	-0.0063***	(-3.73)
CESR$_1$	0.0224***	(17.13)	0.0010	(0.55)
CESR$_2$	0.0308***	(20.41)	0.0076***	(4.00)
CESR$_3$	0.0312***	(17.25)	0.0094***	(4.42)
CESR$_4$	0.0331***	(13.05)	0.0120***	(4.44)
CECR$_0$	-0.0113***	(-3.06)	-0.0120	(-2.63)
CECR$_1$	0.0144***	(3.03)	0.0055	(1.01)
CECR$_2$	0.0368***	(5.92)	0.0237***	(3.49)
CECR$_3$	0.0191**	(2.43)	0.0034	(0.42)
CECR$_4$	0.0350**	(2.46)	0.0249*	(1.79)
Constant	0.4071***	(34.08)		
$\overline{R}^2$			0.9093	
N	1545920		1545920	

Notes:

Dependent variable: Log of average real hourly earnings (reg and irreg)

Specification also includes a set of time and industry dummies;

***,**,* denotes statistically significant at 1, 5, and 10%, respectively.

Table 1.15: Two FE regression for wages distinguishing moves to Lisboa or Porto

1.5 Conclusion

In this paper we look at worker transitions within and across employers and within and across regions. The main contribution of our work is the ability to reconcile the spatial and the firm dimensions of mobility revealing the spatial dimension of internal labor markets. Focusing on multi-plant firms where intra-firm mobility may involve a relocation of the workplace, we develop on the relatively low explored interaction between internal labor markets and migration theories.

We use a MNL model to analyze the individual determinants of each type of move. We conclude that same employer movers are mainly low tenured men that have not been promoted or received wage increases in the past few years and for whom the transfer may be seen as an investment to improve their career and wage perspectives inside the firm. We observed that more than 20% of these same employer transfers were related to a promotion event in the year of the move.

We also found that these same employer movers may be very high skilled or very low skilled workers and that, for the former, same employer transfers may be a less costly and less risky way to migrate. We also looked at the wage premium associated with the different types of moves trying to assess whether they differ and why. The longitudinal dimension of our matched employer-employee dataset allow us track individuals and to observe lagged premiums for mobility. Comparing wage premiums for the group of same employer transfers involving region changes with the group of same employer movers that were locally transferred, we suggest a new approach to estimate the migration premium. We conclude that there exists a larger reward when employees have to incur in additional costs such as those involved in migration. However, we also find that worker and firm specific characteristics are extremely relevant for this decision and that taking into account individual and firm unobserved heterogeneity considerably decreases the value of the premium. Our results suggest that wage premiums are, at least, 2 p.p. higher when the internally transferred worker has to migrate.

We conclude that same employer transfers prevail in large firms and the results seem to suggest that mobility across establishments within the same employer is a channel to

improve wage growth opportunities. This is consistent with our initial hypothesis that in multi-plant firms there exists a global internal labor market which is built on the firm as a whole. We focused on the relation between same employer relocations and internal labor markets, however, a transfer to another establishment may be driven by several different reasons and workers may have to move to regions with different amenities. Our results suggest that for migrations to less central regions the wage premium paid may be 5 p.p. higher than for migration to large urban areas. We also found that premiums for transfers to new establishments are higher.

We conclude that the relatively low studied group of internally relocated individuals deserves further research. We found that among the group of movers, migrations without changing employer are extremely important as they account for more than three fourth of all migrations. However, these moves may be very heterogeneous and this heterogeneity may mask the wage premium because we may be just capturing an average effect. These transfers may also affect the worker's career perspectives and this impact on careers deserves being explored. We believe that future research for this group of internally transferred workers should explore deeper into this heterogeneity.

Appendix A

Hierarchical levels defined by law (Decreto-Lei n.^{o} 121/78, de 2 Junho):

Level	Description
Level 1	Top executives (top management)
Level 2	Intermediary executives (middle management)
Level 3	Supervisors, team leaders, foremen
Level 4	High-skilled professionals
Level 5	Skilled professionals
Level 6	Semi-skilled professionals
Level 7	Non-skilled professionals
Level 8	Apprentices, interns, trainees

Appendix B

CAE - Portuguese Classification of Economic Activities (equivalent to SIC codes):

CAE	Description
CAE A	Agriculture, animal husbandry, hunting and forestry
CAE B	Fishing
CAE C	Mining and quarrying
CAE D	Manufacturing
CAE E	Electricity, gas and water supply
CAE F	Construction
CAE G	Wholesale and retail trade
CAE H	Hotels and restaurants
CAE I	Transport, storage and communication
CAE J	Financial activities
CAE K	Real estate, renting and business activities
CAE L	Public administration, community, social and personal services
CAE M	Education
CAE N	Health and social work
CAE O	Other community, social and personal service activities
CAE P	Families with household employee
CAE Q	International institutions and other extra-territorial organizations

Note: In our final dataset there are no observations for cae P.

Appendix C

Variables definition:

Variable	Description
Tenure36	Tenure less than 36 months
Tenure96	Tenure between 36 and 96 months
Age	Worker's age (in years)
Age squar	Square of worker's age (divided by 100)
Female	Gender dummy equal 1 for female
Educ4	Dummy for 4 or less years of schooling
Educ9	Dummy for 6 or 9 years of schooling
Educ12	Dummy for 12 years of schooling
Promotion [-3,0]	Dummy equal 1 if the worker was promoted in the previous 3 years
$\ln W$	Real hourly wage (in log)
Size	Firm size (log number of workers)
Tenure months	Tenure in months
Tenure months squared	Squared tenure in months (divided by100)
SESR_X	Dummy equal 1 X years after changing estab. in the same region
SECR_X	Dummy equal 1 X years after changing estab. with region change
CECR_X	Dummy equal 1 X years after changing employer in the same region
CECR_X	Dummy equal 1 X years after changing employer with region change
PL_SESR_X	Dummy equal 1 X years after changing estab. in the same region (Lisboa or Porto)
PL_SECR_X	Dummy equal 1 X years after changing estab. and region (to Lisboa or Porto)
Ot_SESR_X	Dummy equal 1 X years after changing estab. in the same region (other regions)
Ot_SECR_X	Dummy equal 1 X years after changing estab. and region (to other regions)
New_SESR_X	Dummy equal 1 X years after changing to new estab./same region
New_SECR_X	Dummy equal 1 X years after changing to new estab./other region
Old_SESR_X	Dummy equal 1 X years after changing to old estab./same region
Old_SECR_X	Dummy equal 1 X years after changing to old estab./other region
Est.Conc.	Concentration of establishments of the firm in the region
Nationality	Dummy equal 1 for foreign workers

Note: When the variable is added the suffix _p this means that it concerns to the previous year.

Appendix D

As stated in Train (2003), mixed logit probabilities are the integrals of standard logit probabilities over a density of parameters. Stated more explicitly, a mixed logit model is any model whose choice probabilities can be expressed in the form:

$$P_{ni} = \int L_{ni}(\beta) f(\beta) d\beta,$$

where $L_{ni}(\beta)$ is the logit probability evaluated at parameters β.

$$L_{ni}(\beta) = \frac{e^{V_{ni}(\beta)}}{\sum_{j=1}^{J} e^{V_{nj}(\beta)}}$$

and $f(\beta)$ is a density function. $V_{ni}(\beta)$ is the observed portion of the utility, which depends on the parameters β. If utility is linear in β, then $V_{ni}(\beta) = \beta^{'} x_{ni}$. In this case, the mixed logit probability takes its usual form:

$$P_{ni} = \int \left(\frac{e^{\beta^{'} x_{ni}}}{\sum_{j} e^{\beta^{'} x_{nj}}} \right) f(\beta) d\beta.$$

The mixed logit probability is a weighted average of the logit formula evaluated at different values of β, with the weights given by the density $f(\beta)$.

Standard logit is a special case where the mixing distribution $f(\beta)$ is degenerate at fixed parameters b: $f(\beta) = 1$ for $\beta = b$ and 0 for $\beta \neq b$. The choice probability then becomes the simple logit formula:

$$P_{ni} = \frac{e^{b^{'} x_{ni}}}{\sum_{j} e^{b^{'} x_{nj}}}$$

The mixed logit probability can be derived from utility-maximizing behavior in several ways. The most widely used in recent applications is based on random coefficients. The decision maker faces a choice among J alternatives. The utility of person n from alternative j is specified as:

$$U_{nj} = \beta_{n}^{'} x_{nj} + \varepsilon_{nj}$$

where x_{nj} are observed variables that relate to the alternative or decision maker, β_n is a vector of coefficients of these variables for person n, and ε_{nj} is a random term that is IID extreme value. The coefficients vary over decision makers in the population

with density $f(\beta)$. This density is a function of parameters that represent, for example, the mean and covariance of the $\beta's$ in the population. This specification is the same as for standard logit except that β varies over decision makers rather than being fixed. The researcher specifies a distribution for the coefficients and estimates the parameters of that distribution. In most applications, $f(\beta)$ is specified to be normal or lognormal.

We used the Stata module *mixlogit* (Train 2003; Hole 2007) to perform the estimation. We specified the choice-specific constants as varying across individuals and as correlated across choices to account for unobserved dependencies among choices.

Due to time and computational reasons, the estimation results we report bellow only considers three types of mobility (instead of five, as in the multinomial logit model) not distinguishing between local and non-local changes:

1. The worker changes establishment within the same employer (identified as SE);
2. The worker changes employer;
3. The worker remains in the same establishment of the same employer (used as comparison).

We also used only regressors for age, gender and education and the years 2000 to 2003 of the panel. The results we obtained appear to validate the results obtained by the multinomial logit model. Table 1.16 reports results for this mixed logit regression.

Variables	Coef.	t-ratio
Age_SE	0,0105	43,14
Age_Change_employer	-0,0333	-167,37
Female_SE	-0,1714	-34,40
Female_Change_employer	-0,1626	-43,06
Education 4_SE	0,8455	97,68
Education 4_Change_employer	-0,4213	-59,12
Education 9_SE	-0,6428	-77,50
Education 9_Change_employer	-0,3239	-47,95
Education 12_SE	-0,1334	-14,99
Education 12_Change_employer	-0,2596	-34,53
SE	-2,2941	-185,30
Change_employer	-0,2715	-28,17
/111	0,0264	0,28
/121	0,0094	0,21
/122	0,0400	1,05

Table 1.16: Mixed Logit Model

NOTE: The final three coefficients are the elements of the lower-triangular matrix L, that is the Cholesky factorization of the covariance matrix V. The covariance matrix for the random coefficients V is given by $V = LL^{'}$.

Appendix E

	OLS		Worker FE		Worker and firm FE	
Variables	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio
$SESR_0$	-0.0069***	(-4.68)	0.0166***	(17.53)	0.0100***	(13.35)
$SESR_1$	0.0021	(1.22)	0.0258***	(22.34)	0.0188***	(17.53)
$SESR_2$	0.0007	(0.32)	0.0266***	(15.49)	0.0253***	(13.11)
$SESR_3$	0.0071**	(2.40)	0.0292***	(15.79)	0.0204***	(11.92)
$SESR_4$	-0.0246***	(-5.04)	0.0174***	(5.96)	0.012***	(5.44)
$SECR_0$	0.0635***	(20.12)	0.0258***	(14.22)	0.0171***	(14.40)
$SECR_1$	0.0642***	(15.32)	0.0267***	(10.57)	0.0244***	(8.92)
$SECR_2$	0.0649***	(10.84)	0.0268***	(7.89)	0.0259***	(7.98)
$SECR_3$	0.0675***	(6.17)	0.0299***	(4.76)	0.0287***	(4.21)
$SECR_4$	0.0811***	(5.28)	0.0378***	(5.24)	0.0299***	(3.98)
Age	0.0471***	(104.15)	0.0475***	(88.31)	0.0470***	(80.10)
Age squared	-0.0419***	(-76.92)	-0.0351***	(-54.68)	-0.0317***	(-49.27)
Female	-0.2808***	(-217.27)				
Education 4	-1.1639***	(-450.78)	-0.0877***	(-26.61)	-0.0543***	(-17.32)
Education 9	-0.8694***	(-361.01)	-0.0770***	(-26.29)	-0.0601***	(-17.79)
Education 12	-0.5748***	(-226.15)	-0.0642***	(-23.73)	-0.0484***	(-16.55)
Tenure months	0.0010***	(47.30)	0.0002***	(13.99)	0.0002**	(11.75)
Tenure squared	-0.0001***	(-9.24)	-0.0000	(-0.59)	-0.0000	(-0.98)
Size	0.0356***	(110.46)	0.0271***	(69.48)	0.0312***	(21.24)
$CESR_0$	0.0572***	(29.39)	0.0119***	(9.12)	-0.0012***	(-5.28)
$CESR_1$	0.0589***	(31.55)	0.0219***	(16.47)	0.0010	(0.89)
$CESR_2$	0.0621***	(28.65)	0.0312***	(20.32)	0.0056***	(8.41)
$CESR_3$	0.0586***	(21.36)	0.0318***	(17.27)	0.0098***	(4.85)
$CESR_4$	0.0504***	(13.27)	0.0338***	(13.10)	0.0101***	(7.27)
$CECR_0$	0.0478***	(11.64)	0.0029	(1.08)	-0.0148	(-0.53)
$CECR_1$	0.0761***	(13.53)	0.0262***	(7.92)	0.0422	(1.00)
$CECR_2$	0.0892***	(12.07)	0.0310***	(7.45)	0.0124***	(5.55)
$CECR_3$	0.0823***	(8.77)	0.0207***	(4.05)	0.0188	(0.22)
$CECR_4$	0.0896***	(4.98)	0.0258***	(2.86)	0.0201*	(1.78)
Constant	1.1794***	(131.45)	0.4078***	(34.13)		
$\overline{R}^2$	0.5646				0.9011	
N	1545920		1545920		1545920	

Notes: Dependent variable: Log of average real hourly earnings
Specification also includes a set of time and industry dummies;
Cluster-robust t stat. in parentheses for OLS model: clust (id_worker)
***, **, * denotes statistically significant at 1, 5, and 10%, respectively

Table 1.17: Wage regressions using the first definition of region change: 2000-2005

Appendix F

	OLS		Worker FE		Worker and firm FE	
Variables	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio
$SESR_0$	-0.0072***	(-5.28)	0.0163***	(23.02)	0.0146***	(20.99)
$SESR_1$	-0.0055***	(-3.52)	0.0189***	(22.06)	0.0170***	(20.63)
$SESR_2$	-0.0108***	(-5.42)	0.0197***	(16.34)	0.0165***	(15.99)
$SESR_3$	-0.0086***	(-3.28)	0.0202***	(14.73)	0.0196***	(15.07)
$SESR_4$	-0.0216***	(-4.87)	0.0198***	(9.13)	0.0184***	(9.02)
$SECR_0$	0.0635***	(15.22)	0.0311***	(17.16)	0.0294***	(17.18)
$SECR_1$	0.1125***	(18.10)	0.0340***	(12.91)	0.0318***	(12.86)
$SECR_2$	0.1429***	(15.93)	0.0379***	(10.32)	0.0367***	(10.66)
$SECR_3$	0.1472***	(11.80)	0.0267***	(5.56)	0.0258***	(5.72)
$SECR_4$	0.1481***	(7.79)	0.0259***	(3.41)	0.0253***	(3.55)
Age	0.0468***	(108.32)	0.0428***	(104.09)	0.0399***	(92.55)
Age squared	-0.0413***	(-79.35)	-0.0325***	(-66.30)	-0.0288***	(-58.54)
Female	-0.2492***	(-199.67)				
Education 4	-1.1848***	(-471.10)	-0.0985***	(-39.02)	-0.0616***	(-24.62)
Education 9	-0.8870***	(-376.61)	-0.0867***	(-38.68)	-0.0568***	(-25.65)
Education 12	-0.5851***	(-234.91)	-0.0706***	(-34.13)	-0.0512***	(-25.15)
Tenure months	0.0011***	(55.07)	0.0004***	(34.61)	0.0005***	(30.62)
Tenure squared	-0.0001***	(-14.00)	-0.0001***	(-18.81)	-0.0001***	(-20.78)
Size	0.0361***	(117.17)	0.0226***	(75.74)	0.0433***	(53.68)
$CESR_0$	0.0537***	(30.04)	0.0170***	(20.18)	0.0097***	(7.80)
$CESR_1$	0.0713***	(41.43)	0.0356***	(35.58)	0.0233***	(18.22)
$CESR_2$	0.0671***	(33.51)	0.0325***	(28.18)	0.0186***	(13.36)
$CESR_3$	0.0481***	(19.30)	0.0167***	(12.09)	0.0057***	(3.63)
$CESR_4$	0.0383***	(10.92)	0.0160***	(8.25)	0.0064***	(3.22)
$CECR_0$	0.0408***	(7.27)	0.0015	(330.52)	0.0084***	(2.72)
$CECR_1$	0.0826***	(10.43)	0.0303***	(8.33)	0.0243***	(6.64)
$CECR_2$	0.1061***	(9.84)	0.0316***	(6.64)	0.0225***	(4.82)
$CECR_3$	0.1249***	(8.61)	0.0268**	(4.46)	0.0147**	(2.55)
$CECR_4$	0.1299***	(4.87)	0.0175	(1.61)	0.0121	(1.18)
Constant	1.1135***	(130.03)	0.5101***	(55.79)		
$\overline{R}^2$	0.6016				0.9459	
N	1545920		1545920		1545920	

Notes: Dependent variable: Log of average real hourly earnings (regular and irregular);
Specification also includes a set of time and industry dummies;
Cluster-robust t statistics in parentheses for the OLS model: clustered (id_worker).
***, **, * denotes statistically significant at 1, 5, and 10%, respectively.

Table 1.18: Wage regressions using only regular earnings: 2000-2005

Appendix G

	Worker and establishment FE	
Variables	Coef.	t-ratio
$SESR_0$	0.0088***	(6.47)
$SESR_1$	0.0151***	(10.03)
$SESR_2$	0.0172***	(9.96)
$SESR_3$	0.0234***	(11.60)
$SESR_4$	0.0154***	(5.36)
$SECR_0$	0.0188***	(6.69)
$SECR_1$	0.0204***	(5.57)
$SECR_2$	0.0232***	(4.86)
$SECR_3$	0.0254**	(2.53)
$SECR_4$	0.0286***	(3.05)
Age	0.0426***	(71.08)
Age squared	-0.0291***	(-43.41)
Female		
Education 4	-0.0499***	(-14.76)
Education 9	-0.0464***	(-15.53)
Education 12	-0.0458***	(-16.67)
Tenure months	0.0002***	(11.00)
Tenure squared	-0.0001***	(-3.88)
Size	0.0329***	(28.28)
$CESR_0$	-0.0042**	(-2.05)
$CESR_1$	0.0053**	(2.52)
$CESR_2$	0.0132***	(5.96)
$CESR_3$	0.0175***	(7.32)
$CESR_4$	0.0213***	(7.34)
$CECR_0$	-0.0170***	(-3.65)
$CECR_1$	0.0002	(0.03)
$CECR_2$	0.0192***	(2.97)
$CECR_3$	0.0009	(0.11)
$CECR_4$	0.0235*	(1.74)
Constant		
$\overline{R}^2$	0.9142	
N	1545920	

Notes: Dependent variable: Log of average real hourly earnings;
Specification also includes a set of time and industry dummies;
***,**,* denote statistically significant at 1, 5, and 10%, respectively.

Table 1.19: Wage regression with worker and establishment fixed effects: 2000-2005

References

[1] Amemiya, T. (1981), "Qualitative Response Models: A Survey", Journal of Economic Literature, Vol 19, No.4, pp. 1483-1536.

[2] Antel, J. J. (1986), "Human Capital Investment Specialization and the Wage Effects of Voluntary Labor Mobility", The Review of Economics and Statistics, Vol. 68, No. 3, pp. 477-483.

[3] Ashenfelter, O. (1978), "Estimating the Effect of Training Programs on Earnings." Review of Economics and Statistics, Vol. 60, No.1, pp. 47-57.

[4] Baker, G., Gibbs, M. and Holmstrom, B, (1994a), "The Internal Economics of the Firm: Evidence from Personnel Data", The Quarterly Journal of Economics, Vol. 109, No. 4, pp. 881-919.

[5] Baker, G., Gibbs, M. and Holmstrom, B, (1994b), "The Wage Policy of a Firm", The Quarterly Journal of Economics, Vol. 109, No. 4, pp. 921-955.

[6] Bartel, A. P. (1979), "The Migration Decision: What Role Does Job Mobility Play?", American Economic Review, Vol. 69, No 5, pp. 775-786.

[7] Becker, G. S. (1962), "Investment in Human Capital: A Theoretical Analysis", The Journal of Political Economy, Vol. 70, No. 5, pp. 9-49.

[8] Blundell, R. and MaCurdy, T. (1999), "Labor Supply: A Review of Alternative Approaches." In Handbook of Labor Economics, eds. Orley Ashenfelter, and David Card, Vol 3, pp. 1559-1695, Amsterdam: Elsevier Science.

[9] Blundell, R. and Dias, M. C. (2009), "Alternative Approaches to Evaluation in Empirical Microeconomics", Journal of Human Resources, Vol. 44, No. 3, pp. 565-640

[10] Borjas, G. (1987), "Self-selection and the Earnings of Immigrants", American Economic Association, Vol. 77, No. 4, pp. 531-53.

[11] Carneiro, A. and Portugal, P. (2006), "Earnings Losses of Displaced Workers: Evidence from a Matched Employer-Employee Data Set", IZA Discussion Paper No. 2289.

[12] Cheng, S. and Long, S. (2007), "Testing for IIA in the Multinomial Logit Model", Sociological Methods Research , Vol. 35, No. 4, pp. 583-600.

[13] Deb, P. and Trivedi, P. (2006a), "Maximum simulated likelihood estimation of a negative binomial regression model with multinomial endogenous treatment", Stata Journal, Vol. 6, pp. 246-255.

[14] Deb, P. and Trivedi, P. (2006b), "Specification and Simulated Likelihood Estimation of a Non-Normal Treatment-Outcome Model With Selection: Application to Health Care Utilization", Econometrics Journal, Vol. 9, No. 2, pp. 307-331

[15] Doeringer, P. B. and Piore, M J. (1971), "Internal Labor Markets and Manpower Analysis", Massachusetts, D.C. Heath and Company.

[16] Dow, J. K. and Endersby, J. W. (2004), "Multinomial Probit and Multinomial Logit: A Comparison of Choice Models for Voting Research", Electoral Studies, Vol. 23, No.1, pp. 107-122.

[17] Farber, S. C. (1983), "Post-Migration Earnings Profiles: An Application of Human Capital and Job Search Models", Southern Economic Journal, Vol. 49, No. 3, pp. 693-705.

[18] Farber, H. S. (1999), Mobility and Stability: The Dynamics of Job Change in Labor Markets, Princeton University in: Handbook of Labor Economics Vol. 3B eds. Orley C.. Ashenfelter and David Card, Amsterdam: North Holland, pp. 2439-2484.

[19] Fry, T. R. L. and Harris., M. N. (1996), "A Monte Carlo Study of Tests for the Independence of Irrelevant Alternatives Property", Transportation Research Part B: Methodological, Vol.30, pp.19-30.

[20] Fry, T. R. L. and Harris, M. N., (1998), "Testing for Independence of Irrelevant Alternatives: Some Empirical Results", Sociological Methods and Research, Vol. 26, pp. 401-423.

[21] Guimarães, P. and Portugal, P. (2010), "A Simple Feasible Procedure to Fit Models with High-dimensional Fixed Effects", The Stata Journal, Vol. 10, No. 4, pp. 628-649.

[22] Ham, J. and LaLonde, R. (1996), "The Effect of Sample Selection and Initial Conditions in Duration Models: Evidence from Experimental Data on Training", Econometrica, Vol. 64, No. 1, pp 175-205.

[23] Hausman, J. and McFadden, D. (1984), "Specification Tests for the Multinomial Logit Model", Econometrica, Vol. 52, No. 5, pp. 1219-1240.

[24] Heckman, J. (1974), "Shadow Prices, Market Wages, and Labor Supply", Econometrica, Vol. 42, No. 4, pp. 679-94.

[25] Heckman, J., and Smith, J. (1999), "The Pre-Program Earnings Dip and the Determinants of Participation in a Social Program: Implications for Simple Program Evaluation Strategies", Economic Journal, Vol. 109, No. 457,pp. 313-348.

[26] Hegedus, D. M., & Hartman, A. (1992), "Patterns and Outcomes of Individual Career Mobility for Wisconsin School Administrators", Journal of Vocational Behavior, Vol. 40, pp. 82–94.

[27] Hole, A. R. (2007), "Fitting Mixed Logit Models by Using Maximum Simulated Likelihood", Stata Journal, Vol. 7, No.3, pp. 388-401.

[28] Hunt, J. (2004), "Are Migrants More Skilled than Non-migrants? Repeat, Return, and same employer Migrants", Canadian Journal of Economics, Vol. 37, No. 4, pp. 830-849.

[29] Jepsen, C. (2008), "Multinomial Probit Estimates of College Completion at Two-Year and Four-Year Schools", Economic Letters, Vol. 98, No. 2, pp. 155-160.

[30] Jovanovic, B. (1979), "Job Matching and the Theory of Turnover", The Journal of Political Economy, Vol. 87, No. 5, pp. 972-990.

[31] Krieg, R. G. and Bohara, A. K. (1999), "A Simultaneous Probit Model of Earnings, Migration, Job Change With Wage Heterogeneity", The Annals of Regional Science, Vol. 33, No. 4, pp. 453-467.

[32] Kropko, J. (2008), "Choosing Between Multinomial Logit and Multinomial Probit Models for Analysis of Unordered Choice Data", Paper Presented at the Annual Meeting of the MPSA Annual National Conference, Palmer House Hotel, Hilton, Chicago.

[33] Lazear, E. P. (1979), "Why Is There Mandatory Retirement?", The Journal of Political Economy, Vol. 87, No. 6, pp. 1261-1284.

[34] Lazear, E. P. (1999), "Personnel Economics: Past Lessons and Future Directions", Presidential Address to the Society of Labor Economists, San Francisco, May 1, 1998", Journal of Labor Economics, Vol. 17, No. 2, pp. 199-236.

[35] Lazear, E. P. and Oyer, P. (2004), "Internal and External Labor Markets: A Personnel Economics Approach", Labor Economics, Vol. 11, No. 5, pp. 527-554.

[36] Lee, L. (1978), "Unionism and Wage Rates: A Simultaneous Equations Model with Qualitative and Limited Dependent Variables", International Economic Review, Vol.19, No. 2, pp. 415 433.

[37] Lima, F. (2004) "How much Mobility? Careers, Promotions, and Wages," Working Paper 3, CEG-IST, Instituto Superior Técnico.

[38] Lima, F. and Centeno, M. J. (2003), "The Careers of Top Managers and Firm Openness: Internal versus External Labor Markets", Banco de Portugal Economic Research Working Paper No. WP 15-03.

[39] Lima, F. and Pereira, P. T. (2003), "Careers and Wage Growth Within Large Firms: Evidence from a Matched Employer-Employee Data Set", International Journal of Manpower, Vol. 24, No. 7, pp. 812-835.

[40] Long, J. S. Freese, J. (2001), "Regression Models for Categorical Dependent Variables Using Stata", Stata Press.

[41] Maddala, G. (1978), "Selectivity Problems in Longitudinal Data", Annales de l'inséé, No. 30/31, The Econometrics of Panel Data pp.423-450.

[42] McCue, K. (1996), "Promotions and Wage Growth", Journal of Labor Economics, Vol. 14, No. 2, pp. 175-209.

[43] McFadden, D. L. (1974), "Conditional Logit Analysis of Qualitative Choice Analysis", Frontiers in Econometrics, ed. P. Zarembka, New York: Academic Press, pp. 105–142.

[44] McFadden, D. and Train, K. (2000), "Mixed MNL Models for Discrete Response", Journal of Applied Econometrics, Vol. 15, No.5, pp. 447-470.

[45] Nakosteen, R. and Zimmer, M. (1980),"Migration and Income: The Question of Self Selection", Southern Economic Journal, Vol. 46, No. 3.

[46] Ostroff, C., and Clark, M. A. (2001), "Maintaining an Internal Market: Antecedents of Willingness to Move, Journal of Vocational Behavior, Vol.3, pp. 425-453.

[47] Pergamit, M. R. and Veum, J. R. (1999), "What is a Promotion?" Industrial and Labor Relations Review, Vol. 52, No. 4, pp. 581-601.

[48] Schaeffer, P. V. (1985), "Human Capital Accumulation and Job Mobility", Journal of Regional Science, Vol. 25, No. 1, pp. 103-114.

[49] Schmidt, P. and Strauss, R.P. (1975), "The Prediction of Occupation Using Multiple Logit Models", International Economic Review, Vol. 16, No. 2, pp. 471-486.

[50] Shaw, K. L. (1991), "The Influence of Human Capital Investment on Migration and Industry Change", Journal of Regional Science, Vol. 31, No. 4, pp. 397–416.

[51] Shi, X. and Heerink, N. (2007), "Choices Between Different Off-Farm Employment Sub-Categories: An Empirical Analysis for Jiangxi Province, China", China Economic Review, Vol. 18, No. 4, pp. 438-455.

[52] Silva, A. D. and Klaauw, B. van der (2006), "Wage Dynamics and Promotions Inside and Between Firms", IZA Discussion Papers No. 2351, Institute for the Study of Labor

[53] Small, K. and Hsiao C. (1985), "Multinomial Logit Specification Tests", International Economic Review, Vol. 26, No. 3, pp. 619-627.

[54] Train, K. (2003), "Discrete Choice Methods with Simulation", New York: Cambridge University Press.

[55] Turban, D. B., Campion, J. E., & Eyring, A. R. (1992), "Factors Relating to Relocation Decisions of Research and Development Employees", Journal of Vocational Behavior, Vol. 41, pp. 183–199.

[56] Waldman, M. (1984), "Job Assignments, Signaling and Efficiency", Rand Journal of Economics, Vol. 15, pp. 255-267.

[57] Willis, R. and Rosen, S. (1979), "Education and self-selection", Journal of Political Economy, Vol. 87, No. 5, pp. S7–S36.

[58] Yankow, J. J. (2003), "Migration, Job Change and Wage Growth: A New Perspective on the Pecuniary Return to Geographic Mobility", Journal of Regional Science, Vol. 43, No. 3, pp. 483-516.

2 Internal Hirings and the Survival of New Establishments

* *We are grateful to Gabinete de Estratégia e Planeamento (GEP) for providing the data for this research.*

2.1 Introduction

The determinants of new plants survival has been the subject of extensive previous research. An important piece of this literature has examined the survival and hazard rates of new plants that are affiliated with pre-established firms. It has been found that the factors affecting the survival of new entrants are different depending on wether the entry is attempted by a new or by an already established firm (Dunee *et al*, 1989; Audretsch and Mahmood, 1994; Mata *et al.*, 1995; Mitchell, 1994). Being owned by a pre-established firm may give the new plant several types of advantages. These entrants may have better access to resources and financial markets since they are affiliated with a pre-existing firm that has built a reputation (Brito and Mello, 1995), and being affiliated to a group can also be an important source of economies of scale (Ingram, 1996). The parent firm may also supply expertise in management and operational knowledge which can help the entrant in the development of a successful entry strategy that will positively affect the new unit's performance. Indeed, the development of firm-specific learning effects contribute to reductions in production cost and may positively affect survival (Darr, Argote, and Epple,1995). Looking at the importance of knowledge transfer, Ingram and Baum (1997) analyzed the importance of chain affiliation in the Manhattan hotel industry, while Darr *et al.* (1995) studied organizational learning and the transfer of knowledge among pizza stores, and Greve (1996) examined radio broadcasters which shared a common corporate owner. These studies highlight the importance of knowledge transfer within organizations and conclude that being part of a chain may improve the chances of survival of individual businesses.

While some works take as granted that belonging to a group brings increased and easier access to knowledge, one central issue relates to the channels or strategies by which the transfer of knowledge occurs. Several mechanisms were proposed in the literature. Some argue that this transfer results from regular communication that can facilitate the diffusion of innovation and the transfer of technology (Tushman, 1977; Ghoshal and Bartlett, 1988; and Rothwell, 1978), while others emphasize the importance of personal acquaintances and personal ties in the transfer of learning (Huberman, 1983; Martilla, 1971; Liebenz, 1982 and Tushman, 1977). Dutton and Starbuck (1978)

highlighted the importance of regular meetings as a channel to transfer learning since more opportunities for communication and competence sharing among corporate units would result in self-imitation within the corporation (Greve, 1996) and learning would occur in the form of interorganizational imitative behavior (Ingram and Baum,1997).

Our work extends the study of the channels by which the parent firm (or other units in the same group) can transfer knowledge to the newly opened branch as the ties and connections between several units of the same firm go beyond regular communications. This chapter contributes to this literature by focusing on a specific mechanism of within-firm transfer of knowledge that has been neglected so far - the transfer of workers from pre-existing to newly-created establishments of the same firm. The novelty in our work is to focus on the role that intra-firm mobility plays as a channel for supplying and transferring knowledge and expertise to the new unit and to analyze the impact of this strategy on the new unit's survival. As knowledge and firm-specific capital is mainly embodied, analyzing the role of intra-firm transfers allows us to asses the importance of knowledge transfer on the new unit's survival. These internal movements not only strengthen personal ties and increase the probability that personal acquaintances exist but also embody a **direct channel for knowledge transfer** that has not been addressed in previous literature.

Intra-firm mobility is an essential question in personnel economics. When a pre-established firm considers the decision to open a new establishment, it has to make choices on how to fill the vacancies created in the new plant. The firm has two options, it can hire in the external labor market or it can opt to fill the vacancy through internal reallocation, transferring an employee from another unit within the same organization. Internal hires are a central channel to transfer firm-specific human capital and expertise and leads us to the concept of internal labor markets (ILM) and to the seminal work of Doeringer and Piore (1971). In essence, the decision on how to fill the jobs in the newly created establishment is akin to the internal promotion decision which is central to the ILM literature. Although ILM literature typically focuses on single-establishment firms (Baker *et al.*, 1994a, 1994b) the fact is that, in multi-plant firms, the existence of an internal labor market will not be restricted to one particular establishment but will

be based on the firm as a whole, necessarily including all the units belonging to that parent firm.[27]

Several factors may explain the existence of internal hiring and the creation of an internal labor market. ILM may be a response to matching effects (Jovanovic, 1979) or may result from the firm's incentive structure (Lazear, 1979). Moreover, risk-averse employers may prefer to hire from within as internal employees' ability can be observed with less noise (Greenwald, 1979). Intra-firm mobility is also a response to the existence of specific human capital (Becker, 1962). For newly created establishments this argument is particularly relevant as the internally transferred employees may be responsible for expertise transfer that can be crucial for the new unit's survival. A very well known paper from Gibbons and Waldman (1999) develops on the role of learning and human capital acquisition as possible explanations for the observed paths of careers inside the organization. Once a worker acquires firm-specific human capital, his value inside the firm deviates from that at other firms. The longer the tenure of the worker, the more specific human capital accumulated and the more costly it would be for the firm to find an external candidate who could outperform an existing worker.

Considering the extension of the internal labor markets' theory into a multi-plant framework we will be interested in analyzing the existence of "ports of entry". In the newly created establishment some jobs will be filled with workers working at other establishments in the same firm whereas other jobs will be filled with individuals hired outside the firm. The latter are, in the ILM terminology, the true ports-of-entry to the establishment, and again, according to the ILM literature are those jobs within the establishment that require less firm-specific human capital. These are, presumably, lower-rank jobs. Higher-rank jobs, on the contrary, require more firm-specific human capital which can only be acquired by working in the firm. Hence, these jobs will be filled from within, i.e., through internal transfers of workers from pre-existing establishments to the new one. In this chapter, our first objective is to characterize the recruitment policy of new establishments affiliated with multi-establishment firms, analyzing the importance of internal and external hires at different hierarchical levels. Our hypothesis

[27] The hypothesis that, in multi-establishment firms, internal labor markets are based on the firm as a whole was thoroughly discussed in the first chapter of this dissertation.

is that, at the new unit, internal transfers will increase at higher hierarchical levels (Lazear and Oyer, 2004).

The second objective of this paper is to asses if internal hires, specially at higher levels affect the survival of new establishments. This is an indirect way to test if intra-firm mobility is motivated by the need to transfer firm specific knowledge to the new unit. If this is the case we will observe a positive effect of internal hiring on survival. Our main hypothesis is that internal hiring affects survival because it works as a direct channel for knowledge transfer. We believe this channel can work in two ways: first, a higher proportion of internally hired employees can increase personal contacts and acquaintances between the new plant and the other units of the group improving and smoothing communication. Second, a higher proportion of internal hiring at the top of the hierarchy will be particularly important as the transfer of knowledge and firm-specific human capital is predominantly carried out by workers at higher-rank jobs. Indeed, if strategic decisions that affect the new plants survival are defined it's probable that this occurs at higher hierarchical levels. On this premise, Lima and Martins (2006) assess the impact of external recruitment of top managers on firm performance and several studies on managerial succession address the impact of internal versus external hiring of CEO (Lauterbach *et al.*, 1999, Furtado and Karan, 1994) and of CEO turnover (Murphy, 1999; Huson *et al.*, 2004) on the firm's performance. Chan (1996) offers us another argument for believing that internal hiring at top levels is particularly relevant for the survival of the new plant. Chan concludes that, to promote effort, employers give an handicap to internal employees and only when an external candidate shows a significant margin of superiority will existing employees be passed over. However, the magnitude of the handicap differs at different levels of an organization, diminishing as one moves up the hierarchy. At more senior levels, the number of potential competitors tends to be smaller, so the handicap should also be smaller and can even be negative at the top of the pyramid. While lower-rank internal contestants enjoy a positive handicap, which prevents them from giving up, those of high abilities may instead find the contest rigged against them to prevent an effortless win. This means that internal employees hired to higher-rank jobs are more likely to have won on the basis of their ability rather

than as a result of the handicap given by the employer. Indeed, we will conclude that the proportion of internal hires at high level jobs is particularly crucial for the new plant's survival.

The paper will be organized as follows: in section 2.2 we detail our sample design and characterize the data; sections 2.3 and 2.4 present the models and discuss the results and section 2.5 concludes.

2.2 The data

2.2.1 Data description and sample design

The dataset in this study was constructed using *Quadros de Pessoal (QP),* a matched employer-employee administrative record. *QP* is an annual mandatory employment questionnaire collected by the Portuguese Ministry of Labor that all firms with wage earners are legally obliged to fill in. The data include establishment-specific details (employment, location, industry), information on the firm with which the establishment is affiliated (location, industry, number of establishments, employment, sales, ownership, legal framework), and workforce characteristics (gender, age, education, occupation, tenure, earnings, hours of work). Data are collected once per year in October.

Firms, establishments and workers entering the database are assigned a unique identifying number and the Ministry implements several checks to ensure that a unit that has previously reported to the database is not assigned a different identification number. The dataset has a longitudinal dimension, which allows us to track firms, establishments and workers over time and to match workers with their firms and establishments.

In this chapter we use the 2003 to 2008 waves of QP. The data corresponding to years 2003 to 2005 are used to identify the creation of new establishments. Each new establishment is followed for three years after its creation, so units created in 2003 are followed until 2006, the ones created in 2004 are tracked until 2007 and new establishments in 2005 are followed until 2008. We identify an establishment entry whenever information for that establishment is reported to QP for the first time in the corresponding spell, i.e., if the establishment is not present in any of the preceding waves

of the data[28]. Similarly, we will identify an establishment exit in one year whenever information for the establishment is absent for that year and for all subsequent years, i.e., if the establishment is not present in any of the subsequent waves of the data [29].

In the dataset, an establishment is defined as a single business location of a firm, new establishments being assigned different identification numbers. Given this definition we will observe an opening if the firm creates a new establishment but also if an existing establishment is relocated or if a new plant is created after the merger and/or closure of previously existing units of the firm. As shown in Table 2.1, 157953 new establishments were created in the 3 years period between 2003 and 2005. These new establishments employ almost 700 thousand workers. In Table 2.2 we observe that these newborn units are affiliated with firms that have, on average, 1.6 establishments and 13 workers. Firms with only one establishment are clearly predominant in the data and we conclude that more than three fourths of the observed entries are single-establishment firms.

	2003	2004	2005	2003-2005
Number of new establishments	50942	46805	60206	157953
Number of workers	235343	203918	255731	694992
Estab. average number of workers	4.6	4.3	4.2	4.4

Table 2.1: Characterizing new establishments

	2003	2004	2005
Number of firms:	45335	41789	53989
Single-establishment	39627	36395	48370
Multi-establishment	5708	5394	5619
Firm average number of estab.	1.6	1.6	1.6
Firm average number of workers	13.6	13.2	12.1
Firm average age (in years)	4.9	5.0	6.9

Table 2.2: Characterizing firms

For the purpose of this paper, we are interested in newly created establishments for which the corresponding parent firm has the option to transfer workers from other

[28] For each year, we use all previous spells of the data (since 1985) to identify an entry.

[29] For each year, we use all subsequent spells of the data until 2009.

establishments within the organization. This possibility implies that the new establishments in our sample have to be affiliated to a firm that pre-existed before the opening. Our sample is further restricted to newly created establishments that belong to firms that remain or become multi-establishment after the opening in year t[30]. Therefore, we keep new establishments that belong to firms that are multi-establishment in both periods, before the opening and in the year of the opening, but also firms that grow from single to multi-establishment firm. The cases of single-single or multi-single were excluded as these are either firms that closed down an establishment and opened a replacement establishment (possibly due to simple relocation of the existing plant) or firms that closed all its pre-existing establishments merging them into a newly created unit. In both cases the "new" establishments are likely to be transformations of pre-existing establishments rather than truly new units. Under these circumstances, internally transferred workers will necessarily come from establishments that are closing and these transfers are expected to be driven by different factors than those that we seek to investigate in this study.

In Table 2.3 we detail our sample restrictions.

Type of firm		In the
Year before the opening (t-1)	Opening year (t)	sample?
Non existent	Single or Multi	No
Single-establishment	Single-establishment	No
Multi-establishment	Single-establishment	No
Single-establishment	Multi-establishment	Yes
Multi-establishment	Multi-establishment	Yes

Table 2.3: Sample design

Of the 157953 establishments that were created between 2003 and 2005, 32803 belong to firms that existed in the previous period but 8411 establishments were linked to firms that were single-establishment after the opening and were also dropped from the sample. Hence, the final sample contains 24392 newly created establishments that

[30] The sample was obtained after performing consistency checks and some cleaning. Workers with an identification number smaller than 100000 and duplicated workers for whom all variables exhibit the same value were dropped (these workers represent less than 1%).

are affiliated to a pre-established parent firm that is multi-establishment in year t. Our sample of new establishments represent 15% of total openings in the period 2003-2005 and are responsible for 29% of the employment created by all new establishments. When compared to the total group of new entrants, the establishments in our sample have twice as many workers even though most of them are small and 55% employ only 3 workers or less.

As we restricted our sample to multi-establishment firms in year t it is not surprising that the parent firms in our final sample are considerably larger having, on average, 7 establishments and almost 100 workers. On the other hand, as we kept only firms that pre-existed in year t-1, the fact that the firms in our sample are older is also expected. Tables 2.4 and 2.5 characterize our final sample. Figure 2.1 characterizes the firms considering the number of establishments owned. We observe that a large majority of multi-estalishment firms have less than 10 establishments.

	2003	2004	2005	2003-2005
Number of new establishments	8561	7820	8011	24392
Number of workers	67562	62137	69359	199058
Estab. average number of workers	8.3	8.4	8.7	8.5

Table 2.4: Sample characterization: establishments

	2003	2004	2005
Number of firms	4566	4339	4343
Firm average number of estab.	6.5	6.6	7.0
Firm average number of workers	93.0	91.4	103.9
Firm average age (in years)	15.2	15.2	15.0

Table 2.5: Sample characterization: firms

2.2.2 Identifying internal hires

Matching information on workers, establishments and their firms we are able to classify workers according to their origin. Internal hires in t, worked for the same employer but in another establishment of the firm in the year t-1. For these workers, we observe a change in the establishment's identification number but the firm's identification number

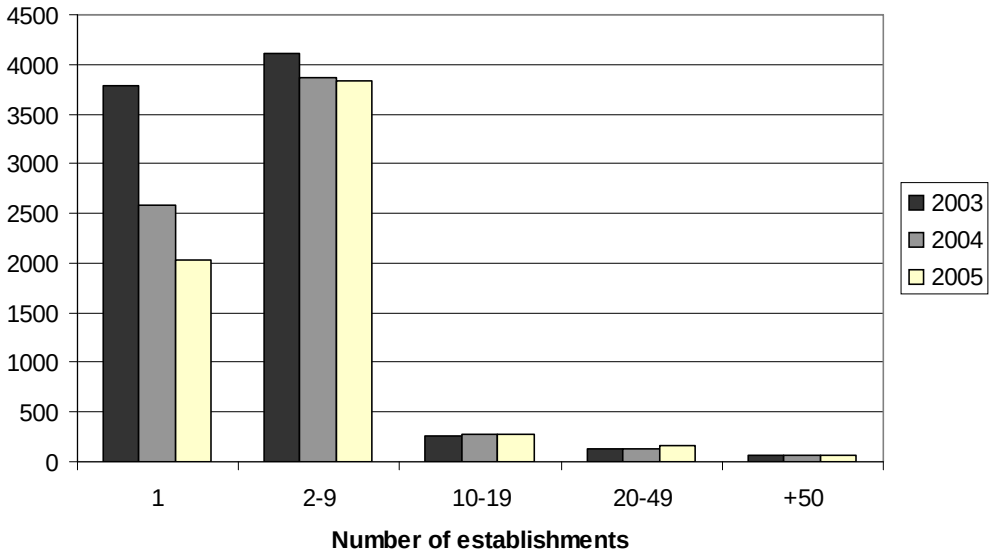

Figure 2.1: Firm characterization by number of establishments

remains unchanged.[31] [32] Workers that meet this criterion may be in two very different situations:

1. The worker is transferred from an establishment that remains active (henceforth, Type I transfers);

2. The worker is transferred from an establishment that ceased its operations (henceforth, Type II transfers).

This distinction is important because the decision to transfer workers from establishments that close (Type II transfers) is driven by different factors than those determining Type I transfers, as they are alternative to a dismissal rather than a transfer driven move. For Type I transfers we have the guarantee that the establishment where the individual previously worked was not closed or relocated.

[31] We also included in this category workers that, in the previous year, don't appear in the dataset but show a tenure higher than 12 months. This indicates that they already worked for that same firm in the previous year but, for some reason, were not reported.

[32] This classification is straightforward if the individual works only for one employer. When the individual, in year t-1, worked for more than one firm we classify him as an internal hire provided that the individual worked for the firm that is opening the new establishment even if he also worked for other firms.

Most remaining hiring situations are classified as external hirings. External hires include workers that, in the previous wave of the data, were:

1. Employed with a different firm;
2. Not present, meaning that they were either out of the labor force (new labor market entrants or re-entrants), unemployed, self-employed or employed as a civil servant.

There is, however, one last case of hirings that we cannot classify into any of the above types of hiring, internal or external. This is a category of workers that are employed at time t in a newly created establishment and undergo a change in the identification number of the firm they are working for but their reported tenure is longer than 12 months. This situation may be due either to workers hired externally that were able to secure whatever tenure they accumulated in their previous job (which may be important for certain types of employer-provided benefits), or to workers that are hired from other firms belonging to the same economic group as the destination firm. In the former case, but not in the latter these are, indeed, external hires. As we cannot separate one situation from the other we classify these situations into a separate group denoting uncertain origin (henceforth referred to as uncertain origin transfers). The incidence of these cases although small is by no means trivial[33]. In Figure 2.2 and in Table 2.6 we sum up the five origins that we consider in the empirical work.

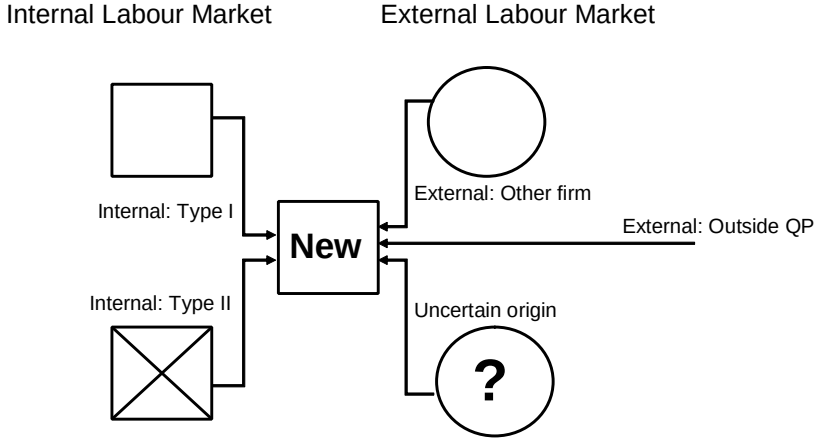

Figure 2.2: Identifying the type of hiring.

[33] In Table 2.9 we observe that uncertain origin transfers represent 8% of total hires.

Origin	Type of hiring	Description
Internal	Internal: Type I	The unit where the individual worked in t-1 remains open
	Internal: Type II	The unit where the individual worked in t-1 closed
External	External: outside QP	The worker was out of QP dataset in t-1
	External: other firm	Firm id changes and tenure is lower than 12 months
	Uncertain origin	Firm id changes but tenure is higher than 12 months

Table 2.6: Type of hiring according to the worker's origin

2.2.3 Characterizing the data

2.2.3.1 The establishment sample

In this section we further characterize the establishments and describe their personnel. In terms of composition of the workforce, in our final sample of newly created establishments, we observe that the proportion of women is slightly higher than the proportion of men. Although, on average, 41% of the workforce has less than 12 months of tenure which is something we might expect in a new establishment we also find a high proportion (around 37%) of higher tenured workers which reveals the importance of internal hiring when opening a new establishment. More than 75% of the workforce of these newly-created establishments has between 25 and 54 years old and around 59% of the hired employees have 9 or less years of schooling. Our data also allows us to characterize the establishment's workforce according to worker's hierarchical level[34]. Frequently, these new establishments are small branches of the parent firm and so it is not surprising that top executives represent less than 7% of the workforce and that only 17% of the new units have top executives in their personnel. We see that, on average, over 70% of the hired workers are merely skilled or less than skilled professionals.

Looking at the establishments' distribution by economic activity and considering the Portuguese Classification of Economic Activity (cae)[35], in our sample, cae G, wholesale and retail trade, stands out, accounting for 40% of the new plants. Financial activities, real estate, renting and business activities (cae J and cae K) rank second accounting for more the 20% of the new units in our sample. Regarding the geographical distribution,

[34] We distinguish eight hierarchical levels defined by law in *Decreto-Lei n.º 121/78, de 2 Junho* (see Appendix A)

[35] Equivalent to Standard Industrial Classification (SIC) codes. See Appendix B.

we observe some regional imbalances with 31% of the establishments located in the Lisbon area. Tables 2.7 and 2.8 characterizes our sample of newly created establishments.

Age	Less than 25 years	17.0%
	$[25, 34[$	35.2%
	$[34, 54]$	41.6%
	More than 54 years	6.2%
Female		54.7%
Tenure	Less than 12 months	40.7%
	$[12, 36]$	22.0%
	More than 36 months	37.3%
Education	Less than 9 years	33.3%
	9 years of schooling	25.3%
The 1% missing	12 years of schooling	29.5%
are ignored.	More than 12 years	10.8%
Hierarchical level	Level 1 - Top executives	6.8%
	Level 2 - Intermediary executives	4.6%
	Level 3 - Supervisors, team leaders, foremen	4.8%
	Level 4 - High-skilled professionals	7.7%
	Level 5 - Skilled professionals	41.2%
The 3% missing	Level 6 - Semi-skilled professionals	13.9%
are ignored.	Level 7 - Non-skilled professionals	9.4%
	Level 8 - Apprentices, interns, trainees	8.6%

Table 2.7: Workforce composition (by establishment): 2003-2005

We move on to analyze the establishment's personnel in terms of its origin in the internal or external labor markets. Looking at Table 2.9, for the new establishments in our sample and for the all period 2003-2005, we observe that, on average, around 40% of the workers are hired in the external labor market: 15% come from another firm while 25% are not present in the dataset in the year before the opening. We also find 8% of uncertain origin hires.

We observe that more than half of the workforce of our new establishments is recruited in the parent firm. This proportion may seem surprisingly high but is better understood if we look at the proportion of internal transfers from establishments that

CAE	A - Agriculture, animal husbandry, hunting and forestry	1.4%
	B - Fishing	0.04%
	C - Mining and quarrying	0.3%
	D - Manufacturing	6.5%
	E - Electricity, gas and water supply	0.5%
	F - Construction	7.4%
	G - Wholesale and retail trade	40.0%
	H - Hotels and restaurants	7.5%
	I - Transport, storage and communication	6.0%
	J - Financial activities	10.1%
	K - Real estate, renting and business activities	11.1%
	L - Public adm., community, social and personal serv.	-
	M - Education	0.9%
	N - Health and social work	4.1%
	O - Other community, social and personal service act.	4.2%
	P - Families with household employee	-
	Q - International inst. and other extra-territorial org.	-
Region	Norte	27.0%
	Centro	21.3%
	Lisboa	30.7%
	Alentejo	8.2%
	Algarve	6.0%
	Madeira	3.2%
	Açores	3.4%
	Foreign	0.2%

Table 2.8: Characterizing establishments: 2003-2005

remain open (Internal: Type I). For Type I internal transfers, the proportion drops to 29% leading us to conclude that several openings may be linked to a closure or a relocation of one (or more) previously existing units. Nevertheless, depending on the year, we observe that between one fourth and one third of the workforce are internally hired from existing establishments that remain open and this supports the importance of intra-firm hires in opening events.

Type of hiring	2003	2004	2005	2003/2005
Internal (total)	54.0%	55.3%	46.1%	51.8%
Internal: Type I	28.8%	33.1%	25.7%	29.2%
Internal: Type II	25.2%	22.2%	20.4%	22.6%
External: outside QP	22.8%	24.7%	28.7%	25.3%
External: other firm	13.0%	15.2%	16.3%	14.8%
Uncertain origin	10.2%	4.8%	8.9%	8.1%

Table 2.9: Type of hiring per year

As expected, the proportion of internal and external hires varies depending on the hierarchical level and occupation. In Table 2.10 we analyze the type of hiring by hierarchical level. We find that internal hiring is more important for top and intermediary executives as well as for supervisors while external hiring predominates for less skilled professionals.

Our data also adds details on the workers' occupation. In Table 2.11 we analyze the type of hiring for the nine major occupational categories according to the National Classification of Occupations (NCO)[36]. Overall, external labor market hires seem to prevail for occupations that require less skills and that are closer to the bottom of the hierarchy. We observe that internal hiring becomes more important as we move up the job ladder. The lower levels in the typical establishment are much more likely to hire from the outside while the upper levels are much more likely to hire from within (Lazear and Oyer, 2004). This is consistent with the existence of ports-of-entry jobs into the establishment and highlights the role of firm-specific human capital as a determinant of internal transfers. Nonetheless, we also observe that a nontrivial proportion of vacancies

[36] Equivalent to the International Standard Classification of Occupations (ISCO). See Appendix C.

at every level and occupation are filled by external hires suggesting that firms are much more complex and don't follow a strict policy of hiring from outside exclusively into a limited set of levels and from inside into others. For example, even at the two highest hierarchical levels 16% to 19% of the jobs are filled externally which suggests that there is some level of fluidity.

Type of hiring	Level1	Level2	Level3	Level4	Level5	Level6	Level7	Level8
Internal (total)	74.2%	61.1%	71.3%	59.2%	53.1%	50.3%	48.1%	31.9%
Internal: Type I	41.8%	34.5%	37.2%	33.9%	27.9%	27.6%	24.2%	16.6%
Internal: Type II	32.4%	26.6%	34.1%	25.3%	25.2%	22.7%	23.9%	15.3%
External: outside QP	9.1%	7.1%	10.0%	10.1%	21.3%	28.8%	29.5%	46.8%
External: other firm	9.4%	9.2%	11.5%	8.7%	14.6%	16.0%	15.2%	17.2%
Uncertain origin	7.3%	22.6%	7.2%	22.0%	11.0%	4.9%	7.2%	4.1%
Number of estab.	4238	4292	4467	4975	15519	6170	4710	3641

Table 2.10: Type of hiring by hierarchical level: 2003-2005

Type of hiring	NCO1	NCO2	NCO3	NCO4	NCO5	NCO6	NCO7	NCO8	NCO9
Internal (total)	76.8%	68.3%	55.3%	55.6%	43.2%	53.3%	64.3%	64.8%	51.2%
Internal: Type I	42.9%	36.5%	29.3%	31.2%	23.4%	25.0%	30.3%	31.1%	25.7%
Internal: Type II	33.9%	31.8%	26.0%	24.4%	19.8%	28.3%	34.0%	33.7%	25.5%
External: outside QP	7.2%	15.4%	13.0%	18.5%	34.3%	22.0%	17.5%	15.9%	27.7%
External: other firm	8.2%	11.5%	11.9%	11.9%	18.0%	16.9%	12.5%	12.6%	15.2%
Uncertain origin	7.8%	4.8%	19.8%	14.0%	4.5%	7.8%	5.7%	6.7%	5.9%
Number of estab.	3500	2227	6574	9578	9654	355	3684	2216	4717

Table 2.11: Type of hiring by NCO: 2003-2005

In Tables 2.12 and 2.13 we analyze how internal hiring varies with the firm and the establishments' size. The proportion of internal hires from establishments that remain open decreases with the new establishment size. Regarding firm size, we see that the proportion of internal hires seems to be higher for establishments that are affiliated with parent firms with less than 50 workers and to parent firms with more than 100 workers.

Finally, in Table 2.14 we analyze how internal hiring varies with the establishments'

Estab. Size	N^o Estab	Internal Hiring (%)	Internal: Type I
<10 workers	20395	51.3%	29.6%
10<= workers< 50	3456	53.3%	27.2%
>= 50 workers	541	59.3%	27.1%
	24392		

Table 2.12: Type of hiring by size of the new establishment: 2003-2005

Firm Size	N^o Estab	Internal Hiring	Internal: Type I
<10 workers	6494	54.9%	32.9%
10<= workers< 50	6932	51.2%	28.2%
50<= workers <100	2303	48.7%	23.0%
>= 100 workers	8663	50.8%	28.8%
	24392		

Table 2.13: Type of hiring by parent firm size: 2003-2005

sector of activity. Internal hiring prevails in cae B (fishing), cae F (construction) and cae I (transport, storage and communication) while internal hiring from establishments that remain active (Type I transfers) prevail in cae I (transport, storage and communication), in cae B (fishing) and in cae E (electricity, gas and water supply).

2.2.3.2 The worker sample

In the previous section we have been featuring the establishments in our sample and their workforce. In Table 2.15 we move on to the characterization of the 199058 workers in our sample, i.e. that work in the establishments created by multi-establishment companies.

We notice that internally hired workers are older than average while individuals that are hired in the external labor market, particularly those that were out of the dataset in the previous year, are younger indicating that some of these individuals may be starting their way in the labor market. Internal hires have a higher proportion of males while external hires have a predominance of females. When compared to external hires we find that internally hired individuals have a slightly higher proportion of workers with

CAE	N^o Estab	Internal Hiring	Internal: Type I
A	333	57.1%	27.6%
B	10	79.2%	48.3%
C	69	66.1%	39.2%
D	1577	61.1%	35.8%
E	128	58.9%	40.4%
F	1814	73.9%	29.5%
G	9756	46.0%	25.7%
H	1830	40.8%	23.8%
I	1469	73.4%	59.3%
J	2473	45.7%	25.7%
K	2696	45.6%	25.0%
L	0	-	-
M	213	60.1%	33.5%
N	1001	63.3%	36.3%
O	1023	56.5%	27.0%
P/Q	0	-	-
	24392		

Table 2.14: Type of hiring by economic activity: 2003-2005

			Internal			External		Uncertain
		All	Total	Type I	Type II	Out QP	Other firm	origin
Number of workers		199058	111506	52275	59231	42552	25512	19488
Age	Less than 25 years	16.2%	9.3%	8.1%	10.4%	36.4%	20.5%	5.6%
	$[25, 34[$	33.8%	32.6%	32.9%	32.2%	34.8%	40.2%	30.8%
	$[34, 54]$	43.8%	50.2%	51.2%	49.3%	26.4%	36.1%	55.4%
	More than 54 years	6.2%	8.0%	7.8%	8.1%	2.5%	3.2%	8.2%
	Female	46.3%	41.4%	42.0%	40.9%	55.8%	50.5%	48.4%
Tenure	Less than 12 months	35.1%	2.6%	2.8%	2.4%	98.2%	98.8%	-
	$[12, 36]$	19.6%	31.0%	29.3%	32.5%	1.8%	1.2%	16.9%
	More than 36 months	45.3%	66.4%	67.9%	65.1%	-	-	83.1%
Education	Less than 9 years	37.1%	40.6%	37.5%	43.4%	32.2%	36.3%	28.8%
	9 years of schooling	23.7%	21.8%	22.9%	20.9%	28.3%	27.2%	19.6%
	12 years of schooling	26.9%	25.1%	26.5%	23.8%	29.7%	26.3%	31.7%
	More than 12 years	11.5%	11.9%	12.8%	11.1%	8.4%	8.8%	19.8%
Hierarchical level	Top executives	5.3%	6.9%	7.9%	6.1%	1.8%	3.4%	5.9%
	Intermed. executives	4.3%	5.3%	6%	4.7%	1.4%	2.7%	7.3%
	Supervisors	4.6%	6.2%	5.9%	6.4%	2%	3.7%	3.0%
	High-skilled prof.	8.0%	9.1%	10.9%	7.4%	2.9%	4.3%	17.9%
	Skilled prof.	35.6%	37.2%	34.4%	39.7%	29.1%	34.9%	41.6%
	Semi-skilled prof.	15.1%	15.9%	19.9%	12.2%	16.2%	15.4%	7.9%
	Non-skilled prof.	15.9%	13.2%	9.0%	16.9%	22.9%	18.4%	12.4%
	Apprentices	4.9%	2.3%	2.3%	2.3%	11.5%	7.0%	2.3%

Table 2.15: Workers' characteristics by type of hire: 2003-2005

tertiary education[37]. We also observe a lower proportion of top and middle managers in the group of externally hired individuals and a higher proportion of top hierarchical levels in the group of internal workers. Non-skilled professionals and apprentices are predominant in the group of externally hired workers.

2.2.3.3 Establishment's survival statistics

Finally, Table 2.16 reports some survival statistics. We observe that 22% of the newly created establishments closed down after one year, allowing us to conclude that we have a relatively high closure rate in the first year after the opening. In the next two years, the closure rate drops. As we can see in the Kaplan-Meier survival plot depicted in Figure 2.3, three years after the opening 44% of the new establishments have closed down.

		Δ
New Estab. 2003/2005	24392	-
Open after 1 year	18965	5427
Open after 2 years	15942	3023
Open after 3 year	13626	2316

Table 2.16: Establishment's survival statistics

2.3 Empirical Methodology: Duration Models, unobserved heterogeneity and frailty models

In order to analyze new plant's survival we define a duration variable that measures time elapsed since opening. The new establishments in our sample are followed until closure or for three years after the opening hence, right censoring exists and must be accommodated[38]. We estimate duration models with time-invariant covariates as we are particularly interested in analyzing how the plant's initial recruitment strategies affect the new unit's survival or hazard. We observe, however, that several plants in our sample are affiliated with the same parent firm as one firm may open several new

[37] In this item, uncertain origin hires stand out because of the considerably higher proportion of more educated workers when compared with the other groups of individuals. We observe that more than one half of these workers have 12 or more years of schooling. This is consistent with a stronger bargain power of these workers allowing them to secure tenure.

[38] Left censoring is not present.

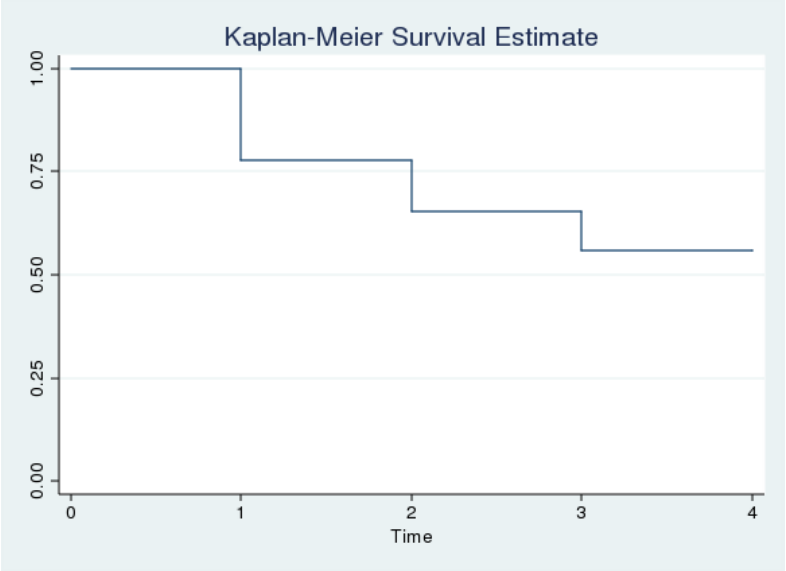

Figure 2.3: Kaplan-Meier survival estimate.

units within the observed period (2003-2005). In table 2.17 we see that, within the observed period 7479 firms open only one establishment but 3419 firms open more then one new unit.

Number of new estab. opened	Number of firms
1	7479
2 to 9	3174
10 to 19	143
20 to 49	78
More than 50	24

Table 2.17: Parent firm characterization by number of establishments opend, 2003-2005

Establishments affiliated with the same firm share a common family background and it is reasonable to believe that unit's affiliated with different firms face different risks of closure. Indeed, the new establishments affiliated with one parent firm may be more (or less) prone to failure than others. Some of these common characteristics can be directly accounted for in our duration model while others may be unobservable or unmeasurable. In this framework we have to account for unobserved heterogeneity as some plants may be more "frail" and more prone to closure than others. We estimate

a frailty model introducing in the duration model a random parameter into the hazard rate that accounts for the unobserved heterogeneity. These models may account for frailties that are individual-specific or, as in our case, frailties that are group-specific because the observations within a subgroup share unmeasured risk factors that may prompt them to exit earlier than other subgroups. The shared frailty models assume that similar observations share a frailty that causes observations within the same group to be correlated even though frailty may vary from group to group. Not taking into account unobserved heterogeneity in duration models is particularly serious as it exacerbates negative duration dependence. This happens because, over time, as the frail units fail, the sample becomes populated by more and more robust individuals. As a consequence, the population hazards decline over time regardless of the shape of hazards that individuals face (Lancaster, 1990). We follow by describing individual and shared frailty models.

A. Individual Frailty Models

A useful concept in statistical analysis of a duration phenomenon is the hazard function, that allows us to approximate the probability of closing within a short interval, conditional on having survived up to the starting time of the interval:

$h(t) = \lim_{\Delta t \to 0} \frac{P(t \leq T < t + \Delta t | T \geq t)}{\Delta t} = \frac{f(t)}{1 - F(t)} = \frac{f(t)}{S(t)}$

where $f(t)$ is the probability density function, $F(t)$ is the distribution function and $S(t)$ is the survival function. Another useful function is the integrated hazard function:

$\Lambda(t) = \int_0^t h(u)du$

which relates to the survival function simply by

$S(t) = \exp\left(-\int_0^t h(u)\right) = \exp\left(-\Lambda(t)\right).$

An especially important class of models with time-invariant regressors is the proportional hazard model that can be written as:

$h_j(t) = h_0(t)e^{X_j\beta}$

Now, suppose we have a sample of j observations where some units are more prone than others to fail due to unobserved heterogeneity. If we have unobserved frailties, the hazard rate will be a function not only of the covariates but also of the frailties:

$h_j(t) = h_0(t)e^{(X_j\beta + W_j\psi)}$

where W_j is a frailty term drawn from a probability distribution with a mean of 0 and a variance of 1. If $\psi = 0$ the standard proportional hazard model is obtained. Also, if we could measure/observe and directly include W_j in our model, then ψ would again go to 0. We can rewrite the hazard in the following form:

$h_j(t) = h_0(t)\upsilon_j e^{X_j\beta}$ where $\upsilon_j = e^{W_j\psi}$.

The hazard rate is now conditional on both the covariates, X, and the frailty term, υ. For identification purposes, we assume that the mean of υ is 1 and that the variance is unknown and equal to the parameter θ.

If the hazard is a function of the frailties, then the survival function is also conditional on both the covariates and the frailty term. Thus, as the survival function $S(t) = \exp[-\Lambda(t)]$ we have the conditional survival function (Lancaster, 1990) as:

$$\begin{aligned} S(t, X, \upsilon) &= \exp\left(-\int_0^t h(u|\upsilon)du\right) \\ &= \exp\left(-\upsilon\int_0^t h(u)du\right) \end{aligned}$$

To derive the expected value of the survival function, we need to specify $g(\upsilon)$, a probability distribution for υ[39]. With the adoption of a distribution $g(\upsilon)$, the expected survival function can be derived from the hazard rate as follows:

$$\begin{aligned} S(t) &= E\left[S(t, X, \upsilon)\right] \\ &= E\left[\exp\left(-\upsilon\int_0^t h(u)du\right)\right] \\ &= L\left[\exp\left(\int_0^t h(u)du\right)\right] \end{aligned}$$

where L is the Laplace transformation. This function is commonly referred to as the marginal survival function. Once the frailty is integrated out, accounting for unobserved heterogeneity is reduced to estimating θ, the variance of the frailty term. This is the marginal survival function because it is the observed survival function after υ has been integrated out.

For empirical purposes, we will consider a Weibull frailty model, so the conditional survival function is:

$S(t|\upsilon) = e^{-(\upsilon\lambda t)^\rho}$

Additionally, we will assume a gamma distribution for $g(\upsilon)$. With gamma frailty, the marginal Weibull survival function is:

[39] The gamma distribution is the most commonly used in the literature.

$S(t) = [1 + \theta(\lambda t)^{\rho}]^{-\frac{1}{\theta}}$

and the hazard rate is now:

$h(t) = \rho\lambda^{\rho}t^{\rho-1}[S(t)]^{\theta}$

Note that, when the variance of the frailty θ is 0, the model reduces to the standard Weibull model.

B. Shared Frailty Models

The main difference between shared and unshared frailty models is the assumption of how the frailty is distributed in the data as the frailty is now group-specific.

Suppose we have j observations (new establishments) and i subgroups (parent firms). The hazard rate for the j^{th} individual in the i^{th} subgroup is:

$h_{ij}(t) = h_0(t)e^{X_{ij}\beta+W_i\psi}$

where W_i is the subgroup frailty that the j units share. The frailty is assumed to be independently distributed with a mean of 0 and a variance of 1. Again, if $\psi = 0$ or if we could directly observe and include W_i, the standard proportional hazards model is obtained. The hazard can be rewritten as:

$h_{ij}(t) = h_0(t)\upsilon_i e^{X_{ij}\beta}$

where $\upsilon_i = e^{W_i\psi}$. The only difference with the individual frailty models is that frailty is now shared among the j establishments of the i^{th} parent firm. To estimate the shared frailty model we just need to proceed exactly as in the case of individual heterogeneity making the assumptions about $g(\nu)$.

2.4 Estimation Results

We begin by describing the set of included covariates in the regression analysis. All the duration models estimated include both firm-specific variables and establishment-specific variables. The former include the parent firm's growth, employment, number of plants and age and are included to control for the effect of observed characteristics that are shared by the newly created establishments affiliated with the same parent firm. The latter are the establishment's size and workforce structure (age, education, gender and hierarchical level). Most relevant for this study, we also control for the new unit's recruitment policies, controlling for the proportion of internal hires in the workforce.

Additionally, we also include a control for the proportion of workers that are shared by the new establishment and other establishments of the same parent firm. All the estimated regressions include a set of time, industry and region dummies.

Estimation results are shown in Table 2.18. The variables of interest to this study are included in the latter subset of regressors. In the first column we report a standard Weibull duration model that controls only for observed individual and shared heterogeneity. In the second column we report results for a shared frailty model that also controls for unobserved heterogeneity shared between new units that are affiliated with the same parent firm, considering a gamma distribution for the shared frailty[40]. In the third column we also report a shared frailty model but, in this specification, we add a control for the proportion of internal transfers at the plant's top hierarchical level. Note that, in this third specification, we include a control for the proportion of internal hires at the plant's highest hierarchical level and not the proportion of hires for "top executives", the highest hierarchical level in the data. This choice stems from the observation that most of these new units are small branches of the parent firm that often don't have top managers in their personnel. However, even in these small units, transfer of firm-specific knowledge from the parent firm will be necessary and it is reasonable to believe that this task is mainly carried out by the most skilled workers at the plant's highest hierarchical level. Therefore, to capture the importance of top level workers but also to account for the establishments' personnel structure, we identified the highest hierarchical level present in each new establishment and included a control for the proportion of internal hires at this highest level.

Looking at the first specification, that disregards unobserved heterogeneity, we see that the Weibull hazard function exhibits a positive duration dependence as the estimated ρ parameter is greater than 1, meaning that the new plant's hazard of failure increases over time. However, as discussed in the previous section, if unobserved frailty exists this estimate is likely to be biased downwards as the frailty always pushes down the duration dependence. Indeed, looking at the shared frailty model, reported in the second column of the Table, we can observe an increase in the parameter ρ.

To check for the appropriateness of introducing shared frailty in our models we

[40] Considering an inverse-Gaussian distribution for the shared frailty we obtained similar results.

	Duration		Shared Frailty(1)		Shared Frailty(2)	
Variables	Coef.	t-ratio	Coef.	t-ratio	Coef.	t-ratio
Dummy for exogenous firm growth	-0.1612***	(-6.78)	-0.0732**	(-2.08)	-0.0735**	(-2.08)
Firm size: log total employment	-0.0558***	(-7.69)	-0.0771***	(-4.49)	-0.0768***	(-4.48)
Pre-multi	0.0565**	(2.34)	-0.0373	(-0.91)	-0.0362	(-0.88)
Firm age (years)	-0.0001	(-0.70)	0.0002	(0.83)	0.0002	(0.84)
Plant size: log total employment	-0.1989***	(-17.89)	-0.2691***	(-18.28)	-0.2658***	(-18.00)
Workers' age: 25 to 34 (% of total)	0.0979**	(2.44)	0.0879*	(1.66)	0.0863	(1.63)
Workers' age: 34 to 54 (% of total)	0.0906**	(2.24)	0.0966*	(1.76)	0.0951*	(1.73)
Workers' age: + 54 (% of total)	0.0302	(0.48)	0.1441*	(1.68)	0.1403	(1.64)
Workers' edu.: 6 or 9 years (% of tot.)	-0.0396	(-1.20)	0.0001	(0.00)	0.0021	(0.05)
Workers' edu.: 12 years (% of total)	-0.1310***	(-3.82)	-0.0700	(-1.42)	-0.0688	(-1.40)
Workers' edu: + 12 years (% of total)	-0.1200**	(-2.19)	-0.0512	(-0.67)	-0.0486	(-0.63)
Female (% of total)	-0.1137***	(-4.33)	-0.0638	(-1.62)	-0.0642	(-1.63)
Shared workers (% of total)	0.4922***	(3.02)	0.6066**	(2.41)	0.6103**	(2.43)
Internal: Type I (% of total)	-0.2749***	(-9.03)	-0.2415***	(-5.74)	-0.0442	(-0.54)
Internal: Type II (% of total)	0.0161	(0.52)	-0.1777***	(-4.22)	-0.1839***	(-4.36)
Uncertain Origin (% of total)	-0.4417***	(-7.46)	-0.0809	(-0.93)	-0.0877	(-1.01)
Internal (I) highest level (% tot. at level)					-0.1958***	(-2.78)
Constant	-2.4401***	(-21.47)	-2.3307***	(-13.22)	-2.3268***	(-13.09)
N	24392		24392		24392	
ρ	1.3224		1.8223		1.8224	
θ			1.9678		1.9657	
Log likelihood	-24695.18		-22467.90		-22463.98	
Prob>X^2	0.0000		0.0000		0.0000	

Notes: Specifications include time, industry and region dummies and controls for worker's hierarchical level

***, **, * denotes statistically significant at 1, 5, and 10%, respectively

Table 2.18: Duration model and shared frailty model: 2003-2008

analyze the results from the likelihood ratio test of $H_0 : \theta = 0$. The result of the test indicates a statistically significant level of unobserved heterogeneity since the obtained p-value is virtually zero.

With frailty models we can distinguish between the hazard rates that individuals face and the population hazard. In a standard proportional hazard model, these hazards are the same since all individuals are assumed to be identical. However, in a heterogeneous population, with group-shared frailty the population hazard can fall while the individual hazards rise because, over time, as the frail members close down, the population becomes crowded by more and more robust individuals. This frailty effect assures that population hazards may decline over time regardless of the shape of hazards that individuals face. Considering our gamma shared frailty model reported in the second column of Table 2.18, Figure 2.4 shows the population (or unconditional) hazard while the mean individual (or conditional) hazard is shown in Figure 2.5. Indeed, we observe that the population hazard does decline after the second year whereas the individual hazard continues to climb.

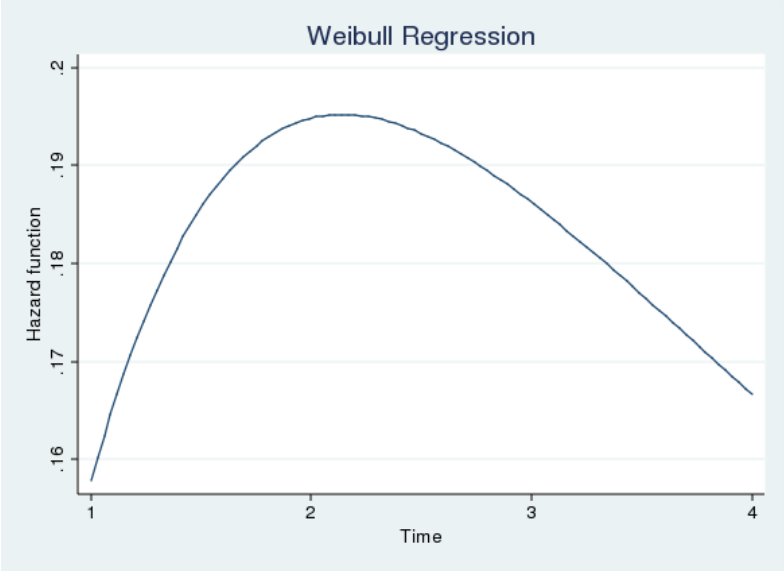

Figure 2.4: Unconditional hazard

In order to discuss the relevance of firm-specific human capital to the new unit's success we need to assess how the firm's recruitment strategy in the internal versus external labor market affects survival. Considering the model in the second column

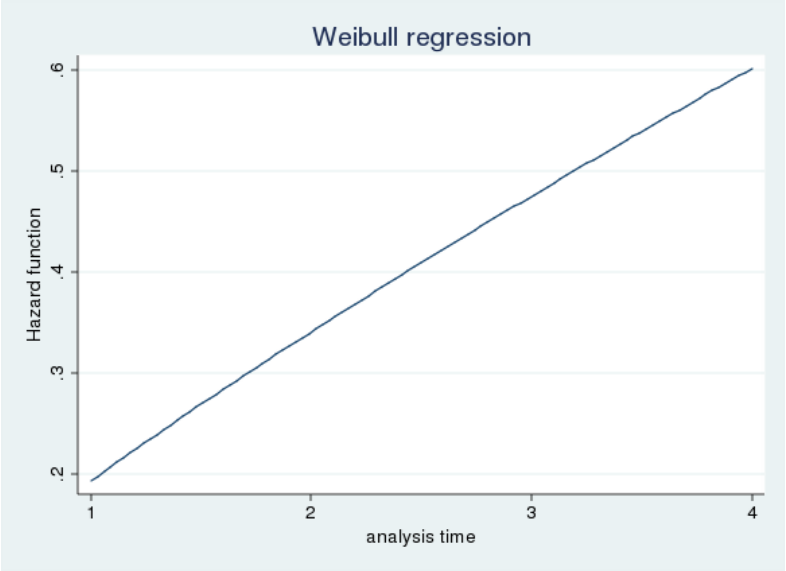

Figure 2.5: Individual hazard

of Table 2.18, that already takes into account the unobserved frailties that are shared by new establishments affiliated with the same parent firm, we observe that a higher proportion of total internal hires, compared to external hires, decreases the probability of failing. This positive impact on the new establishment's survival is obtained for both types of internal hires, whether they come from establishments that remain in operation (Type I) whether they come from establishments that are closing (Type II). This evidence supports our hypothesis that embodied firm-specific human capital plays an important role in improving the survival of newly created establishments. However, not all employees will be equally important to this process. To get a more detailed outlook on how this channel for knowledge transfer works, in the specification reported in column three of Table 2.18 we add a control for the proportion of internal hires at the new establishment's top hierarchical level. Adding this control, we observe that the proportion of internal transfers at the highest hierarchical level has a positive impact on the new unit's survival but we also note that the total proportion of Type I internal hires loses its statistical significance (although the sign remains negative). We may conclude that skilled workers at high-rank jobs are crucial for the transmission of firm-specific human capital to the new unit whereas low skilled, undifferentiated workers will not play an important role in the knowledge transfer process. In the new plant,

skilled workers will be responsible for the diffusion and implementation of firm-specific human capital that will positively affect the new establishments survival. Some authors have pointed out that it is human capital rather than physical capital that provides the basis for sustained competitive advantage (Youndt *et al.*, 1996). Successful firms are those that develop firm-specific assets which cannot be imitated by competitors and that provide the basis for their competitive advantage (Wernerfelt, 1984; Barney 1991). Other authors, such as Teece (1998), have argued that one of the few classes of assets that are not tradeable today are knowledge assets, which puts the ultimate source of competitive advantage of a firm in its employees. For newly created establishments, this is particularly true for those employees that are central to the knowledge transfer process or, in other words, for skilled workers. Internal transfers are, probably, one of the most important channels to share and transfer this "unique" assets to the new plant. We conclude that, although knowledge is tacit and hard to codify, it is embodied in the organization's routines and processes (Nelson and Winter, 1982; Coff, 1997 and Teece, 1998) and can be successfully transferred from the parent firm to the new unit embodied in the group of employees that are internally transferred. Moreover, the positive impact on the firm's survival brought by the higher proportion of internally hired top level workers can be strengthened by the fact that workers internally hired to higher-rank jobs are more likely to have won on the basis of their ability rather than as a result of the handicap given by the employer (Chan, 1996).

Looking at the shared frailty models we also observe that new plants affiliated with growing firms are less likely to close down[41]. New establishments affiliated with large firms also tend to be less prone to failure. Therefore, we may conclude that being linked to a large growing parent firm apparently increase the robustness of the new unit and provides a favorable environment for the new establishment. The parent firms' age and being a multi-establishment firm before the opening of the new unit doesn't appear to have a statistically significant impact on the new unit's closure probability. Moving on to analyzing the impact on failure of the new plants' characteristics, we conclude that

[41] To avoid endogeneity problems related to the impact on the firm's growth due to the opening of the new unit, our growth dummy controls for the increase in the total number of workers employed by the firm not including the new unit's employees.

larger establishments are less likely do close down. Previous studies on firm duration have concluded that the probability of failure is negatively related to firm size (Mata and Portugal, 1994). Larger units should be able to survive longer because, when facing negative outcomes, they have the option to shrink before they exit. On the other hand, larger entry size may signal greater *a priori* expectations of success and more periods with bad results will be needed to eliminate the *ex ante* positive expectations (Frank, 1988). Larger units may also take longer to fail as small units tend to be more flexible and respond more easily to market fluctuations (Mills and Schumann,1985). Looking at the composition of the new plant's personnel we observe that plants with a high proportion of younger workers tend to fail less. Furthermore, new establishments with a higher proportion of more educated workers and with a higher proportion of skilled workers (i.e., workers in managerial and technical occupations) seem to have a lower probability of failing, although some of the regressors are not statistically significant[42]. We also conclude that the presence of a higher proportion of employees that the new plant has to share with other establishments of the parent firm increases the new unit's risk of failure.

2.5 Conclusion

In this paper we examined the survival of new plants affiliated with pre-established firms. Entrants from pre-established firms deserve special and separated attention as the determinants of survival may differ. A central issue in entries by pre-established firms is that the parent firm can supply expertise in management and operational knowledge which may aid the new plant developing a successful entry strategy. Our work develops the study of the channels by which the parent firm or other units in the same group transfer expertise to the newly opened branch by suggesting a direct channel for knowledge transfer that has not been addressed in previous literature: the internal transfer of employees from existing units to the new establishment. Our hypothesis is that within-firm and across establishments mobility plays a central role in the transfer of firm-specific knowledge and, therefore, positively affects survival.

[42] Previous works have concluded that the larger the initial stock of human capital in the firm, the lower the likelihood that the firm will exit (Geroski *et al.*, 2010).

We observed that internal hires are an important way to fill the new vacancies created by the opening. On average, more than one half of the workers in the new plant were hired from other establishments of the same firm. Although some of these employees were transferred from establishments that were closing down, we also found that the proportion of internal hires that were transferred from establishments that remain in operation was still high, reaching 30%, and this proportion increases to around 40% for the highest hierarchical levels and skilled workers. Among the reasons that can explain the option for internal hires, we believe that, for new entrants, the need to transfer firm-specific human capital to the new unit is a key argument. Indeed, we observed that almost 70% of the internally hired workers had more than 36 months of tenure at the firm. The specific knowledge argument is also particularly pertinent for skilled workers and we observed that internal hires prevail at higher levels and for skilled professionals. Overall, external labor market hires seemed to prevail for occupations that were closer to the bottom of the hierarchy giving some support for the existence of ports of entry. Nevertheless, we also observed that firm's recruitment strategies are complex and external hires may be observed virtually at all levels and, even for the two highest hierarchical levels, 16% to 19% of the jobs were filled externally.

Duration models were used to analyze the impact of internal hiring on survival. Given that new plants affiliated with the same parent firm share the same family background and as it is reasonable to believe that unit's affiliated with different firms face different risks of closure we included shared frailty in our models. The obtained results strongly supported the presence of shared unobserved heterogeneity that affects the new plant's survival.

We observed that the proportion of internal hires has a positive impact on survival. The obtained results led us to conclude that internal transfers are, probably, one of the most important channels to transfer firm-specific knowledge to the new establishments. This non-tradable unique asset may create an important competitive advantage for new units affiliated with pre-established firms. We also concluded that not all employees are equally important to this knowledge transfer. Low skilled workers are not at the centre of strategic decisions and, therefore, are not critical for a successful expertise transfer.

The transfer of firm-specific expertise is carried out by the skilled workers that are internally hired to the new establishment's high-rank jobs. Finally, the improved survival of establishments with a higher proportion of skilled internal hires also supports the premise that at higher levels, hires are based on the candidates' superior ability. Our main conclusion is that firm-specific knowledge, that is an important source of competitive advantage and that can improve the new plant's survival, can be successfully transferred from the parent firm to the new unit embodied in the group of employees that are internally transferred.

Finally, bearing in mind our finding that a significant proportion of vacancies in the new plant are filled by employees transferred from other establishments of the same firm that remain open, we believe that promising future research in this field could focus on what happens at the origin when these workers are transferred to the new plant. Namely, it would be relevant to assess how the establishment of origin replaces or copes with the exit when an employee is transferred to a new establishment.

Appendix A

Hierarchical levels defined by law (Decreto-Lei n.º 121/78, de 2 Junho):

- Level 1 - Top executives (top management)
- Level 2 - Intermediary executives (middle management)
- Level 3 - Supervisors, team leaders, foremen
- Level 4 - Higher-skilled professionals
- Level 5 - Skilled professionals
- Level 6 - Semi-skilled professionals
- Level 7 - Non-skilled professionals
- Level 8 - Apprentices, interns, trainees

Appendix B

CAE - Portuguese Classification of Economic Activities (equivalent to SIC codes):

- cae A - Agriculture, animal husbandry, hunting and forestry
- cae B - Fishing
- cae C - Mining and quarrying
- cae D - Manufacturing
- cae E - Electricity, gas and water supply
- cae F - Construction
- cae G - Wholesale and retail trade
- cae H - Hotels and restaurants
- cae I - Transport, storage and communication

- cae J - Financial activities
- cae K - Real estate, renting and business activities
- cae L - Public Administration, Community, Social and Personal Services[43]
- cae M - Education
- cae N - Health and social work
- cae O - Other community, social and personal service activities
- cae P - Families with household employee
- cae Q - International Institutions and other extra-territorial organizations

Appendix C

National Classification of Occupations (NCO), equivalent to the International Standard Classification of Occupations (ISCO):

- NCO 1 - Executive civil servants, industrial directors and executives
- NCO 2 - Professionals and scientists
- NCO 3 - Middle management and technicians
- NCO 4 - Administrative and related workers
- NCO 5 - Service and sales workers
- NCO 6 - Farmers and skilled agricultural and fisheries workers
- NCO 7 - Skilled workers, craftsmen and similar
- NCO 8 - Machine operators and assembly workers
- NCO 9 - Unskilled workers

[43] Establishments belonging to CAE L were droped as this sector is out of the main scope of our analysis (this establishments represented less than 1% of the inital group).

References

[1] Audretsch, D. and Mahmood T. (1994), "The Rate of Hazard Confronting New Firms and Plants in U.S. Manufacturing", Review of Industrial Organization, Vol. 9, No.1, pp. 41-56.

[2] Baker, G., Gibbs, M. and Holmstrom, B, (1994a), "The Internal Economics of the Firm: Evidence from Personnel Data", The Quarterly Journal of Economics, Vol. 109, No. 4, pp. 881-919.

[3] Baker, G., Gibbs, M. and Holmstrom, B, (1994b), "The Wage Policy of a Firm", The Quarterly Journal of Economics, Vol. 109, No. 4, pp. 921-955

[4] Barney, J. (1991), "Firm resources and sustained competitive advantage", Journal of Management, Vol. 17, No.1, pp. 99-120.

[5] Becker, G. S. (1962), "Investment in Human Capital: A Theoretical Analysis", The Journal of Political Economy, Vol. 70, No. 5, pp. 9-49.

[6] Brito, P. and Mello A. (1995), "Financial Constraints and Firm Post-Entry Performance", International Journal of Industrial Organization, Vol. 13, No.4, 543-566.

[7] Chan, W (1996), "External Recruitment Versus Internal Promotion", Journal of Labor Economics, Vol. 14, No. 4, pp. 555-570.

[8] Coff, R. (1997), "Human Assets and Management Dilemmas: Coping With Hazards on the Road to Resource-Based Theory", Academy of Management Review, Vol. 22, No. 2, pp. 374-402.

[9] Darr, E., Argote, L. and Epple, D. (1995), "The acquisition, transfer and depreciation of knowledge in service organizations: Productivity in franchises." Management Science, Vol. 41, No. 11, pp. 1750-1762.

[10] Doeringer, Peter B. and Piore, Michael J. (1971), Internal Labor Markets and Manpower Analysis, Massachusetts, D.C. Heath and Company

[11] Dunne, T., Roberts, M. and Samuelson, L. (1988), "Patterns of Firm Entry and Exit in U.S. Manufacturing Industries", Rand Journal of Economics, Vol. 19, No.4, pp. 495-515.

[12] Dutton, J. and Starbuck, W. (1978), "Diffusion of an Intellectual Technology," in K. Krippendorff (Ed.), Communication and Control in Society, Gordon & Breach Science, New York, pp. 289-511.

[13] Farber, H. S. (1999), Mobility and Stability: The Dynamics of Job Change in Labor Markets, Princeton University in: Handbook of Labor Economics Vol. 3B eds. Orley C.. Ashenfelter and David Card, Amsterdam: North Holland, pp. 2439-2484.

[14] Frank, M. (1988), "An Intertemporal Model of Industrial Exit', Quarterly Journal of Economics", Vol. 103, No. 2, pp. 333-344.

[15] Furtado, E. and Karan, V. (1994), "Internal/External Top Management Succession and Firm Performance", Journal of Financial and Strategic Decisions, Vol. 7, No. 1 pp. 1-14.

[16] Geroski, P., Mata, J. and Portugal, P. (2010), "Founding Conditions and the Survival of New Firms", Strategic Management Journal, Vol. 31, No. 5, pp. 510-529.

[17] Ghoshal, S. and Bartlett C.(1988), "Creation, Adoption and Diffusion of Innovations by Subsidiaries of Multinational Corporations," Journal of International Business Studies, Vol. 19, No. 3, Fall, pp. 365-388.

[18] Gibbons, R. and Waldman, M. (1999), "Careers in Organizations: Theory and Evidence", in Ashenfelter, O., Card, D. (Eds), Handbook of Labor Economics, Elsevier, Vol. 3, pp. 2373-2437.

[19] Greenwald, B (1979),"Adverse Selection in the Labor Market", New York: Garland

[20] Greve, H. (1996), "Patterns of Competition: The Diffusion of a Market Position in Radio Broadcasting", Administrative Science Quarterly, Vol. 41, No. 1, pp. 29-60.

[21] Huberman, A. (1983), "Improving Social Practice Through the Utilization of University-based Knowledge", Higher Education, Vol. 12, No. 3, pp. 257-272.

[22] Huson, M., Malatesta, P. and Parrino, R. (2004), “Managerial Succession and Firm Performance”, Journal of Financial Economics, Vol 74, No. 2, pp. 237–275.

[23] Ingram, P. (1996), "Organizational form as a solution to the problem of credible commitment: The evolution of naming strategies among U.S. hotel chains, 1896–1980", Strategic Management Journal, Vol. 17, Summer Special Issue, pp. 85-98.

[24] Ingram, P. and Baum, J. (1997), "Chain Affiliation and the Failure of Manhattan Hotels: 1898-1980", Administrative Science Quarterly, Vol. 42, No. 1, pp. 68-102.

[25] Jovanovic, B. (1979), “Job Matching and the Theory of Turnover”, The Journal of Political Economy, Vol. 87, No. 5, pp. 972-990.

[26] Lancaster, T. (1990), "The Econometric Analysis of Transition Data", Cambridge: Cambridge University Press.

[27] Lauterbach, B., Vu, J.and Weisberg, J. (1999), "Internal vs. External Successions and Their Effect on Firm Performance Human Relations", Vol. 52, No.12, pp. 1485-1504.

[28] Lazear, E. (1979), “Why Is There Mandatory Retirement?”, The Journal of Political Economy, Vol. 87, No. 6, pp. 1261-1284.

[29] Lazear, E and Oyer, P. (2004), "Internal and External Labor Markets: A Personnel Economics Approach", Labor Economics, Vol. 11, No. 5, pp 527– 554.

[30] Liebenz, M. (1982), "Transfer of Technology: U. S. Multinationals and Eastern Europe", Praeger Publishers, New York.

[31] Lima, F. and Martins, P. (2006), “External Recruitments and Firm Performance”, Applied Economics Letters, Vol. 13, No. 14, pp. 911-915.

[32] Martilla, J. (1971), "Word-of-mouth Communication in the Industrial Adoption Process," Journal of Marketing Research, Vol. 8, No.2, pp. 173-178.

[33] Mata, J. and Portugal, P. (1994), "Life Duration of New Firms", The Journal of Industrial Economics, Vol. 42, No. 3, pp. 227-245.

[34] Mata, J., Portugal, P. and Guimarães, P. (1995), "The Survival of New Plants: Entry Conditions and Post-Entry Evolution", International Journal of Industrial Organization, Vol. 13, No. 4, pp. 459-482.

[35] Mills, D. and Schumann, L. (1985), "Industry Structure with Fluctuating Demand', American Economic Review, Vol. 75, No. 4, pp. 758-767.

[36] Mitchell, W. (1994), "The Dynamics of Evolving Markets: The Effects of Business Sales and Age on Dissolutions and Divestitures", Administrative Science Quarterly, Vol. 39, No. 4, pp. 575-602.

[37] Murphy, K. (1999), "Executive Compensation", in O. Ashenfelter and D. Card (eds.), Handbook of Labor Economics, Vol. 3, pp. 2485-2525.

[38] Nelson, R. and Winter, S. (1982), "An Evolutionary Theory of Economic Change", Cambridge, Mass., Harvard University Press.

[39] Rothwell, R. (1978), "Some Problems of Technology Transfer into Industry: Examples from the Textile Machinery Sector", IEEE Transactions on Engineering Management, Vol. 25, No.1, pp. 15-20.

[40] Teece, D. (1998), "Capturing Value from Knowledge Assets; The New Economy, Markets for Know-How and Intangible Assets", California Management Review, Vol. 40, No. 3, pp. 55-79.

[41] Tushman, M. (1977), "Communication Across Organizational Boundaries: Special Boundary Roles in the Innovation Process," Administrative Scence Quarterly, Vol. 22, No. 4, pp- 587-605.

[42] Wernerfelt, B. (1984), "A Resource-Based View of the Firm", Strategic Management Journal, Vol. 5, No. 2, pp. 171-180.

[43] Youndt, M., Snell, S., Dean, J. and Lepak, D. (1996), "Human Resource Management, Manufacturing Strategy and Firm Performance", Academy of Management Journal, Vol. 39, No.4, pp. 836-866.