The dynamics of youth labor market integration

ANNE BUCHER

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Anne Bucher[1]

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Abstract

This paper provides a theoretical and quantitative explanation for the time-consuming integration process of young workers. The search process fails both in matching costlessly firms and workers and in screening matches of poor quality, thus leading to recurring job loss and high unemployment at the entry of the labor market.

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[1]A.Bucher: GAINS-TEPP, Université du Maine, Faculté de Droit et de Sciences Économiques, Avenue Olivier Messiaen, 72085 Le Mans Cedex 9, France - +33(0)2 4383 3134 - e-mail: anne.bucher.etu@univ-lemans.fr

1 Introduction

It is well known that young people face difficulties trying to integrate into the labor market and have to experience several short-lived jobs before settling into more stable employment, ((Gangl M. and Müller W. 2003), (Ryan P. 2001), (Quintini G., Martin J.P. and Martin S. 2007), (OECD 1996a)). OECD data reveal that the probability of being with the same employer five years later is higher for prime-aged workers than for youth, ((OECD 1994)). Younger workers display both higher unemployment rates and higher turnover whatever the country considered. The point is that high youth unemployment rates are mainly due to a high frequency of entry to unemployment rather than lower employment prospects.

This paper attempts to provide a theoretical and quantitative explanation for the labor market integration dynamics of young workers. Surprisingly enough, few theoretical papers explicitly investigate this issue. (Neal D. 1999) developed a job search model to investigate the complexity of job mobility among youth. He argued that changing first both careers and employers is an optimal job search strategy. This should result in higher turnover at the labor market entry. In a recent paper, (Kitao S., Ljungqvist L. and Sargent T. 2008) proposed a complete life-cycle model in which young workers pass through a phase of job churning before being able to accumulate capital. Higher youth unemployment rates in Europe are explained by the rise in minimum wages.

There are two main intuitions behind the school-to-work transition process. The standard approach would be to consider human capital accumulation. As younger workers need to accumulate experience, discrepancies between age-groups in unemployment and separation rates are partly due to differences in productivities. Another approach considers that the information on the labor market is incomplete thus leading to "job shopping". As defined by (Johnson W.R. 1978), "job shopping refers to the period of experimentation with jobs and accompanying high rates of mobility which typically occurs at the beginning of the working life". The idea is the following: some characteristics of a match between a worker and a firm can be ascertained during job search while some others cannot be known without experience in the job. Workers and employers have to engage in production to evaluate the long-term potential of their match. In consequence, new entrants try out jobs to find a suitable match. This approach was mainly advanced by the empirical literature to explain school-to-work transitions while the theoretical one attempted to account for evidence on worker turnover without any consideration for life-cycle issues. (Pries M. and Rogerson R. 2005) developed a worker turnover model that integrates a signal extraction problem in spirit of (Jovanovic B. 1979): the quality of a match is not perfectly observed at the time of meeting but will be revealed stochastically by engaging in production. The main contribution of the paper is to account for worker turnover differences observed between the United states and European countries. They did not investigated discrepancies between age-groups.

This paper proposes to investigate the relevance of the theory of job shopping for explaining the labor market integration process of young workers. The framework I rely on borrows from the learning model developed by (Pries M. and Rogerson R. 2005). I consider an economy in which workers

tend to change job frequently while searching for a good match. Stochastic age-groups are introduced but age specificity is not considered. I explore the employment composition effects when the search process fails in both matching costlessly firms and workers, and screening matches of poor quality. The learning process on match quality is source of recurring job loss at the labor market entry. The specificity of young workers comes from their entry position on the labor market. As new workers need time to find both a job and a good match, separations and unemployment are decreasing with age.

Finally, to test the robustness of the model, I rely on simulations and compute it above French data. The model performs well in reproducing discrepancies observed between 20-24 and 25-54 years old individuals in the separation and unemployment rates.

The next section presents the model that is close to the "laissez-faire" economy of (Pries M. and Rogerson R. 2005). The paper does not account for labor market institutions and I simplify the basic framework proposed by the authors by assuming homogeneity in potential match quality. Finally, the analytical and quantitative results are derived in section 3.

2 The Model

2.1 The environment

The basic environment borrows from the traditional matching model *à la* Pissarides. Workers and firms are forward-looking, risk-neutral and have a common exogenous discount rate of β. Time is discrete and the model is developed in a general equilibrium setting.

The labor force is constant over time. At each period, a fraction δ enters the labor market as young and have a probability $(1 - \lambda)$ of becoming adult next period. All workers have a probability δ to exit from the labor market[2]. Thus, in the absence of any age-targeted policies, heterogeneity in age does not affect the equilibrium value of θ. The paper focuses on employment composition effects while decisions are not age-dependant. To account for the labor market flows from school to work, a fraction $\delta_u < 1$ of new entrants is assumed to start their working-life as unemployed while a fraction $(1 - \delta_u) > 0$ enter the labor market directly as employed in their first job. Actually, this assumption is only relevant for the simulations as it allows me to investigate how labor market frictions affect the unemployment gap between youth and adult workers.

The labor market is affected by search frictions. Workers and firms are brought together according to a standard matching function, $m(u,v) = u^\varphi v^{(1-\varphi)}$ where u and v denote respectively the unemployment and the vacancy rates of the economy. The probability to fill a vacancy and the probability

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[2]Assuming that only adult workers exit from the labor market as they retire would permit to replicate the main features of (Chéron A., Hairault J-O. and Langot F. 2008b) without modifying the results drawn by the analysis. However, the paper focuses on the labor market entry process

of an unemployed finding a job are expressed by respectively $q(\theta) = \frac{m(u,v)}{v}$ and $p(\theta) = \frac{m(u,v)}{u}$, with $\theta = \frac{v}{u}$ the labor market tightness. From the standard properties of the matching function, we have $q'(\theta) < 0$ and $p'(\theta) > 0$. It should be notice that unemployed workers are homogenous so that I do not integrate segmented search between new entrants and experienced workers.

A worker and a firm who are matched together produce an output y which level depends on how the worker's attributes mesh the firm's attributes. A match can be either high productive, y_h, or low productive, y_l. Firms and workers do not perfectly observe the quality of a match, but the proportion of good matches in the economy, ψ, is common knowledge. It represents the probability for a match to be of good quality. I thus differ from (Pries M. and Rogerson R. 2005) by assuming homogeneity in potential match quality. Indeed, the authors assumed that the value of ψ is drawn from a general distribution at the time of meeting. In consequence, firms and workers evaluate the potential of their match before engaging in production and not all matches turn out to be potentially good enough to be formed. This assumption is required to analyze how labor market institutions or policies affect hiring practices. The paper focuses on employment compositions effects in an economy where the search process fails to weed out all matches of poor quality. As I do not investigate hiring practices, I assume that the signal on match quality is common to all matches.
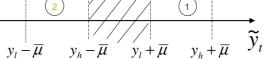
Next, the match quality is revealed stochastically only by engaging in production, in the manner of (Pries M. and Rogerson R. 2005). Firms and workers attempt to infer the quality from the observed output flow, $\tilde{y}_t = y + \mu_t$, which is the sum of two unobserved components, the true match quality, $y = \{y_l, y_h\}$, and a noisy component, μ_t. This last term represents transitory factors that affect the production process. It thus prevents firms and workers from perfectly inferring the information after first producing: the learning process on match quality is then time-consuming. Besides, μ is assumed to be a mean zero *iid* random variable, uniformly distributed on $[-\bar{\mu}, \bar{\mu}]$, so the learning process takes a "all-or-nothing" form, (Figure 1):

- If $\tilde{y}_t < y_h - \bar{\mu}$, the match is revealed to be bad. If $\tilde{y}_t > y_l + \bar{\mu}$, the match is revealed to be good.

- If $\tilde{y}_t \in [y_h - \bar{\mu}, y_l + \bar{\mu}]$, firms and workers cannot determine whether the observation reflects more the match quality rather than a bad or good fortune. They will infer the information next period according to the new realization of μ and regardless of the previous observations.

Let $\alpha = \frac{y_h - y_l}{2\bar{\mu}}$ denote the exogenous probability that the match type is revealed.

Figure 1: The learning process

	The true match quality remains unknown
1	The match is revealed to be good, **output y_l**
2	The match is revealed to be bad, y_h

All jobs have a common probability s to be exogenously destructed in each period and we are interested in equilibria in which matches revealed to be bad are dissolved.
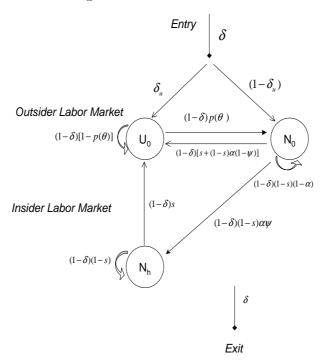
Finally, the assumptions about timing are the following: job search occurring in t entails production in $t+1$. At the end of the period, firms and workers observe the output flow $\tilde{y}_{t+1}$ and the quality will be revealed accordingly. Some matches turn out to be dissolved ; whatever the cause of the separation, firms and workers are allowed to search for a new suitable match next period[3].

2.2   Age Employment dynamics

The *outsider* labor force is defined by workers who are searching for a good match, both unemployed (U) and employed (N_o), and the *insider* labor force by workers who are employed in a match revealed to be good, (N_h). The representation of the labor market is given by figure 2.

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[3]Contrary to (Pries M. and Rogerson R. 2005), I do not assume that a job ceases to exist when hit by a shock. This assumption is required by the authors to distinguish between job and worker turnover.

Figure 2: The Labor market

The labor force is constant over time and normalized to one: $u_t + n_t^o + n_t^h = 1$. The youth and adult population are denoted by the superior $k = y, a$. The employment and unemployment dynamics are given by the following set of equations:

$$u_{t+1}^y = \delta\delta_u + \lambda(1-\delta)\left\{[1 - p(\theta)]u_t^y + [s + (1-s)\alpha(1-\psi)]n_{o,t}^y + sn_{h,t}^y\right\} \tag{1}$$

$$u_{t+1}^a = (1-\delta)[1 - p(\theta)]\left\{(1-\lambda)u_t^y + u_t^a\right\} + s(1-\delta)\left\{(1-\lambda)n_{h,t}^y + n_{h,t}^a\right\} \tag{2}$$

$$+ (1-\delta)\left[s + (1-s)\alpha(1-\psi)\right]\left\{(1-\lambda)n_{o,t}^y + n_{o,t}^a\right\}$$

A fraction δ_u of new entrants and young workers who are separated from their job falls into the youth unemployment pool. The mass of young unemployed workers at period $t + 1$ is thus composed by young workers who start searching for a job in $t + 1$ and by young unemployed workers who did not find a job in period t. Then, the mass of adult unemployed workers at period $t + 1$ is composed by adults and young workers entering the adult age-group who remain or become unemployed. Recall that all workers exit the labor market with rate δ.

$$n_{o,t+1}^y = \delta(1-\delta_u) + \lambda(1-\delta)\left\{p(\theta)u_t^y + (1-s)(1-\alpha)n_{o,t}^y\right\} \tag{3}$$

$$n_{o,t+1}^a = (1-\delta)p(\theta)\left\{(1-\lambda)u_t^y + u_t^a\right\} + (1-\delta)(1-s)(1-\alpha)\left\{(1-\lambda)n_{o,t}^y + n_{o,t}^a\right\} \tag{4}$$

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Unemployed workers who find a job in period t enter the employment pool at period $t+1$. Similarly, a fraction of new entrants are assumed to have searched for a job during education and enter the labor market directly as employed. They have to experience the match to reveal the quality of the employment relationship. Once the quality is known to be good, workers enter the insider segment of the labor market where destructions are only driven by economic shocks.

$$n^y_{h,t+1} = (1-\delta)(1-s)\lambda\{\alpha\psi n^y_{o,t} + n^y_{h,t}\} \tag{5}$$

$$n^a_{h,t+1} = (1-\delta)(1-s)\alpha\psi\{(1-\lambda)n^y_{o,t} + n^a_{o,t}\} + (1-\delta)(1-s)\{(1-\lambda)n^y_{h,t} + n^a_{h,t}\} \tag{6}$$

2.3 The Labor market Equilibrium

There is continuum of identical firms. One firm is assumed to have one job which can be either vacant and costing c by unit of time, or occupied. Workers are either employed specialized in production or unemployed specialized in job search and enjoying some real return z. As the match quality is not perfectly observed, job creation decisions and wage bargaining are based on the signal ψ.

Let Π^v be the value of an unfilled employment position to a firm and V^u be the value of unemployment to a worker. These two values must satisfy:

$$\Pi^v = -c + \beta\{q(\theta)\Pi_o + [1-q(\theta)]\Pi^v\} \tag{7}$$

$$V^u = z + \beta(1-\delta)\{p(\theta)V_o + [1-p(\theta)]V^u\} \tag{8}$$

Π_o and V_o denote the expected gain of matches of unknown quality for respectively firms and workers, and are given by:

$$\Pi_o = \psi y_h + (1-\psi)y_l - w_o + \beta(1-\delta)(1-s)\{(1-\alpha)\Pi_o + \alpha\psi\Pi_h + \alpha(1-\psi)\Pi^v\} \\ + \beta[s+\delta(1-s)]\Pi^v \tag{9}$$

$$V_o = w_o + \beta(1-\delta)(1-s)\{(1-\alpha)V_o + \alpha\psi V_h + \alpha(1-\psi)V^u\} + \beta(1-\delta)sV^u \tag{10}$$

The expected output flow is $E(\tilde{y}_t) = \psi y_h + (1-\psi)y_l$. If the position is revealed to be of good quality, the information is updated: firms and workers get respectively Π_h and V_h that solve:

$$\Pi_h = y_h - w_h + \beta\left\{[s+(1-s)\delta]\Pi^v + (1-s)(1-\delta)\Pi_h\right\} \tag{11}$$

$$V_h = w_h + \beta(1-\delta)\{sV^u + (1-s)V_h\} \tag{12}$$

As is standard, wages are determined according to the Nash bargaining solution in which the worker's threat point is the value of being unemployed and the employer's threat point is the value of a vacancy:

$$w_i = argmax \ \left[V_i - V^u\right]^{1-\gamma}\left[\Pi_i - \Pi^v\right]^\gamma \quad for \ \ i = \{o,h\} \tag{13}$$

with γ, the worker's relative bargaining power coefficient. The sharing rule is given by:

$$(V_i - V^u) = \gamma \left[V_i - V^u + \Pi_i - \Pi^v \right] \tag{14}$$

In equilibrium, all profit opportunities are exploited so that the rent from vacant jobs is drove to zero: $\Pi^v = 0$. The free entry condition implies that:

$$\frac{c}{q(\theta)} = \beta \Pi_o \tag{15}$$

The labor market tightness is such that the expected profit from a new job equals the expected cost of hiring a worker.

Definition 1 *The steady-state equilibrium values of θ, w_o and w_h satisfy the free entry condition 15 and the sharing rule 14:*

$$
\begin{cases}
\dfrac{c}{q(\theta)} = \beta \dfrac{\left[1 - \beta(1-\delta)(1-s)\right](y_0 - w_0) + \beta(1-\delta)(1-s)\alpha\psi(y_h - w_h)}{\left[1 - \beta(1-\delta)(1-s)\right]\left[1 - \beta(1-\delta)(1-s)(1-\alpha)\right]} \\[2em]
w_i = \gamma(y_i + c\theta) + (1-\gamma)b \qquad for \quad i = \{o, h\}
\end{cases}
$$

3 The specificity of youth labor markets

The framework points out that labor market frictions and imperfect information generate discrepancies between age-groups. As young workers need time to find both a job and a good match, they exhibit higher separation and unemployment rates.

3.1 Analytical results

Adults' characteristic is that they have a greater experience on the labor market. Once established in a good match, workers face lower unemployment risks. In the developed framework, the learning process is source of recurring job loss.

Proposition 1 *The destruction rate of outsider employment is higher than the destruction rate of insider employment:*

$$s + (1-s)\alpha(1-\psi) > s$$

Young workers enter the labor market as outsiders, either unemployed or employed. Stochastic revelation of the match quality renders the learning process time-consuming.

Result 1 *The proportion of outsiders should be relatively higher among young workers than among adults. The learning process on match quality thus leads to higher separation and unemployment rates.*

Besides, given that lower qualifications would result in higher mismatch, the lower ψ, the larger destructions on the youth labor market relative the the adult one. Thus, discrepancies between age-groups should be higher in a low-skilled labor market. This is consistent with the empirical evidence.

The shape of the unemployment rate is determined not only by the learning process but also by labor market frictions.

Proposition 2 *Frictions on the labor market render the hiring process time-consuming, the unemployment rate is thus higher at the labor market entry.*

Let us assume that young start their working life as unemployed, $(\delta_u = 1)$. The unemployment rate thus decreases with age even with complete information. Then, a more efficient matching process (a higher $p(\theta)$) would result in lower youth unemployment rates. This is consistent with OECD data. The US labor market is well known for the efficiency of the matching process contrary to Europe. European countries as a whole exhibit a youth unemployment rate 1.5 times higher than in the US. Similarly, the lower the value of δ_u, the lower the unemployment rate at the labor market entry. This suggests that education systems by apprenticeship which result in smoother school-to-work transitions are source of lower discrepancies in unemployment between young and middle-aged workers, as observed in Germany and Denmark (contrary to France or Belgium). Moreover, dual systems should also prevent from mismatch thereby reducing unemployment risks at the labor market entry.

3.2 Quantitative results

I now turn to a quantitative evaluation of the impact of both the matching and the learning processes on the youth labor market. In order to take into account typical age-specific unemployment rates, I consider a youth population composed by 20-24 years old individuals starting working, and adult workers who are between 25 and 54 years old. Simulations allow me to investigate the robustness of the framework. The model is computed above French data in order to reproduce labor market flows observed in 2002 for the whole population. I investigate its strength to reproduce discrepancies by age-groups.

3.2.1 Calibration

The month is taken as unit of time. As we are interested in equilibrium in which matches revealed to be bad are dissolved[4], we set $y_l = b$. The calibration of parameters α, s and δ_u is based on data from the French Labor Force Survey 2002. Employment of tenure higher than 5 years should be composed by matches revealed to be good while employment of tenure lower than 1 year should be composed by matches of unknown quality. I consider the empirical transition rates from employment to unemployment between 2001 and 2002 as proxies for the separation rates of outsider and insider employment. The exogenous destruction rate of the economy is fixed accordingly. The probability

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[4]$y_l = b$ is a sufficient condition to ensure that $\Pi_l = (1 - \gamma)(y_l - b) + \gamma c\theta + \beta(1 - s)\Pi_l < 0$

α is computed to match the difference between separation rates of outsider and insider employment. Theoretically, this difference is given by: $f_0 - f_h = [s + (1-s)\alpha(1-\psi)] - s \iff \alpha = \frac{f_0 - f_h}{(1-s)(1-\psi)}$. Then, we choose a value of ψ that reproduces an overall separation rate of 0.82%. Next, the fraction of new workers starting their working life as unemployed, δ_u, is set according to the monthly transition rate from school to unemployment observed in 2002. Finally, the targeted hiring rate is 8.52%. The level of the unemployment income, b, is computed to ensure that the desired tightness is an equilibrium value. The calibration is summarized in Table 1.

Table 1: Calibration

Parameters		Values	Targets
Discount factor	β	0.9966	annual interest rate, $r = 4\%$
Elasticity of the matching function with respect to u	φ	0.5	(Petrongolo B. and Pissarides C. 2001)
Worker's bargaining power	γ	0.5	
Probability to start the working life as unemployed	δ_u	0.3	French LFS 2002
Probability for a worker to remain young	λ	0.9833	The youth population is composed by 20-24 years old individuals
High level of match's quality	y_h	1	Normalization
Low level of match's quality	y_l	b	Equilibrium condition
Cost of a vacancy	c	3.5211	$\frac{c}{q(\theta)} = 0.3y_h$, (Mortensen D. and Pissarides C. 2003)
Exogenous destruction rate	s	0.0002	French LFS, separation rate of jobs with tenure > 5 years
Unemployment income	b	0.9251	French LFS, Monthly hiring rate of 8.52%
Probability that the match is of high quality	ψ	0.0986	French LFS, Monthly firing rate of 0.82%
Probability of revelation	α	0.0272	French LFS, $f_0 - f_h = 0.0245$

3.2.2 Results

The first column of Table 2 summarizes the main labor market statistics observed in France in 2002. Simulation results[5] are reported in the second column.

Table 2: Results for the [20-24] and [25-54] years old

	French Economy 2002	Simulation	Simulation for $\delta_u = 0$
Unemployment rate, (%):	7.6	9.03	8.68
[20-24]	17.58	21.58	17.28
[25-54]	6.72	8.20	8.11
Youth relative to Adult	2.6	2.59	2.13
Firing rate, (%):	0.82	0.82	0.82
[20-24]	2.89	2.16	2.16
[25-54]	0.66	0.75	0.75
Youth relative to Adult	4.3	2.88	2.88
Hiring rate, (%):	8.52	8.52	8.52
[20-24]	12.36	8.52	8.52
[25-54]	7.65	8.52	8.52
Youth relative to Adult	1.6	1	1

The model performs well in reproducing discrepancies between age-groups in unemployment and separation rates. The learning process explains almost 70% of the observed discrepancies in firings between young and adult workers while the simulated unemployment ratio between youth and adults almost equals the observed one. Recall that the probability $p(\theta)$ is common to all workers, so this framework is not able to reproduce the shape of the hiring rate. In consequence, the youth unemployment rate is overestimated. Similarly, I do not consider the employment protection legislation. Young workers are mainly hired in fixed-term contracts which improves worker turnover. We can suppose that taking into account this fact will allow us to better match the worker turnover's profile and discrepancies in the unemployment rate.

Next, the analysis suggested that labor market frictions imply higher unemployment at the labor market entry when workers start their working life as unemployed. The youth-adult unemployment gap thus results from both the time-consuming matching and learning processes. In order to investigate the contribution of the learning process on the shape of the unemployment rate, the model

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[5]Computing and simulating the model to match worker turnover observed in France in 1994 gave similar results. They are available upon request.

Table 3: Results for the [20-29] and [30-54] years old

	French Economy 2002	Simulation	Simulation for $\delta_u = 0$
Unemployment rate, (%):	7.6	9.02	8.68
[20-29]	13.06	19.47	17.01
[30-54]	6.16	7.64	7.58
Youth relative to Adult	2.12	2.55	2.24
Firing rate, (%):	0.82	0.82	0.82
[20-29]	1.95	1.94	1.94
[30-54]	0.55	0.69	0.69
Youth relative to Adult	3.57	2.81	2.81
Hiring rate, (%):	8.52	8.52	8.52
[20-29]	11.52	8.52	8.52
[30-54]	6.90	8.52	8.52
Youth relative to Adult	1.67	1	1

is simulated for a null value of δ_u. Young people directly start their working life as employed but have to experience several jobs in order to find a suitable match. In consequence, all discrepancies in the unemployment rate results from the time-consuming learning process that generates recurring job loss. The simulation results suggest that the learning process accounts for 83% of the simulated discrepancies in unemployment between age-groups: the ratio between youth and adult unemployment reaches 2.24 while the model with $\delta_u > 0$ reproduces a ratio of 2.55. The unemployment gap is mainly due to the learning process on match quality.

Finally, one can question the age-groups' choice. To test the robustness of the model, simulations are done considering the following age-groups: [20-29] and [30-54] years old individuals. Results are similar to the previous ones (Table 3). The model is now able to match 78.7% of the differences in unemployment risks between young and adult workers, and 87.8% of the unemployment gap between young and adults comes from the time-consuming learning process. As the age-group of young workers is larger, the observed discrepancies get reduced. However, the model is not sensitive enough. The ratio in the separation rate decreases from 2.88 to 2.81 while the observed one goes from 4.3 to 3.57.

4   Conclusion

This paper proposes a basic framework to account for the specificity of youth labor markets observed in most OECD countries. The central feature is that it integrates a signal extraction problem into a matching framework. I do not claim that imperfect information on the labor market is the only source of differences between young and adult workers. Human capital accumulation, labor market institutions and educational systems should obviously impact on workers' labor market trajectories. The purpose of the paper was to examine an approach to which the empirical literature already referred, unlike the theoretical one. The main contribution is thus to show how learning on match quality and labor market frictions interact to explain the integration process of young workers. The theory of job shopping appears to be relevant for explaining the labor market integration dynamics of young workers.

The analysis suggests that the time-consuming learning process is source of recurring job loss at the labor market entry. The model performs well in reproducing discrepancies in separation and unemployment rates by age-group and highlights the major impact of incomplete information on the youth labor market. However, this model is mainly relevant for continental European labor markets. As stated previously, Germany, Netherland or Denmark with dual education systems exhibit smoother labor market integration processes.

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