Essay 2

The Dynamics of Schooling Attainments and Employment Contracts in the Early Career

2.1 Introduction

In the last decades, Fixed Term Contracts (FTCs) have become a widespread form of employment in European countries. In 2006, the share of FTCs in the economy was 15% of total employment for EU25 countries. This share was 14% in France and 34% in Spain, which represents the largest proportion of the sample (European-Commission, 2007). FTCs are characterized by a (quasi-)absence of firing costs (which makes them a flexible form of employment) and a legal limitation in their duration. They were introduced in the economy, jointly with stronger employment protection legislations on regular (permanent) employment contracts, as a political response to the increase in unemployment at the end of the 70's. At the individual level, spells of fixed term employment appears mainly in the early career. As an example, among workers who completed schooling in 1998 in France, 70% got a FTC for their first job. This proportion

decreased to 31% after three years in the labour market, and 15% after seven years (Céreq, *Génération 98*).

The impact of the introduction of FTCs on the level of unemployment has been investigated in Blanchard and Landier (2002) and Cahuc and Postel-Vinay (2002). They derive job matching models that combine employment protection (firing costs associated to Permanent Contracts, PCs) and FTCs. Theoretically, those two measures have an ambiguous impact on the level of unemployment. On the one hand, firing costs reduce flows into unemployment from PCs but, at the same time, reduce hiring rates into PCs. On the other hand, FTCs increase both entry and exit flows between employment and unemployment. The calibration of those models with French data shows that FTCs induce higher job turnover and affect positively the level of unemployment.

At the microeconomic level, the effect that an employment spell in a FTC has on employment outcomes, and especially on the access to stable employment, is also ambiguous. In a job matching framework, in which the productivity of a match is not perfectly observed at the time the match is formed (Jovanovic, 1979) and with uncertainty on future productivity levels of matches, a PC match is formed only if the expected productivity of the match is sufficiently high, such that the expected loss of paying the firing cost is compensated by the expected gain of forming a PC match rather than a FTC match. In this context, several factors affect either positively or negatively the impact that a FTC match has on the probability of forming a PC match. On the one hand, a worker employed in a FTC match increases his level of human capital and has an incentive to provide more effort. This affects positively the expected productivity of his future matches and thus increases the probability that his future matches are PC ones. Employment in a FTC match also gives the worker access to informal employment networks, which increase his job contact rate, and thus enhances the likelihood to form a PC match. On the other hand, during employment in a FTC, the on-the-job search intensity of the worker can be lower, which reduces the probability of forming PC matches. Another negative effect is induced by the fact that matches formed for a fixed term duration are the ones with relatively low expected productivity levels. Outside

employers can therefore associate a negative stigma to a worker employed in FTC matches during his career, especially if the matches have not been converted into PC matches in the same firm.

The uncertain effect of FTC employment on subsequent employment outcomes (and especially on the access to stable employment) has given birth to a large empirical literature whose aim is to determine if FTCs are considered as "traps" or "ports of entry" in the workers' career. In one of the few studies focusing on the US, Farber (1999) finds that job losers are more likely to be re-employed in temporary jobs, but such jobs lead to permanent employment, since the probability to be employed in a FTC decreases with time since the job loss. For the UK, Booth, Francesconi, and Frank (2002) show that workers employed in a FTC have higher exit rates to PCs but get lower wages than workers who were directly employed in PCs. Zijl, van den Berg, and Heyma (in press), for the Netherlands, find a negative impact of FTCs on the unemployment duration, but FTCs have no impact on the total duration before a PC. Concerning Spain, where the share of FTCs is the highest among European countries, Güell and Petrongolo (2007) find higher conversion rates of FTCs into PCs for better educated workers. In Italy, Berton, Devicienti, and Pacelli (2008) use a dynamic multinomial logit model with fixed effects to show that FTCs, compared to unemployment, increase the probability of getting a PC, but they also find a high state dependence in FTCs inside firms.[1] Cockx and Picchio (2009) model contract type transitions in the Belgian labor market in a discrete time duration model with unobserved individual heterogeneity. From post-estimation simulations, they show that accepting a short-lasting job (less than 1 quarter) rather than staying unemployed increases the likelihood of employment in a long lasting job (at least 4 quarters) by around 10%.

Despite the significant share of Fixed Term Contracts in the French labor market, analyzing their impact on employment prospects has remained relatively unexplored. However, a particular attention has been given to the evaluation of public employment policies, like subsidized jobs (two major contributions are Bonnal, Fougère, and Séran-

[1] It should be noted that there is no time-limitation in the use of FTCs in Italy.

don, 1997, and Magnac, 2000). In a recent article, following Magnac (2000), Givord and Wilner (2009) have used a dynamic multinomial logit model with fixed effects to evaluate the "trap" versus "port of entry" role of FTCs. They find that the probability to exit into PC employment is slightly higher from FTC employment than from unemployment.

Even if the interest in international comparisons is limited by the cross-country heterogeneity in legislations concerning FTCs, the majority of contributions rather provide empirical support for a "port of entry" role of FTCs. An aspect that has remained relatively unexplored until now, is the role played by educational attainments on individual employment contract transitions. Since the nature of a match (either permanent or fixed term) is driven by its expected productivity level, workers can decide to increase the probability that they form PC matches by increasing their own productivity level through pre-market skill investment. Therefore, educational attainments are likely to be an important determinant of employment contract transitions, especially in the early career.

The principal objective of this article is therefore to investigate how educational attainments affect early employment contract transitions. We focus our analysis on the employment contract outcomes of the first two job spells of workers in the labor market after school completion. In line with the literature analyzing the "trap" versus "port of entry" role of FTCs, we first measure the impact of the first FTC on the probability of employment in a PC, and we analyze how this impact relates to schooling attainments. We further check if experiencing an unemployment period after the first FTC increases the probability of employment in a PC. In a second time, we measure the marginal impact of schooling on the PC employment probability and assess the importance played by schooling attainments in explaining employment contract outcomes, relative to other observable and unobservable factors.

Investigating those issues requires an econometric model that corrects the endogeneity of both schooling attainments and the first employment spell. We therefore estimate a reduced-form dynamic model of grade transitions and early career contract outcomes. Our model contains five schooling levels. After each level, six options are considered:

(i) continue to the next grade (ii) accept a PC, (iii) accept a FTC with a short duration, (iv) accept a FTC with a long duration, (v) accept another type of FTC, (vi) withdraw from the labor force (a residual state). Then, at the end of a FTC, for each grade level, the first labor transition is modeled. The following destination states are considered: (i) conversion of the FTC into a PC in the same firm, (ii) direct access to a PC in another firm, (iii) access to a PC in another firm through a period of unemployment, (iv) direct access to a FTC in another firm, (v) access to a FTC in another firm through a period of unemployment, (vi) no transition (residual state). So, given a completed grade level, each option (each element in the choice sets) has its own latent utility equation, as in a standard Roy model. The latent utility equations are parameterized as a function of a large set of parental background variables and unobserved heterogeneity. Our dynamic model, in which outcomes are affected by previous choices and outcomes, is in the spirit of structural models of schooling decisions (Keane and Wolpin, 1997). However, since value functions are not explicitly modeled but approximated by latent utility equations, our approach can be labeled as semi-structural.

Our first finding is that accepting a first FTC has a positive impact on the probability of PC employment for a large set of the population. However, for some subsets (characterized by a combination of schooling attainments and unobserved characteristics), a negative effect is not rejected. For those individuals, we find that, in case of non conversion of the first FTC into a PC in the same firm, they can benefit for a subsequent job search (unemployment) period to find a permanent position, which is not the case for workers experiencing a positive effect of the first FTC. Secondly, we show that, after controlling for observed and unobserved heterogeneity, schooling attainments explain around one third of employment contract outcomes. However, the share explained by schooling falls to 17% for explaining the conversion of a FTC lasting more than 3 months.

The remaining of the paper is organized as follows. In Section 2.2, we discuss the theory about the role of uncertainty and education in the formation of FTC and PC matches. Then, in Section 2.3, we introduce the database used in the analysis. Sections 2.4 and 2.5 are devoted to the presentation of the econometric model. In

Section 2.6, we discuss the fit of the model. Sections 2.7 and 2.8 analyze respectively results about the impact of the first FTC and schooling attainments in the access to permanent employment. Section 2.9 concludes.

2.2 Uncertainty, Schooling Investment and Employment Contracts

2.2.1 The Formation of Fixed Term and Permanent Matches

Let us consider a labor market in which two types of matches can be formed when a worker and an employer meet: either a Fixed Term Contract (FTC) match or a Permanent Contract (PC) match. Cahuc and Postel-Vinay (2002) integrate these two types of employment contracts in the job matching model with endogenous job destruction of Mortensen and Pissarides (1994). In their framework, once an employer and a worker meet, they draw the productivity level of their potential match, and then decide either (i) not to form a match, (ii) form a FTC match, or (iii) form a PC match.[2] A FTC match lasts for one period only. At the end of this period, the match is either stopped (and no firing cost is supported) or converted into a PC match. A PC match does not have a predetermined duration. When it is destroyed, the employer has to pay a firing cost. At each period, each match can be randomly hit by a productivity shock. A new productivity level is drawn, which can lead to the closure of the match.

The authors show that the formation of the match, the type of match formed and the continuation of the match depend on its productivity level. More precisely, there exist 3 productivity thresholds, ϵ_1, ϵ_s and ϵ_0, that correspond respectively to the thresholds for continuing a PC match, forming a FTC match and forming a PC match (resulting either from a match creation or the conversion of a FTC match). Those thresholds are characterized by the following property: $\epsilon_1 \leq \epsilon_s \leq \epsilon_0$, which means that (i) a PC match

[2]The model of Blanchard and Landier (2002) differs slightly from the one of Cahuc and Postel-Vinay (2002) by excluding the possibility of forming PC matches at the time the employer and the worker meet: only FTC matches are formed and can be transformed into PC matches at the end.

is formed if the productivity level of the match is sufficiently high (greater than ϵ_0), and (ii) PC matches are less often destroyed than FTC matches (which underlines the job protection character of firing costs). The principal factors that explain this property are the presence of potential future productivity shocks, that can lead to the match destruction, and the presence of a firing cost induced by the destruction of PC matches only.

One important characteristic of this model is that the productivity of all matches is drawn from the same distribution. Let us relax this assumption and consider, instead, that workers are heterogeneous in their productive skills, which creates heterogeneity in the productivity of matches. This can be characterized by the existence of two (or more) types of workers, each type having its own distribution from which is drawn the productivity of the matches he forms. Introducing this heterogeneity in the Cahuc and Postel-Vinay's (2002) model would lead to the conclusion that employment contract outcomes are driven by the worker's productive skills: workers endowed with higher productivity levels form more PC matches than workers endowed with low ones.[3]

Another central assumption that influences the type of match formed, is the perfect information of the randomly drawn match productivity levels: once the productivity level of a potential match is drawn, it is observed perfectly by the employer and the worker. This assumption is relaxed in the model of Jovanovic (1979), where a match is considered an experience good whose quality is revealed only after a period of employment. If a similar assumption is made in our context, the present component of the value function associated to each type of match is based on the expected productivity level of the match, no more on the exact productivity level since it is unobserved. The future component integrates the possibility that the match productivity level turns out to be low, which will result in its destruction and the payment of the firing cost if the match is a PC one. The match formation decision and the choice between a FTC and a

[3]Casquel and Cunyat (2008) extend the matching model of Blanchard and Landier (2002) in this direction, assuming that workers are endowed with either a high or a low productivity level. They show that there exists an equilibrium in which only FTC matches formed with high skilled workers are transformed into PC matches.

PC match is therefore based on the expected productivity level of the match: it has to be sufficiently high to form a PC match.

2.2.2 The Role of Schooling on Employment Contract Outcomes

Let us now consider that the formation of worker's productive skills is endogenous: workers can increase their productivity level from schooling investment. According to the human capital model developed by Mincer (1958), Becker (1964) and Ben-Porath (1967), when agents decide to increase their schooling level, they compare their incurred costs (direct costs associated to material and tuition expenses on the one hand and opportunity costs associated to forgone earnings on the other hand) with expected gains. These expected gains are characterized by higher expected earnings, and, in our context, a higher employment stability, through a higher probability of forming PC matches.[4]

Moreover, when the productivity level of a potential match is not observed, workers' schooling attainments may also play a signaling role on the type of match to be formed. Indeed, if unobserved schooling and productive ability levels are correlated, a worker's schooling level may be used as a signal on his unobserved level of productivity. This affects the expected productivity of the match and thus influence the type of match to be formed.[5]

2.2.3 The Role of Previous Employment Contract Outcomes

We now discuss how the type of match formed by a worker can be affected by the nature of the matches formed during his career. In this paper, we measure the causal impact that a FTC match has on the probability of forming a PC match by comparing the probability to form a PC match before and after a FTC match is formed. Here, we detail the potential factors which are likely to affect the evolution of the probability to form a PC match.

[4] As shown in Cahuc and Postel-Vinay (2002), the presence of a firing cost increases the bargaining power of workers employed in PC matches, which allows them to get higher wages than workers employed in FTC matches.

[5] Evidence on the correlation between schooling ability, realized schooling attainments and labor market ability is provided in a structural model by Belzil and Hansen (2002).

First, during employment in a FTC match, a worker acquires productive skills which increase his level of human capital. This higher level of human capital affects positively the productivity level of future potential matches and thus increases the probability to form PC matches.

The second element concerns the effort provided by the worker during a FTC match. A worker employed for a limited time duration may have the incentive to provide more effort than a worker employed in a PC, in order to increase the probability of conversion of a FTC match into a PC match in the same firm.[6]

Third, employment in a FTC may also affect the rate at which a worker meets employers and thus influence the evolution of the probability to form a PC match. On the one hand, employment in a FTC, by giving access to informal networks, favors the probability to form future matches. On the other hand, the worker's job search intensity in trying to form PC matches may be lower during employment in a FTC compared to unemployment, since the time allocated to the job search process is reduced.

The last factor is a potential stigma effect associated to employment in a FTC, that may have a negative impact on the evolution of the probability of forming a PC match. Indeed, as stated in Part 2.2.1, FTC matches are formed when the expected productivity is not sufficiently high. When the match productivity level depends on the worker's productivity level, outside employers can associate a negative stigma to a worker employed in a FTC match. Moreover, in a context where the productivity level of the worker is not observed and (partially) revealed during a FTC match, the non-conversion of a FTC match into a PC match with the same employer may also provide an additional negative stigma to outside employers. [7]

[6]The hypothesis of higher effort during FTCs is investigated in Engellandt and Riphahn (2005) on Swiss data. They use unpaid overtime work and absence as a proxy of effort and find that workers employed in FTCs are more likely to work unpaid hours than workers employed in PCs. For France, Givord and Wilner (2009) do not find that overtime work affects the transition rate from FTC to PC employment.

[7]Individual preferences for FTCs is another factor that affects negatively the instantaneous probability of forming a PC match compared to a FTC match. For example, workers having a strong disutility of work may prefer to form successive FTC matches, and stay unemployed when the experience they accumulated during FTC matches makes them eligible to unemployment benefits (in France, no such benefit is obtained after resignation from a PC). Even if preferences play negatively on the instantaneous probability of forming a PC match compared to forming a FTC match, they can be considered as stable in time. Therefore, they should not affect the evolution of the probability to form a PC match before and after a FTC match.

2.3 The Data: *Génération 98*

This work is based on *Génération 98*, the same survey used in the first essay and presented in Section 1.3. However, the sample and the variables used in the analysis conducted in this essay differ from the ones used in the previous one, according to the elements described here.

2.3.1 Education

In order to model education, we use the highest educational level (reached in 1998). We consider 5 categories for the educational level variable: (1) no qualification, (2) first degree in vocational high school (*CAP* and *BEP*, professional degrees), (3) high school graduates (*baccalauréat*, A level), (4) technical or vocational higher education graduates or university undergraduates (*baccalauréat* and 2 years), (5) intermediate and advanced university graduates (baccalauréat and 3 years or more), elite business or engineering school graduates.

2.3.2 Employment Contracts

The data contain information on the nature of the employment contract at the beginning of each employment spell, as well as changes in the contract type within the spells. A variety of contract types exist in the French legislation. They can be classified into two groups, distinguished by their term, defined when the contract is signed by the employer and the employee.

The Permanent Contract (PC) group is composed by contracts for which no duration is set when the contract is signed by the employer and the employee. The contracts falling in this category are contracts held by civil servants and indefinite term contracts (*Contrats à Durée Indéterminée, CDI*) in the private sector. Recruitment of civil servants happens through a tournament process with a fixed number of positions to be filled. Once hired, civil servants can not be fired, except because of a severe professional fault. Workers employed under an indefinite term contract can have a probationary

period, whose duration depends on the position filled (the maximum length of the probationary period is 4 months for blue and white collars, 6 months for technician and middle managers and 8 months for executives).[8] A worker employed under an indefinite term contract can be fired at no cost at the end of the probationary period. If the contract is stopped by the employer after the probationary period, it involves the payment of severance payments and firing costs, whose amount depends on the tenure in the position.

The second group concerns contracts concluded for a fixed duration. The most widespread form of fixed duration employment contracts is the definite term contract (*Contrat à durée déterminée, CDD*), that a worker signs directly with an employer, or with a temporary work agency (*intérim*). Such a contract can be renewed once in the same firm, and the total maximum duration of employment in definite term contracts in the same firm is set to 18 consecutive months. A second form of fixed duration employment contracts is contracts subsidized by state or local governments, intended especially to young workers, without a training content (*Contrats Emploi Solidarité, CES*, and *emplois jeunes*). A third form is contracts associated to a formal training program, such as apprenticeship, internship or professional qualification contracts (*contrats de qualification* or *contrats d'adaptation*). A fourth form corresponds to particular forms of employment, such as self-employment, seasonal work or family helping.

The purpose of this paper is to analyze the access to permanent employment and especially to focus on the role played by an initial period of employment under a fixed duration contract. An analysis based on the comparison of the different forms of fixed duration contracts would be interesting, especially for a political economy perspective.[9] However, the relative scarcity of observations associated to certain types of contracts

[8]Unfortunately, when an indefinite term contract is ended, the data do not allow us to identify if the separation date happens before or after the end of the probationary period. Since no firing cost is supported by an employer who fires a worker at the end of the probationary period, there is no legal difference between a probationary period and a definite term contract. Therefore, the employment rate into permanent contracts is certainly slightly over-estimated.

[9]See Bonnal, Fougère, and Sérandon (1997) for a comparison of various French public employment policies and Magnac (2000) for an evaluation of the impact of training schemes on youth employment outcomes.

(like self-employment or internship) and the discrete choice nature of our model make hard to estimate a model with a too large number of alternatives. We therefore restrict our analysis to two categories of fixed duration employment contracts. The first one, called Fixed Term Contract (FTC) hereafter, contains all limited term contracts used by employers or workers as an alternative to permanent contracts, that are not associated to a formal training program[10] and that do not correspond to specific forms of employment. The two forms of fixed duration contracts assigned to the FTC category are thus definite term contracts and subsidized contracts.[11] Contracts associated to a training program and contracts that correspond to particular forms of employment are included together in a residual category, called "other" hereafter.

2.3.3 Sample Construction and Summary Statistics

The initial sample is composed of 55,345 individuals, with 51.13% of men. From that sample, we remove 921 (2%) individuals whose observed characteristics necessary to estimate the model are missing. We also remove 2,841 (5%) individuals whose parents are farmers, since they appear to have totally different transitions than others. Finally, we loose 6,358 individuals (11%) who have missing observations for the type of employment contract.

The final sample is then composed by 45,225 individuals. Table 2.1 reports summary statistics of the educational level and individual characteristics used in the econometric analysis. It shows that the mean educational level is around high school graduation (*baccalauréat*), whereas the mode of the distribution corresponds to intermediate or advanced higher education diplomas (3 years and more). In total, 44% of the sample get a higher education diploma (i.e. level 4 or 5). Concerning parents' occupation, mothers

[10]The main purpose of contracts with a formal training program is to make the workers holding these contracts acquire skills that are lacking in their schooling curriculum. They have therefore to be considered independently from regular limited term contracts, especially in our framework where schooling investment is explicitly considered.

[11]We believe that individuals who choose subsidized contracts consider it as a step in the pathway toward permanent employment and that the experience obtained in such contracts is taken into account by employers who meet them subsequently in the labour market. We therefore chose to include them in the FTC category, aside with other "regular" limited term contracts.

Table 2.1: Summary Statistics

	Mean	St. Dev.
Educational Level		
1: No qualification	0.080	0.271
2: First degree in vocational high school	0.240	0.427
3: High school graduate	0.243	0.429
4: 2 years higher education graduate	0.183	0.386
5: 3 years or more higher education graduate	0.256	0.436
Average level	3.295	1.295
Father's occupation in 1998		
Craftsman, tradesman, company director	0.113	0.317
Senior executive, ingineer, teacher	0.190	0.392
Technician, middle manager	0.087	0.282
White collar	0.273	0.446
Blue collar	0.235	0.424
House-husband, missing or deceased	0.101	0.302
Mother's occupation in 1998		
Craftswoman, tradeswoman, company director	0.043	0.204
Senior executive, ingineer, teacher	0.110	0.313
Technician, middle manager	0.048	0.213
White collar	0.490	0.500
Blue collar	0.097	0.296
Housewife, missing or deceased	0.212	0.409
Parents' country of origin		
Both parents born in France	0.789	0.408
At least one parent born in another OECD country	0.080	0.271
At least one parent born in a non-OECD country	0.132	0.338
Living in an urban area in 1998	0.812	0.391
Delay during primary school	0.230	0.421
Male	0.517	0.500
Age in 1998	21.832	3.285
Observations	45525	

are much more likely to be empoyed as white collars than fathers (those proportions are respectively 49% and 27%) and much less likely to be blue collar workers (10% and 23%). When looking at the geographical origin of the parents, it appears that 21% are born from at least one parent born in a foreign country. Finally, the majority of individuals live in an urban area and 23% have been delayed during primary school.[12] The distribution of contract outcomes can be found next to simulated employment contract outcomes, in Table 2.4, and will be discussed in Section 2.6.

[12]Individuals delayed during primary school are those who enter secondary school after being 11 years old, which is the "normal" age at which children attain this level without schooling delay.

2.4 Econometric Strategy

Our central concern in this paper is to assess how schooling attainments and FTC employment affect the access to permanent employment. The main methodological issue, raised by Heckman (1981), is to disentangle the impact attributed to the correlation of schooling decisions and employment contract outcomes with individual observed or unobserved characteristics (the spurious impact) from their pure effect (the causal impact). Indeed, schooling decisions and employment contract outcomes can be influenced by the same individual characteristics that are observed (like family background) or unobserved (like motivation or ability). To address this endogeneity issue, we adopt a reduced-form dynamic discrete choice structure which models jointly schooling decisions, the first contract outcome after school completion, and the first transition after a FTC, in which unobserved heterogeneity is introduced.[13] A graphical representation of the model is presented in Figure 2.1.

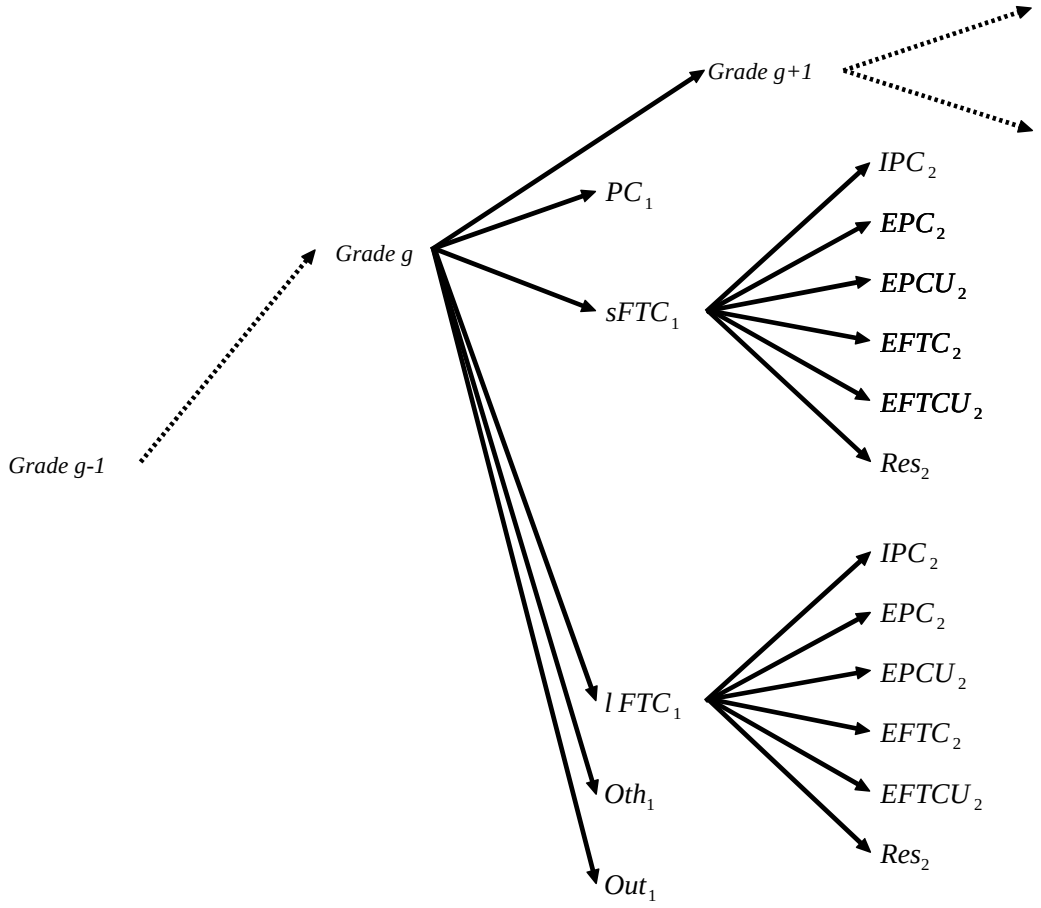
At each grade level, individuals decide between obtaining more schooling and entering the labor market. In this last case, we model five job status: employment in a Permanent Contract (PC_1), employment in a Fixed Term Contract of short duration (inferior or equal to 3 months – $sFTC_1$), employment in a Fixed Term Contract of long duration (superior to 3 months – $lFTC_1$), employment in another form of fixed duration contract (Oth_1) and out of the labor force (Out_1), a residual state.[14]

Even if our main concern is not to explain the duration of FTCs, it appears interesting to make a distinction between short and long FTCs to test if the length of the first FTC affects the probability of permanent employment. We restrict the duration heterogeneity of FTC spells to two cases (short or long) to keep a reasonable number of parameters. The choice of the criterion of duration, 3 months, is driven by the fact that there is a high increase in the transition rates from FTCs to PCs when the duration increases from 3 to 4

[13] Modeling schooling decisions as a reduced-form transition (hazard) model has been done in Cameron and Heckman (1998, 2001), Belzil (in press), Belzil and Poinas (in press).

[14] We do not distinguish here between unemployed workers who choose not to work, and unemployed workers who are searching for a job.

Figure 2.1: Model Representation



months. This feature is certainly due to the fact that very short FTCs are only used by employers to execute a task whose expected duration is low.

After having modeled the first contract outcome, we model the first transition after a Fixed Term Contract. We consider the nature of the contract at the beginning of the next spell (FTC or PC), and if the contract is obtained within the same firm or in another firm, as well as if it is preceded by a period of unemployment. More precisely, the 6 following transitions are modeled: Conversion into a PC in the same firm (IPC_2), Permanent Contract in another firm directly after the first FTC (EPC_2), Permanent Contract in another firm through a period of unemployment ($EPCU_2$), Fixed Term Contract in another firm directly after the first FTC ($EFTC_2$), Fixed Term Contract in another firm through a period of unemployment ($EFTCU_2$), Residual state (Res_2).[15] [16] As far as we know, modeling such a variety of destination states at the end of a FTC has not already been considered in the literature.

This model is in the spirit of Keane and Wolpin's (1997) structural model of schooling decisions and career outcomes, in the sense that we retain the dynamic/sequential nature of individual schooling decisions and employment outcomes: the decision at one period is conditional on decisions taken at previous periods. However, instead of explicitly modeling individual preferences, we approximate the value functions associated to each choice by latent utility equations, in which the present and the expected future components are not distinguished. This approach, called semi-structural, offers the advantage of avoiding to numerically solve the value functions, but leaves the results open to many interpretations since individual preferences are not modeled. The individual value functions associated to each option are approximated using individual characteristics that are likely to affect preferences. Those characteristics include parents' occupation and immigration status (born in an African country or in another foreign

[15]The residual state contains the following cases: individuals employed in another form of fixed duration contract than a FTC, individuals voluntary or involuntary unemployed after the first job spell and individuals still employed in their first FTC employment period at the end of the observation period (3 years after school completion).

[16]The data do not allow to identify individuals who are employed in many subsequent FTCs within the same firm. Therefore, we do not model the transition from a FTC as a first contract to a FTC in the same firm.

country),[17] household location (living in an urban area), gender and an indicator of delay during primary school, which can be considered as a cognitive skill indicator. On top of these observable variables, we introduce an individual unobserved time invariant heterogeneity term which controls for unobserved characteristics and skills, like ability or motivation.[18] Because the model is interpreted as the reduced-form of a more involved structure, the terms choices and outcomes may be used interchangeably.[19]

2.5 Econometric Model

In this section, we describe in detail the functional forms adopted in the econometric model. We first focus on the schooling decisions and the first employment contract outcomes. Then, we turn on the description of the first transition after a FTC. Finally, we describe how unobserved heterogeneity is introduced in the model.

2.5.1 Schooling Choices and the First Contract Outcome

2.5.1.1 Choice Sets and Optimal Choice

Let first define, for each schooling level g, the choice set C^g. Due to a low number of observations, we do not model employment outcomes at level 1 (no qualification). Therefore, the choice at this grade level is either to continue schooling to the next grade level or to stop schooling: $C^1 = \{cont, stop\}$. At the end of schooling levels 2, 3 and 4, the choice sets are given by $C^2 = C^3 = C^4 = \{cont, c_1, c_2, c_3, c_4, c_5\}$ where $c_1, \ldots, c_5$ correspond to the five employment contract outcomes (respectively PC_1, $sFTC_1$, $lFTC_1$, Oth_1 and Out_1). At the end of schooling level 5, continuing schooling is not possible. Therefore, the corresponding choice set is defined by $C^5 = \{c_1, c_2, c_3, c_4, c_5\}$.

[17] See Belzil and Poinas (in press) for a comparison of schooling and first contract employment outcomes between second-generation immigrants with African parents and their French-native counterparts.

[18] The inclusion of unobserved heterogeneity on sequential models of schooling decisions is crucial to control for educational selectivity, i.e. the correlation between unobserved factors and family background characteristics (see Cameron and Heckman, 1998, for a comprehensive discussion).

[19] For instance, the data does not allow us to distinguish individuals who accept limited term contracts because they received no permanent contract offer from those who actually accept a limited term contract over a permanent one.

At each grade level g, $g = 1, \ldots, 5$, the optimal choice for an individual i is the following:

$$\widehat{c}_{i,g} = \arg\max_{c \in C^g} \left\{ U^*_{i,g,c} \right\},$$

where $U^*_{i,g,c}$ is the utility from choosing option c at the end of grade g.

2.5.1.2 Latent Utility and Probability

The expression of the latent utility is given by:

$$U^*_{i,g,c} = X_i \beta_{g,c} + \gamma_{g,c}(\theta_i) + \epsilon_{i,g,c},$$

where X_i is the vector of individual observed characteristics, $\beta_{g,c}$ is the vector of grade-outcome specific slope parameters, $\gamma_{g,c}(\theta_i)$ is an individual-grade-outcome specific intercept (that depends on the unobserved individual factors, represented by θ_i) and $\epsilon_{i,g,c}$ is an error term.

Then, assuming that $\epsilon_{i,g,c}$ is an i.i.d. extreme value variable, we can write the probability that an individual i exits to the outcome c once he achieved grade g as an extension of McFadden's (1974) conditional logit model:

$$\Pr\left(D_{i,g,c} = 1 | X_i, \theta_i\right) = \frac{\exp\left(X_i \beta_{g,c} + \gamma_{g,c}(\theta_i)\right)}{\sum_{a \in C^g} \exp\left(X_i \beta_{g,a} + \gamma_{g,a}(\theta_i)\right)} \qquad \text{for } c \in C^g,$$

where $D_{i,g,c} = 1$ if individual i's outcome after grade g is $c \in C$, i.e. if $\widehat{c}_{i,g} = c$. As is standard in conditional logit models, we have to normalize one benchmark outcome to zero at each grade level. Therefore, $\beta_{g,\widetilde{c}} = 0$ and $\gamma_{g,\widetilde{c}}(\theta_i) = 0$ for benchmark state $\widetilde{c}$.

2.5.1.3 Hazard Rate

Now, let denote H_{i,g,c_j} the hazard rate, i.e. the probability that individual i exits to the employment outcome c_j, given he decided to continue schooling at the $g-1$ previous

grade levels:

$$H_{i,g,c_j}(X_i,\theta_i) = \prod_{b=1}^{g-1} \Pr\left(D_{i,b,cont} = 1|X_i,\theta_i\right) \cdot \Pr\left(D_{i,g,c_j} = 1|X_i,\theta_i\right) \qquad j = 1,\ldots,5.$$

2.5.2 Transition After a Fixed Term Contract

2.5.2.1 Choice Sets and Optimal Choice

Like we did for schooling choices and the first contract outcome, we have now to define the choice sets after a short FTC (c_2) or a long one (c_3). These choice sets are denoted $E^{c_2} = E^{c_3} = \{e_1,\ldots,e_6\}$, where $e_1,\ldots,e_6$ are the six alternatives for the first transitions. They correspond respectively to IPC_2, EPC_2, $EPCU_2$, $EFTC_2$, $EFTCU_2$ and Res_2.

The optimal choice for an individual i after contract c_j, $j = 2,3$, obtained at grade level g, $g = 2,\ldots,5$ is given by:

$$\widehat{e}_{i,g,c_j} = \arg\max_{e \in E^{c_j}} \left\{ U^*_{i,g,c_j,e} \right\},$$

where $U^*_{i,g,c_j,e}$ is the utility from choosing option e after contract c_j, $j = 2,3$ (i.e. $sFTC_1$ or $lFTC_1$) obtained at grade g.

2.5.2.2 Latent Utility and Probability

The expression of the latent variable is given by:

$$U^*_{i,g,c_j,e} = X_i\beta_{g,c_j,e} + \gamma_{g,c_j,e}(\theta_i) + \epsilon_{i,g,c_j,e}.$$

The individual characteristics (X_i) and the form adopted for $\epsilon_{i,g,c_j,e}$ are the same as for schooling and the first contract outcome.

The probability that the individual i exits to outcome e after contract c_j obtained at grade g is then:

$$\Pr\left(D_{i,g,c_j,e} = 1 | X_i, \theta_i\right) = \frac{\exp\left(X_i\beta_{g,c_j,e} + \gamma_{g,c_j,e}(\theta_i)\right)}{\sum_{a \in E^{c_j}} \exp\left(X_i\beta_{g,c_j,a} + \gamma_{g,c_j,a}(\theta_i)\right)},$$

where $D_{i,g,c_j,e} = 1$ if individual i's outcome after contract c_j at grade g is $e \in E$, i.e. if $\widehat{e}_{i,g,c_j} = e$. Like we did previously, $\beta_{g,c_j,\widetilde{e}} = 0$ and $\gamma_{g,c_j,\widetilde{e}}(\theta_i) = 0$ for benchmark state $\widetilde{e}$.

2.5.3 Unobserved Heterogeneity

In the spirit of Heckman and Singer (1984), a discrete distribution is adopted for unobserved heterogeneity. Assuming that there are K types in the population, the probabilities associated to the K types are specified as logistic transforms:

$$p_k = \frac{\exp q_k}{\sum_{s=1}^{K} \exp q_s} \qquad k = 1, \ldots, K,$$

where q_k's are parameters to be estimated, with the restriction that $q_K = 0$.

Given we use an individual-grade-outcome-specific intercept term in our model specification, $\gamma_{g,c}(\theta_i)$ for schooling and the first contract outcome, and $\gamma_{g,c_j,e}(\theta_i)$ for the first transition, the K types distribution induces the estimation of K type-specific intercepts for each outcome equation at each schooling level. Therefore, unobserved heterogeneity in our model has to be interpreted as a vector of schooling and labor market unobserved skills, ability or motivation, whose dimension is K times the number of latent equations modeled.

2.5.4 Likelihood Function

As a consequence, the likelihood for an individual i of type k who stops schooling after the completion of grade g and is directly employed in a PC (c_1), an "other" limited term

contract (c_4) or who is unemployed (c_5) after three years is:

$$L^k_{i,g,c_j}(X_i) = \left[H^k_{i,g,c_j}(X_i)\right]^{1[d_{i,g,c_j}=1]} \qquad \text{for } j = 1,4,5.$$

For an individual who is employed in a short FTC (c_2) or a long FTC1 (c_3), at grade g, followed by the outcome e_l, the likelihood reads:

$$L^k_{i,g,c_j,e_l}(X_i) = \left[H^k_{i,g,c_j}(X_i) \cdot \Pr\left(D_{i,g,c_j,e_l} = 1 | X_i, \theta_i\right)\right]^{1[d_{i,g,c_j,e_l}=1]}$$
$$\text{for } j = 2,3 \text{ and } l = 1,\ldots,6.$$

Therefore, the likelihood for an individual i of type k is the following:

$$L^k_i(X_i) = \prod_{g=1}^{5}\left[L^k_{i,g,c_1}(X_i) \cdot \left(\prod_{l=1}^{6} L^k_{i,g,c_2,e_l}(X_i)\right) \cdot \left(\prod_{l=1}^{6} L^k_{i,g,c_3,e_l}(X_i)\right) \cdot L^k_{i,g,c_4}(X_i) \cdot L^k_{i,g,c_5}(X_i)\right].$$

Finally, the mixed likelihood for an individual i is simply:

$$L_i(X_i) = \sum_{k=1}^{K} p_k \cdot L^k_i(X_i).$$

The model is estimated by maximization of the sum of all individual (mixed) log likelihoods.

2.6 Unobserved Heterogeneity and the Goodness of Fit

The estimation of the model has been done with a various number of types. We selected 3 as the optimal number of types since moving to a larger number of types does not increase the fit of the model. Table 2.2 shows the repartition of the three types in the population, obtained form the parameter estimates. It shows that there is a smaller proportion of type 2 individuals and that types 1 and 3s are almost evenly distributed.

Table 2.2: Estimated Unobserved Heterogeneity Distribution

Type 1	Type 2	Type 3
35.0%	28.6%	36.4%

Table 2.3: Actual and Simulated Grade Distributions

Grade	Actual Sample	Simulated Sample			
		Average	Type 1	Type 2	Type 3
1	0.080	0.079	0.001	0.276	0.000
2	0.240	0.238	0.528	0.113	0.055
3	0.243	0.244	0.160	0.217	0.347
4	0.183	0.184	0.167	0.175	0.209
5	0.256	0.254	0.144	0.219	0.389
Average Grade	3.295	3.296	2.924	2.946	3.930

From the parameter estimates and covariates, we compute simulated choices (schooling attainments and employment contract outcomes) for all the individuals of the sample. We first compute simulated choices for each unobserved heterogeneity type separately, and then compute simulated choices when the distribution of types corresponds to the one estimated. In this last case, according to the distribution of types estimated, we randomly assign a type to each worker of the sample. The simulated distributions of choices are then compared with the ones actually observed in the data to assess the goodness of fit of the model. As is shown in Table 2.3 for the schooling attainments and in Table 2.4 for the contractual outcomes, simulated and actual distributions very close each other. This underlines the good job of the model to fit the data, which is certainly due to its flexibility. Moreover, there are clear different patterns across types, both in schooling attainments and contract outcomes, which show that individual unobserved heterogeneity plays an important role. Now, we turn to a detailed description of simulated distributions, focusing on the comparison of unobserved heterogeneity types patterns.

Table 2.4: Actual and Simulated Employment Contract Outcomes

Contract Outcome	Actual Sample	Simulated Sample			
		Average	Type 1	Type 2	Type 3
First Employment Spell					
PC_1	0.313	0.309	0.319	0.138	0.396
$sFTC_1$	0.118	0.116	0.125	0.114	0.109
$lFTC_1$	0.429	0.434	0.382	0.608	0.386
Oth_1	0.099	0.100	0.135	0.092	0.071
Out_1	0.041	0.041	0.039	0.048	0.038
First Transition After a Short FTC					
IPC_2	0.194	0.184	0.193	0.129	0.206
EPC_2	0.085	0.096	0.103	0.109	0.080
$EPCU_2$	0.069	0.066	0.041	0.146	0.046
$EFTC_2$	0.249	0.249	0.343	0.071	0.251
$EFTCU_2$	0.287	0.292	0.179	0.461	0.317
$Res2$	0.116	0.113	0.141	0.084	0.100
First Transition After a Long FTC					
IPC_2	0.207	0.207	0.287	0.141	0.191
EPC_2	0.098	0.100	0.120	0.135	0.049
$EPCU_2$	0.058	0.058	0.038	0.075	0.062
$EFTC_2$	0.187	0.186	0.125	0.198	0.233
$EFTCU_2$	0.156	0.161	0.122	0.203	0.159
$Res2$	0.294	0.288	0.308	0.248	0.306

2.6.1 Simulated Schooling Attainments

Table 2.3 shows that 8% of the sample have no qualification[20] and that it concerns almost only type 2s. The majority of type 1 individuals stop at the end of the second schooling level (first degree in vocational high school), and individuals of type 3 clearly form the highest educated group (39% of type 3s get a diploma whose level is at least 3 years after high school completion and their average level is one point higher than the other types').

2.6.2 Simulated Employment Contract Outcomes

We now describe employment outcomes reported in Table 2.4. Concerning the first employment spell, FTC is the most likely outcome in the whole population (12% are employed in short FTCs and 43% in long FTCs). Type 2s are characterised by a very high proportion of employment in long FTCs (61%). For types 1 and 3s, FTC is also the most likely outcome, but they get more often PCs (32% for type 1s, 40% for type 3s) than type 2s (14%). We can note that type 3 is associated both to the highest schooling attainments and the highest frequency of permanent employment at the beginning of the first spell.

For the second contract outcome, the distinction between short and long FTCs appears to be meaningful, since they lead to different patterns concerning subsequent outcomes. The proportion of workers belonging to the residual category, Res_2 (censored employment spells, other types of limited-term contracts and unemployed), is much higher after long FTCs (29%) than after short FTCs (12%) and the sum of proportions of PC outcomes (IPC_2, EPT_2 and $EPCU_2$) is identical after short and log FTCs (35%). Therefore, conditionning on being employed in a regular form of employment in period 2, workers get more often a PC after a long FTC than after a short one. Outcomes vary with respect to the types as well. After short FTCs, type 2s get more often PCs, especially after a period of unemployment (15%) whereas types 1s and 3s are more often employed in FTCs (52% and 57% respectively). After long FTCs, which is the most likely outcome at period 1 for all types, one can remark that type 1s have the highest rate of conversion

[20] We already mentioned that, because of this small number of observations, no employment outcome is modeled at that level.

of FTCs into PCs in the same firm (29%). Concerning type 2s, they have a high likelihood of external Permanent Contract outcome (through EPC_2 or $EPCU_2$, which amounts to 21%).

2.7 The Impact of the First Fixed Term Contract on the Access to Permanent Employment

In this section, we investigate how employment in a FTC after school completion affects the probability of employment in a PC. Firstly, we check if the probability of PC employment increases or not after a first employment spell in a FTC, once controlling for covariates, schooling attainments and unobserved heterogeneity. The goal of this analysis is to determine if the first FTC has rather a "trap" or a "port of entry" role in the access to permanent employment and if the net effect varies across schooling levels. Secondly, we investigate if, after a period of employment in a FTC which is not converted into a PC in the same firm, the occurrence of an unemployment period affects the probability of permanent employment, other parameters being fixed. In analyzing this question, we determine if a subsequent job search spell helps workers to form permanent matches after a first FTC match not internally converted.

2.7.1 Measuring the Causal Impact of the First Fixed Term Contract

We measure the causal impact of the first FTC on the access to permanent employment as the difference between the probabilities of employment in a PC after and before a FTC, after controlling for observed and unobserved factors. The causal impact is positive (resp. negative) if the probability of PC increases (resp. decreases) after the first FTC. In order to control for observed and unobserved factors, we compute the probabilities at each schooling level and for each unobserved heterogeneity type, fixing the covariates' values at the mode of their distribution, i.e. for a man having a white collar father and a white collar mother both born in France, living in an urban area and not being delayed at school.

More precisely, the probability of permanent employment before a FTC is the probability associated to the PC_1 outcome. The probability of PC after a FTC is the sum of the probabilities of all states associated to permanent employment in period 2 (IPC_2, EPC_2 and $EPCU_2$). Since we focus on PC outcomes relative to FTC outcomes, we control for not being unemployed or employed in another limited term contract by dividing the PC probabilities respectively by the probabilities of employment in PC or FTC in periods 1 and 2. Therefore, the causal impact of the first FTC for type k and at schooling level g is measured by:

$$\frac{\Pr(IPC_2|\widetilde{X},g,k)+\Pr(EPC_2|\widetilde{X},g,k)+\Pr(EPCU_2|\widetilde{X},g,k)}{1-\Pr(Res_2|\widetilde{X},g,k)} - \frac{\Pr(PC_1|\widetilde{X},g,k)}{1-\Pr(Oth_1|\widetilde{X},g,k)-\Pr(Out_1|\widetilde{X},g,k)},$$

where $\widetilde{X}$ denotes the mode of the X distribution. We also compute the causal impact independently of the schooling levels as the sum of the differences at each grade level g multiplied by the probability of obtaining grade g. Standard errors are obtained from parametric bootstrap.

Table 2.5 contains measures of the causal impact of short and long FTCs. When the impact is averaged across the schooling levels, long FTCs have a positive impact for types 1 and 2s and an insignificant impact for type 3s. The magnitude of the impact differs across types: type 2s have a higher impact (the first FTC increases the probability of PC employment by 22 percentage points, p.p.) than type 1s (13 p.p.). Short FTCs have also a significant causal impact for types 1 and 2s, but it becomes negative for type 1s (-11 p.p.).

When we investigate more closely the causal impact by schooling level and by type, we find that types 1 and 2s have a positive or not significant impact at all grades, except for type 1s at grade 3 for short FTCs, whose impact is negative and high (-55 p.p.). This is that particular case that drives the average negative impact of short FTCs. Concerning type 3s, even if the average impact of both short and long FTCs is not significant, it

Table 2.5: Causal Impact of the First Fixed Term Contract

Grade	Type 1		Type 2		Type 3	
Short Fixed Term Contract						
2	-0.031	(0.076)	**0.337**	(0.063)	**0.219**	(0.096)
3	**-0.551**	(0.108)	**0.134**	(0.037)	**0.103**	(0.053)
4	**0.224**	(0.100)	0.025	(0.071)	**-0.134**	(0.040)
5	**0.285**	(0.067)	**0.265**	(0.055)	**-0.222**	(0.071)
All Grades	**-0.115**	(0.038)	**0.202**	(0.031)	0.046	(0.036)
Long Fixed Term Contract						
2	**0.149**	(0.061)	0.009	(0.059)	**-0.281**	(0.054)
3	-0.157	(0.113)	**0.476**	(0.029)	**0.132**	(0.046)
4	**0.479**	(0.100)	0.011	(0.050)	**0.304**	(0.042)
5	**0.548**	(0.044)	**0.650**	(0.044)	**-0.275**	(0.042)
All Grades	**0.132**	(0.033)	**0.220**	(0.028)	-0.021	(0.024)

Note 1: The causal impact of a FTC is:

$$\frac{\Pr(IPC_2|.) + \Pr(EPC_2|.) + \Pr(EPCU_2|.)}{1 - \Pr(Res_2|.)} - \frac{\Pr(PC_1|.)}{1 - \Pr(Oth_1|.) - \Pr(Out_1|.)}$$

Note 2: In parenthesis: Standard errors computed using parametric bootstrap. In bold: Significant differences at 5%.

is highly heterogeneous across grades. What is of particular interest is the fact that both short and long FTCs' impact is negative at the highest grade (-22 p.p. and -27 p.p. respectively), and positive at grade 3 (10 p.p. and 13 p.p.), which concerns respectively 39 and 35% of type 3s (cf. Table 2.3).

Overall, those results show that the impact of the first FTC is either not significant or positive for a large number of schooling and unobserved characteristics combinations. Nevertheless, we find a negative impact for some subsets of the population. Therefore, those results suggest that employment in a FTC during the first employment spell has a "stepping stone" effect for a majority of workers, but it can be a "trap" for other workers. More generally, our results highlight the importance of schooling and unobserved characteristics in analyzing the impact of the first FTC on employment outcomes. Indeed, they suggest that, even if an average "port of entry" role of FTCs is found, it may hide a "trap" effect that is related to individual characteristics.

2.7.2 Measuring the Causal Impact of a Job Search Spell After a Fixed Term Contract not Internally Converted

Now, we investigate the role played by the unemployment spell that follows a FTC that is not internally converted into a PC in the same firm. More precisely, we compute the difference between the PC probability right after the first FTC given no internal conversion and the PC probability after an unemployment spell. In order to get a causal impact, we proceed as in the previous part, by computing the difference by schooling attainment and by unobserved heterogeneity type, at the mode of the covariates' distribution.

More precisely, the PC probability after a FTC not internally converted is the probability associated to the EPC_2 outcome relative to FTC_2, and the PC probability after the subsequent period of unemployment is the one associated to $EPCU_2$ relative to $FTCU_2$. The causal impact for type k and at schooling level g is thus given by the following expression:

$$\frac{\Pr(EPCU_2|\widetilde{X},g,k)}{\Pr(EPCU_2|\widetilde{X},g,k)+\Pr(FTCU_2|\widetilde{X},g,k)}-\frac{\Pr(EPC_2|\widetilde{X},g,k)}{\Pr(EPC_2|\widetilde{X},g,k)+\Pr(FTC_2|\widetilde{X},g,k)}.$$

The values of this partial effect are provided in Table 2.6. For an average schooling level, the impact of unemployment after a long FTC not internally converted is negative for type 1s (-23 p.p.), not significant for type 2s and positive for type 3s (18 p.p.). Those impacts differ if the first FTC is of short duration, since the same impact is not significant for type 1s and negative for type 2s (-24 p.p.) and 3s (-29 p.p.). Here again, one can observe a large variation in the impacts across classes of schooling levels and unobserved heterogeneity types. For type 1s, it is negative at schooling levels 2 and 5, whatever the length of the first FTC, and negative at schooling level 3 only if the first FTC is of long duration. Concerning type 2s, the impact after a short FTC is negative at all grades, except at grade 2, and the impact after a long FTC is positive only at grade 2. Finally, for type 3s, we can note that the impact is positive at the highest grade level after short and long FTCs.

Table 2.6: Causal Impact of Unemployment after a Fixed Term Contract not Internally Converted

Grade	Type 1		Type 2		Type 3	
After a Short Fixed Term Contract						
2	**-0.186**	(0.055)	0.065	(0.130)	**-0.926**	(0.034)
3	**0.473**	(0.095)	**-0.267**	(0.072)	**-0.463**	(0.076)
4	**0.365**	(0.100)	**-0.801**	(0.048)	**0.161**	(0.051)
5	**-0.387**	(0.111)	**-0.257**	(0.104)	**0.934**	(0.030)
All Grades	0.042	(0.045)	**-0.243**	(0.058)	**-0.292**	(0.030)
After a Long Fixed Term Contract						
2	**-0.209**	(0.049)	**0.464**	(0.090)	**0.331**	(0.069)
3	**-0.434**	(0.077)	**-0.219**	(0.058)	0.078	(0.043)
4	**0.132**	(0.065)	**-0.292**	(0.055)	0.109	(0.071)
5	**-0.495**	(0.062)	0.060	(0.068)	**0.179**	(0.059)
All Grades	**-0.231**	(0.036)	0.054	(0.038)	**0.181**	(0.033)

Note 1: The causal impact of a unemployment given no internal conversion is:

$$\frac{\Pr(EPCU_2|.)}{\Pr(EPCU_2|.)+\Pr(FTCU_2|.)} - \frac{\Pr(EPC_2|.)}{\Pr(EPC_2|.)+\Pr(FTC_2|.)}$$

Note 2: In parenthesis: Standard errors computed using parametric bootstrap. In bold: Significant differences at 5%.

From these results, we can conclude that, when a FTC is not internally converted into a PC, the impact of a subsequent unemployment period on the probability of PC employment is highly dependent on the schooling attainment and unobserved characteristics. For a significant part of the population, the probability of forming a PC match is lower after this unemployment spell.

We now check if the sign of the causal impact of unemployment is correlated to the sign of the causal impact of the first FTC. Table 2.7 crosses the signs of both causal impacts reported in Tables 2.5 and 2.6 for each subgroup of the population, defined by their unobserved heterogeneity types and schooling attainments. It shows a clear correlation between the signs of these two causal impacts. Indeed, subgroups having a positive or unsignificant impact of the first FTC are also more likely to have a non significant or positive impact of unemployment, except for type1s with schooling level 4 and type 2s with schooling level 2 after a long FTC only. More clearly, for all groups

Table 2.7: Correlation Between the Signs of the Causal Impact of the First Fixed Term Contract and the Causal Impact of Subsequent Unemployment

		Causal Impact of Unemployment		
		Positive	Not Significant	Negative
Causal Impact of a Short FTC	Positive	T1S4	T2S2	T1S5 T2S3 T2S5 T3S2 T3S3
	Not Significant			T1S2 T2S4
	Negative	T1S3 T3S4 T3S5		
Causal Impact of a Long FTC	Positive	T1S4	T2S5 T3S3 T3S4	T1S2 T1S5 T2S3
	Not Significant	T2S2		T1S3 T2S4
	Negative	T3S2 T3S5		

Note: The signs of the causal impacts of the first FTC and unemployment are the ones reported in Tables 2.5 and 2.6 respectively. T*a*S*b* stands for Type *a* at schooling level *b*.

of workers having a negative effect of the first FTC, the impact of unemployment is positive, whatever the length of the FTC.

Those results therefore show that, for subgroups of the population characterized by a higher likelihood of permanent employment after a FTC, a subsequent period of unemployment has a negative impact on the PC likelihood. At the opposite, subgroups experiencing a lower PC employment probability after a FTC may benefit from a subsequent period of unemployment in order to form a PC match, if their first FTC is not internally converted into a PC.

2.8 The Impact of Schooling Attainments on the Access to Permanent Employment

In the previous section, we showed that the influence of the first FTC and the subsequent spell of job search were heterogeneous across schooling attainments and unobserved characteristics. In this section, we analyze more closely the role played by schooling in explaining PC employment outcomes. In a first part, we compute the marginal impact of schooling on the probability of PC employment, after controlling for observed and unobserved factors. In a second part, we measure how important are schooling attainments, relative to other explanatory factors, in explaining the access to permanent employment at various stages of the early career.

2.8.1 Measuring the Marginal Impact of Schooling

We quantify the impact of moving from one educational level to the next one on the probability of forming a Permanent Contract match relative to a Fixed Term Contract one, other factors being fixed. This impact thus measures what we call the (causal) marginal impact, i.e. the difference in the probabilities of permanent employment for two subsequent schooling grades, when covariates and unobserved heterogeneity are controlled. The permanent employment probability is computed as the sum of the probabilities of being employed either in a PC at the beginning of the first job spell (PC_1) or in a PC at the beginning of the second job spell (IPC_2, EPC_2 or $EPCU_2$), conditioning on not belonging to the residual states (Oth_1, Out_1 and Res_2). More precisely, for schooling

grade g and type k, the permanent employment probability is :

$$\begin{aligned}\Pr(PC|\widetilde{X},g,k) \;=\; & \frac{\Pr(PC_1|\widetilde{X},g,k)}{1-\Pr(Oth_1|\widetilde{X},g,k)-\Pr(Out_1|\widetilde{X},g,k)} \\ & + \Pr(sFTC_1|\widetilde{X},g,k)\cdot \\ & \frac{\Pr(IPC_2^s|\widetilde{X},g,k)+\Pr(EPC_2^s|\widetilde{X},g,k)+\Pr(EPCU_2^s|\widetilde{X},g,k)}{1-\Pr(Res_2^s|\widetilde{X},g,k)} \\ & + \Pr(lFTC_1|\widetilde{X},g,k)\cdot \\ & \frac{\Pr(IPC_2^l|\widetilde{X},g,k)+\Pr(EPC_2^l|\widetilde{X},g,k)+\Pr(EPCU_2^l|\widetilde{X},g,k)}{1-\Pr(Res_2^l|\widetilde{X},g,k)},\end{aligned}$$

where $\widetilde{X}$ still denotes the mode of the covariates' distribution.

Then, the marginal impact of grade g is computed as the following difference:

$$MRPC(g|\widetilde{X},k) = \Pr(PC|\widetilde{X},g,k) - \Pr(PC|\widetilde{X},g-1,k).$$

Marginal impact values are presented in Table 2.8. We can remark a high variability of impacts across grades and types. Moving from grade 2 to 3 has a positive impact, only for type 1s (it increases their permanent employment probability by 20 p.p.) whereas it has a negative impact for types 2 and 3s (18 and 11 p.p. respectively). The impact of other schooling levels is either unsignificant or positive. In particular, attaining the highest schooling level has a positive impact of 11 and 22 p.p. respectively for types 2s and 3s. As we can see, the impact of moving to the next educational level is not linear and not always positive. The negative impact found for schooling level 3 is not that much surprising. Indeed, level 2 corresponds to the first degree in vocational high school, whereas schooling level 3 corresponds to high school graduates, included individuals who enter higher education but leave it without completing any degree. Contrary to the majority of individuals who leave school with a high school degree, the ones having a vocational diploma have acquired professional qualifications during high school that make them rapidly operational in the firm. Moreover, there may be lower uncertainty on the productivity level of these workers, who fill principally blue collar positions in

Table 2.8: The Marginal Impact of Schooling on the Permanent Employment Likelihood

Grade	Type 1		Type 2		Type 3	
3	**0.198**	(0.087)	**-0.177**	(0.041)	**-0.109**	(0.041)
4	0.066	(0.092)	0.013	(0.042)	**0.083**	(0.035)
5	0.047	(0.034)	**0.113**	(0.044)	**0.221**	(0.028)

Note 1: The marginal impact of grade g is:

$$MRPC(g|\widetilde{X},k) = \Pr(PC|\widetilde{X},g,k) - \Pr(PC|\widetilde{X},g-1,k)$$

Note 2: In parenthesis: Standard errors computed using parametric bootstrap. In bold: Significant differences at 5%.

the manufacturing sector, compared to higher educated workers, who are more likely to fill white collar and managerial positions. This lowers the employer's expected cost of forming PC matches.

2.8.2 Evaluating the Importance of Schooling Attainments Relative to Other Factors

Now, we analyze the importance of the causal impact of schooling in explaining the access to permanent employment, relative to other factors (unobserved heterogeneity and observed characteristics). This analysis is conducted for three subsequent employment outcomes: (i) Employment in a Permanent Contract at the beginning of the first job spell, (ii) Conversion of a first Fixed Term Contract into a Permanent Contract in the same firm, (iii) Employment in a Permanent Contract in another firm, given the first Fixed Term Contract has not been internally converted.

The importance of schooling is measured as the share of the variance of the PC employment probability explained by the variance of schooling attainments, relative to the share of the variance explained by other factors. This measure is obtained through a variance decomposition technique, whose principle is to regress the simulated indicator of being employed in a PC (relative to being employed in a FTC) on explanatory factors separately: observed covariates, simulated schooling attainments and unobserved

heterogeneity. The share of the variance explained by a particular factor is the ratio between the R^2 of the corresponding regression and the sum of the R^2s of the regressions conducted on all the factors separately.

Simulated schooling attainments and employment outcomes are obtained from the following procedure:

1. A random type is attributed to each individual. The distribution of types in the population corresponds to the one estimated (presented in Table 2.2).

2. At each schooling level and for each individual, the latent utility of each option is computed from parameter estimates, covariates' values and a random draw of the error term (following an extreme value distribution of type I). The simulated schooling grade attained by an individual is the first one at which the simulated utility of continuing schooling is not the highest of all options.

3. For each individual, at his simulated schooling level, the simulated latent utility of being employed in a PC (for the first contract, the internal transformation and the external PC given no internal transformation) is compared with the utility of being employed in a FTC. The simulated outcome attributed (PC or FTC) is the one associated to the highest latent utility value.

This procedure enables us to obtain a simulated outcome, either employment in a PC or employment in a FTC, for each individual, even if none of the 2 alternatives correspond to the maximum latent utility value. For example, when we compute the simulated outcome of obtaining a PC after a long FTC not internally transformed, we compare the latent utilities of obtaining an external PC not preceded by an unemployment period ($\widetilde{U}^*_{i,g,EPC_2^l}$), obtaining an external PC after an unemployment period ($\widetilde{U}^*_{i,g,EPCU_2^l}$) and obtaining a FTC preceded or not by an unemployment period ($\widetilde{U}^*_{i,g,FTC_2^l}$ and $\widetilde{U}^*_{i,g,FTCU_2^l}$ respectively). If the maximum value is $\widetilde{U}^*_{i,g,EPC_2^l}$ or $\widetilde{U}^*_{i,g,EPCU_2^l}$, the simulated outcome is a PC, whereas if it is $\widetilde{U}^*_{i,g,FTC_2^l}$ or $\widetilde{U}^*_{i,g,FTCU_2^l}$, the simulated outcome is a FTC. Therefore, even if, for an individual, the simulated latent utility value of obtaining a PC in the same firm ($\widetilde{U}^*_{i,g,IPC_2^l}$) is higher than all those values, we nevertheless obtain a (counterfactual)

Table 2.9: Variance Decomposition of Obtaining a Permanent Contract for the First Job Spell

Observed Covariates	19%
Simulated Schooling	32%
Unobserved Heterogeneity	49%

simulated outcome for being hired in a PC rather than a FTC in an external firm, conditioning on the fact that the first FTC has not been converted in the same firm.

Obtaining such counterfactual simulated outcomes for all the individuals of the sample is essential in order to perform the variance decompositions of the different employment outcomes on the same sample. Indeed, the distributions of types, covariates and simulated schooling attainments is identical at the successive outcomes considered.

2.8.2.1 Permanent Contract for the First Job Spell

Table 2.9 contains the results of the variance decomposition of the probability of employment in a PC (relative to employment in a FTC) at the beginning of the first job spell. It shows that the variance of schooling attainments accounts for 32% in the variance of PC employment, whereas almost half of the PC employment variance is explained by unobserved heterogeneity.

2.8.2.2 Internal Transformation of a Fixed Term Contract into a Permanent Contract

We now decompose the variance of the probability that the first FTC is converted into a PC in the same firm. The explained variable for this variance decomposition is a dummy indicating that IPC_2 is the most likely outcome, compared to EPC_2, $EPCU_2$, FTC_2 and $FTCU_2$. The variance decomposition is computed separately for outcomes after a short and a long FTC and results are contained in Table 2.10. Unobserved heterogeneity has still the highest explanatory power (38 and 72% respectively). Concerning the role of schooling, we can remark that it is quite stable (31%) concering the internal transormation after a short FTC compared to the role it plays on the first PC outcome. However, after a long FTC, the magnitude of the causal impact of schooling falls to 17%,

Table 2.10: Variance Decomposition of an Internal Conversion into a Permanent Contract for the Second Job Spell

	After a short FTC	After a long FTC
Observed Covariates	31%	11%
Simulated Schooling	31%	17%
Unobserved Heterogeneity	38%	72%

whereas unobserved heterogeneity has a strong explanatory power, which amounts to 72%.

2.8.2.3 External Permanent Contract after a Fixed Term Contract not Internally Converted

Now, we study the determinants of the probability of employment in a Permanent Contract, after a spell of employment in a FTC that has not been internally converted into a PC. The outcome of interest is an indicator of obtaining an external PC (EPC_2 or $EPCU_2$) rather than an external FTC (FTC_2 or $FTCU_2$). Again, the analysis is performed for the two types of first FTCs (long and short ones) and results are shown in Table 2.11. We find that the impact of schooling is not decreasing in explaining external permanent employment after a FTC. More precisely, it remains stable after a short FTC (29%) and slightly increases after a long FTC (37%). Covariates explain a relatively higher share of the PC outcome, especially after a short FTC (46%), whereas unobserved heterogeneity explains 39 and 25% of the variance. Those results contrast with the ones found for the internal permanent employment outcome. Indeed, schooling does not have a lower impact compared to the first employment outcome. Instead, its impact is close to the one found for the internal transformation after a short FTC (29 and 31% respectively) and much higher after a long FTC (37 and 17% respectively).

Table 2.11: Variance Decomposition of an External Permanent Contract for the Second Job Spell, Given no Internal Transformation

	After a short FTC	After a long FTC
Observed Covariates	46%	24%
Simulated Schooling	29%	37%
Unobserved Heterogeneity	25%	39%

2.8.2.4 Scope and Limits of Employer Learning to Interpret the Evolution of the Impact of Schooling on Successive Employment Outcomes

Our results on the evolution of the causal impact of schooling on successive employment outcomes can be put in line with results obtained in the literature testing the presence of employer learning and statistical discrimination on schooling. Altonji and Pierret (2001) estimate a wage equation in which they incorporate schooling, experience, and an interaction between schooling and experience as explanatory variables. They also add the score obtained in an ability test (the Armed Forces Qualification Test), which is assumed to be observed by the econometrician, but not by employers. Their results show a decreasing impact of schooling and an increasing impact of the AFQT score with experience. This is consistent with the implications given by a model of symmetric employer learning, in which the schooling level is used by employers as a signal on the worker's ability level (the unobserved part of his productivity). When the worker accumulates experience, employers rely more on observations of produced output and less on schooling to infer the worker's ability level.[21] Schönberg (2007) extends their framework, by considering job tenure, to test if employer learning is symmetric or asymmetric. She shows that, when learning is symmetric, schooling and ability variables have the same impact on wage offers of incumbent and outside employers, but when learning is asymmetric, the impact of schooling (resp. test score) is more important for

[21] This article follows the analysis performed by Farber and Gibbons (1996). They estimate the same equation, but instead of introducing the AFQT score as an explanatory variable, they include the part of the AFQT score which is orthogonal to schooling. Thus, their framework allows employer learning, but not statistical discrimination on schooling, and they show that, under symmetric employer learning, the impact of schooling should remain stable, whereas the impact of the orthogonal test score should increase with experience.

the wage offers of outside (resp. incumbent) firms, since the current employer observes the ability level, whereas outside employers rely solely on schooling to assess the worker's expected ability level. Therefore, she shows that, in the case of asymmetric (resp. symmetric) learning, the impact of the interaction between schooling and tenure should be negative (resp. remain stable) and the impact of the interaction between the test score and tenure should be positive (resp. remain stable). However, null impacts should be found if learning is symmetric. Her results support symmetric learning, except possibly for college graduates.[22]

Here, we do not assess the impact of schooling on earnings, but on the employment contract outcomes, at different employment periods. As argued above, the econometric model developed in this paper treats schooling attainments as endogenous, which makes it possible to distinguish their causal from their spurious impact on employment contract outcomes. The causal impact, which is defined as the residual impact of schooling once unobserved heterogeneity is controlled, may capture two effects. The first one is the direct impact of schooling on the worker's level of human capital, and so on his productivity level. The second effect comes from the signaling role that the level of schooling conveys about the worker's expected productivity level, when it is unobserved.

Let us assume that an employment contract outcome results from an offer made by an employer which is accepted by a worker. Following our discussion of Section 2.2, the contract offer is based on the expected productivity level of the worker: the higher the worker's expected productivity level, the higher the probability that he receives a PC offer. The arguments developed by Altonji and Pierret (2001) imply that, if employers learn on the productivity level of the workers through the observation of produced output during the first FTC, the signaling effect of schooling should be more important for the first employment contract outcome, and should decline for the employment

[22] In a recent paper, Lange (2007) uses the same framework as Altonji and Pierret (2001) to estimate the speed of employer learning and derive an upper bound on the contribution of the signaling impact of schooling. He shows that employers learn quickly (their expectation errors on worker's ability decline by 50% within 3 years) and that the impact of schooling on the gains attributable to signaling is less than 25%.

outcome that follows the first FTC. Indeed, under the symmetric learning hypothesis, the current employer and outside employers rely less on schooling as a signaling tool (unless the FTC period is too short to learn). In the case of asymmetric learning, as argued by Schönberg (2007), outside employers still use schooling as a signal, but the signaling role may be lower if employers combine it with other signals (like the non conversion of the first FTC into a PC in the same firm). If employers do not use the first employment spell to learn on the workers' productivity level, the signaling impact should remain stable between employment outcomes occurring before and after the first FTC.

The results shown in Parts 2.8.2.1 to 2.8.2.3 are consistent with the fact that employers learn during long FTCs on the productivity level of the workers employed in their firm. Indeed, the decreasing causal impact of schooling between the first PC outcome and the internal transformation outcome supports the fact that the current employer relies less on schooling to assess the individual's productivity level. However, learning seems to be asymmetric, since no such decreasing impact of the causal impact of schooling is found for external outcomes after a FTC. This implies that outside employers still rely on schooling to assess the workers' productive level.

Even if this learning interpretation is consistent with our results, it requires the will to accept a crucial hypothesis made in employer learning models about the role of education on post-schooling human capital accumulation. Altonji and Pierret (2001) and Schönberg (2007) suppose that the impact of schooling attainments on a worker's productivity level is identical whatever his experience; this is only the impact of schooling on employers' expectations about unobserved ability (i.e. the signaling role) that decreases as employers learn. However, this static role of schooling on the level of human capital is challenged by Cunha and Heckman (2007), who argue that skill formation is a dynamic process by which the accumulation of skills at time t leads to future skill accumulation, or Belzil, Hansen, and Kristensen (2008), who show complementarity between schooling and training (better educated workers benefit more from training). If the accumulation of experience does not influence the productivity level identically for each schooling level

attained, then, the evolution of the causal impact of schooling does not solely reflect its signaling impact, but also the fact that the productivity level is enhanced differently by accumulated experience at different schooling levels.

2.9 Conclusions and Perspectives

In this article, we estimate jointly schooling decisions and the two first contract outcomes in a dynamic discrete choice model that accounts for individual unobserved heterogeneity. This semi-structural framework allows us to disentangle the causal and the spurious impacts of schooling attainments and the first employment contract on subsequent employment contract outcomes. We investigate the impact of the first FTC on the probability to form a PC match and focus on how schooling attainments relate to this effect. We also measure the causal impact of the unemployment spell that follows the first FTC, not internally converted into a PC, on the permanent employment probability. Then, we measure the importance of schooling attainments, relative to observed factors and individual unobserved heterogeneity, in explaining employment contract outcomes.

Our first results concern the impact of the first FTC on the probability of PC employment. We show a positive effect for a large portion of the population, and a negative impact limited to some groups, characterized by certain schooling attainments and unobserved attributes. The positive effect can be interpreted by several factors: a raise in the productivity level during the first FTC, a higher level of effort provided during a FTC, or a better access to employment networks. At the opposite, the negative effect can result from a lower job search effort in finding a PC match during the first FTC or a negative stigma that employers attribute to employment in a FTC. We further show that, when the first FTC match is not converted into a PC match in the same firm, the subsequent unemployment spell has an impact on the probability to form a PC match, whose sign and magnitude depends on the schooling level and the unobserved individual specific attributes. We find that the impact of unemployment is related to the impact of the first

FTC: all groups of workers having a lower permanent employment probability after the first FTC benefit for the subsequent job search period to form a PC match.

Our second results, about measuring the relative importance of the different factors (schooling attainments, unobserved heterogeneity and observed individual characteristics) in explaining employment contract outcomes, show that schooling attainments explain around one third of the variance of the probability of employment in a PC for the first contract outcome. When the outcome of interest is the conversion of a long FTC into a PC in the same firm, schooling accounts for 17% of the variance, whereas it still accounts for around 30% for external PC outcomes, given no internal conversion of the first FTC. Following Altonji and Pierret (2001), this result can be interpreted by the presence of asymmetric employer learning on the workers' unobserved skills. However, the employer learning interpretation is limited by the restrictive assumption that schooling has a static role on the worker's productivity level (experience has the same impact on the worker's productivity whatever his schooling level).

The analysis conducted in this article can be extended in two directions. The first extension is to consider the economic sector in which PC and FTC matches are formed. Indeed, we may suspect that the probability that a job match is hit by a productivity shock is not homogeneous across economic sectors. In this case, forming a PC match in economic sectors characterized by relatively higher uncertainty levels will be more costly for employers, since the probability of match destruction, which leads to the payment of the firing cost, is higher. Incorporating the economic sector in our a model would require a more sophisticated approach than simply adding it as a control in the set of covariates associated to employment outcomes. Indeed, in our model, covariates measure individual characteristics that approximate the value functions associated to each option. The economic sector of the realized option cannot be included jointly with the determinants affecting the choice. Instead, different economic sectors of employment should be considered as different possible alternatives. The incorporation of the economic sector in our model would therefore lead to build the set of possible options as the intersection between economic sectors and employment contracts. Implementing

this extension by simply adding possible alternatives in our model faces the risk to consider potential alternatives rarely chosen, which raises difficulties in estimating the parameters. This issue has therefore to be considered through a different approach.

The second extension consists in considering the durations of employment and unemployment spells, instead of focusing on their occurrence. To this end, we can consider time as discrete, and define the choice set at each period to be composed by employment in a PC, employment in a FTC and unemployment. The dynamics of the model would come from conditioning the probability of a choice at one period on the choices made at previous periods. Such a model would be a complement of the analysis performed in this article, by studying how the duration dependence in a FTC relates to schooling investment. Moreover, by computing the probability associated to each state at each period, the model would allow to compare the causal impact of a period spent in FTC employment with the causal impact of a period spent in unemployment on the probability of forming a subsequent Permanent Contract match. This potential model would be closer to the matching models of Cahuc and Postel-Vinay (2002) or Blanchard and Landier (2002). An issue of interest would be to use these matching models as a starting point to build a microeconomic model that could lead to the estimation of a fully structural model. This constitutes a very challenging issue for future research.