Young workers' professional experience: employment instability and access to high-skill jobs

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Abstract

This paper studies, in a search-matching model, macroeconomic consequences of an on-the-job search of young workers. The labor market is segmented into two sub-markets: beginner workers' one and the confirmed workers' one offering higher wages. After a long enough employment spell, beginners can search a better job in the confirmed sub-market. Whereas the relaxing of workers' contracts is advocated in order to reduce youth unemployment, we show that with higher instability in beginners' jobs, there is a fall in employment in the high-skill sub-market, consequently penalizing the overall economy by dragging domestic production downward.

Key-words: segmented labor market, on-the-job search, employment.

JEL classification numbers: J21, J63, J64, J65

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1 Introduction

This paper studies, in a search-matching model, macroeconomic consequences of an on-the-job search of young workers. In France, youth unemployment is now considered one of the main problems of the labor market. In response to that situation, successive governments have reacted by making short fixed-term jobs more readily obtainable, some are officially subsidized and some are not. This employment policy disregards the fact that jobs openings, reserved for beginner workers, are only a first step in their career path whose final objective is to secure a more stable and better paid job. Therefore, as job instability increases, young workers will struggle to accumulate the years of successful professional experience necessary to obtain a more productive job. The resulting insecurity will be harmful for firms because they will meet with more and more difficulties finding applicants with the experience necessary to fill high-skill jobs. This will consequently lead to a fall in high-skill employment, penalizing the overall economy by dragging domestic production downward.

Empirical studies that take into account on-the-job search are few. Fallick and Fleischman (2004) have performed careful estimations of Blanchard and Diamond (1989) showing that, based on American data, half of newly signed contracts resulted from job-to-job transitions rather than from unemployment-to-job transitions.

There are primarily two main motivations for searching while on-the-job: an insatisfaction felt by workers in their job and to which they can respond by quitting their job; financial incitement to take a better paid job. The first motivation, of a more sociological type, is not taken into account in this study. The second one, economically related, suggests that more opportunities for securing a more advantageous remuneration should increase search on the job for workers whose wages were previously low. One can then expect that beginners would be more reactive to this phenomenon than older experienced workers with higher wages.

Confirming this assumption, Topel and Ward (1992) show that two thirds of young workers with more than one year of experience on the labor market, quit their job within a year and that most of these separations are due to job-to-job transitions rather than dismissals. In their study on the fast food industry, Card and Krueger (1995) report Charner and Fraser's (1984) results [1]. According to their survey, half of young employees were on the job for about one year or less. One third of employees, occupying a job at t-time, left within the next six months. 30% of them left for another job. Skuderud (2005) reconstructs, for Canada and the USA, on-the-job search rates according to age and sex. Their results, which coincide with the ones of Pissarides and Wadsworth (1994) regarding British data, suggest that on-the-job search rates actually decrease with age and that these rates are clearly higher for young workers. The same study also put to the fore that employees preferring to work overtime are more inclined to look for another job. This observation concords with the fact that workers aspiring to a higher wage are generally the ones searching on-the-job. Correspondingly, hourly paid workers are much more inclined to search for another job. Altonji and Paxson (1988) suggest that under-

[1] Charner, I. And Fraser, B., 1984, Fast Food Jobs, Washington D.C.: National Institute for Work and Learning

employed workers are relatively more susceptible to quit their job unless they receive financial compensation for the small number of their hours worked.

Regarding the French labor market, "Enquêtes emploi 2004" and "Enquêtes emploi 2005" surveys conducted annually by INSEE[2], established two main observations. First, in 2005, over 16% of workers aged 15-30 occupied a fixed-term contract job (CDD) and were about 5% in professional training course or occupying a governmentally subsidized contractual job, whereas workers aged over 30 were respectively only 4,7% and less than 1%. Secondly, the 2004 survey reveals that 7,5% of workers aged 15-30 occupying a regular job wish to find another job[3]. This percentage decreases as age of the groups increases. The first reason expressed by employees in "regular-job" is an incompatibility with the current job. The second, the search for a better wage, and finally, the risk of losing their current job. Only 7,5% of the labor force searching on the job seems to be very low compared to American and Canadian data[4] that are twice this rate. However, the French labor market inflexibility and the few existing job opportunities can at least partially explain the weakness of this rate. Indeed, young employees are more inclined to accept their present situation if they anticipate that in any case, their search will most likely be unsuccessful or unprofitable if successful.

The preceding observations bring us to take into account two considerations: promoting governmentally subsidized contracts, fixed-term or open-ended, part-time or full-time, and more generally the increase of CDDs and insecure jobs, should increase on-the-job search of beginners. Moreover, professional insertion process of young workers should be delayed. In this case, what would be the impact of this phenomenon on the labor market and on domestic production? Considering the inflexibility of the French labor market and even without official data comparing job-to-job and unemployment-to-job transitions, one can expect on-the-job search of beginner workers to be important - because fixed-term contracts allow them to anticipate unemployment spells - and to greatly influence the overall labor market. The potential perverse effects of fixed-term contracts have been studied theoretically and empirically, without on-the-job search, by Blanchard and Landier (2002). They argue that the main effect of an increase of fixed-term contracts may be high turnover of beginners leading to higher unemployment and may possibly reduce the overall productivity and output.

The existing theoretical literature about on-the-job search is mainly dominated by extensions of the wage posting model of Burdett and Mortensen (1998). These models discuss about the existence of equilibria with continuous wage distribution and analyse wage dispersion. The literature essentially deals with the modelling of wage bargaining when workers can accept external offers (see Mortensen (2003), Postel-Vinay and Robin (2004), Christensen, Lentz, Mortensen, Neumann, and Werwatz (2005) and Shimer (2006)). To break free from the standard model of Burdett and Mortensen, Gautier, Teulings and Van Vuuren (2005) introduce on-the-job search in the circular model of Marimon and Zilibotti (1999). Cahuc, Postel-Vinay and Robin (2003) propose a model in which the

[2]The French National Statistical Institute

[3]see PARAE: Labor Force Searching another Job

[4]see Skuderud (2005).

wage is initially negotiated according to a Nash bargaining game and then renegotiated following a three players bargaining game with offers and counter-offers between a worker, her employer and an external firm.

Our contribution is an extension of a matching model (Pissarides 1990-2000). It considers a segmented labor market: a beginner sub-market composed of beginner workers and a confirmed sub-market composed of confirmed workers. The aim of this paper is to highlight the consequences of instability of youth employment and its implications in terms of employment policy. There are two types of employed beginners: "new beginners" and "old beginners". Only the second type searches on the job; their goal being to obtain a higher wage in the confirmed sub-market. This distinction captures the idea that only experimented beginners are potentially employable in high-productivity jobs. The model suggests that promoting more fixed-term contracts[5] - generally viewed as unstable contracts - penalizes domestic production. Intuitively, beginners searching for a more highly paid job have even less chance to get one when their present contract ends quickly. Indeed, their experience will probably not be considered sufficiently convincing for firms to offer them more important jobs. From this point of view, unstable work contracts reduces the number of beginners who can potentially get a better paid job. Thus, the number of confirmed workers decreases, and consequently domestic production.

The paper is organized as follows: Section 2 sets the analytical framework focusing on the labor market segmentation between a beginner sub-market composed partly of on-the-job searchers and a confirmed sub-market offering higher wages. Section 3 presents the resolution of the model and the way the sub-markets interact. The results of the comparative statics are stated in section 4 as well as a more specifical analyse of the negative impact, at the national level, of a reduction of the average duration of young workers jobs. Finally, section 5 concludes.

2 The Model

This model is inspired by a model of search equilibrium with a matching function (Pissarides (1990-2000)) in which on-the-job search is introduced. The economy consists of two types of agents, workers and firms, who are supposed to be risk-neutral. Firms are infinity-lived whereas workers have a life expectancy of $1/m$. The parameter m is then comparable to a labor market exit rate. The total labor force N is normalized to a unit. Each worker who exits the labor market is replace by a newcomer. Time is continuous and all the agents discount future payoffs at rate r, with $r > 0$.

2.1 A segmented labor market

The labor market is divided into two sub-markets: a "beginner sub-market" composed of new workers who were not previously on the labor market or who just enter the market, and a "confirmed sub-market" composed of confirmed workers (experienced) who have

[5] In France, these kind of contracts are short and generally vary from 6 months to 2 years.

been on the job longer. There is a specific matching technology in each sub-market. Firms distribute themselves in the two sub-markets, each sub-market offering a different job type. There are two firm categories: type 2 firms open job vacancies for beginners whereas type 1 firms open job vacancies exclusively for confirmed workers. Only one vacant job can be opened in each firm. Type 1 job productivity is higher than type 2, $y_1 > y_2$, resulting from job differences and not individual acquired skills. Thus suggesting that type 1 firms protect themselves by offering confirmed workers better jobs. Therefore, by assumption, $w_1 > w_2$, where w_2 is the wage offered by type 2 firms to beginners and w_1 the wage offered by type 1 firms to confirmed workers. This wage differentiation motivates beginner workers to look for better paid jobs in type 1 firms. But only beginners that have been on the job long enough become eligible to enter into jobs in the confirmed sub-market. These "older" beginners can apply in type 1 jobs and are then the only ones searching on-the-job. Each beginner who succeeds in finding a vacant job in a type 1 firm becomes a confirmed worker. This implies that the two labor sub-markets interact.

Workers can be distributed among five different categories:

1. *Employed confirmed workers* - These are all confirmed workers employed in type 1 firms. They do not search on-the-job as they cannot expect a better situation in the future. The number of employed confirmed workers is denoted L_1.

2. *Unemployed confirmed workers* - noted U_1 - these workers lost their type 1 job previously. They are now unemployed confirmed workers and their unemployment spell does not prevent them from belonging to the confirmed sub-market.

3. *"New" employed beginners* - noted $\widetilde{L}_2$ - are new beginners employed in type 2 firms. They cannot immediately apply for type 1 jobs due to their lack of experience. They do not search on-the-job but they aspire to become employable in type 1 firms, *i.e.* to change from $\widetilde{L}_2$ to $\widehat{L}_2$. Their goal is then to become "older" beginners. To simplify, we suppose that these beginners have a probability λ to become employable by type 1 firms. $1/\lambda$ then represents the expected average waiting time before going through this obligatory "older" stage. If beginners lose their type 2 job, they will become unemployed beginners.

4. *"Older" employed beginners* - noted $\widehat{L}_2$ - are experienced beginners (as they have been on the job longer) employed in type 2 firms. Older beginners can apply for better paid jobs in type 1 firms. They are all engaged in an on-the-job search and they compete for the same vacant jobs as unemployed confirmed workers. As mentioned previously, if older beginners lose their type 2 job, they will also become unemployed beginners.

5. *Unemployed beginners* - noted U_2 - are composed of beginners (new and older) who lost their type 2 job and of newcomers on the labor market. They can only apply for type 1 jobs as their previous experiences, if any, cannot be considered successful.

The total labor force can be normalized to a unit, represented by:

$$U_1 + U_2 + L_1 + \widetilde{L}_2 + \widehat{L}_2 = 1 \tag{1}$$

In this labor market, a matching function must be built for each sub-market. In the confirmed sub-market, the labor sub-market tightness, θ_1, depends on the number of type 1 vacancies V_1, on the number of unemployed confirmed workers U_1, but also on the number of older employed beginners $\widehat{L}_2$ because they are engaging in an on-the-job search. Thus:

$$\theta_1 = \frac{V_1}{U_1 + \widehat{L}_2} \tag{2}$$

denotes the confirmed labor sub-market tightness. The matching function is determined by:

$$h_1 = h_1(V_1, (U_1 + \widehat{L}_2))$$

The matching function is assumed to be increasing in both its arguments, concave and homogenous of degree 1. Job vacancies are filled by random sorting according to a Poisson process. Hence, the homogeneity of the matching function implies:

$$q_1 = \frac{h_1(V_1, (U_1 + \widehat{L}_2))}{V_1} = h_1\left(1, \frac{1}{\theta_1}\right) = q_1(\theta_1)$$

where q_1 is the rate at which a vacant job is matched. During a small interval δt a vacant job is matched with a probability $q_1(\theta_1)\delta t$, so the mean duration of a vacant job is $1/q_1(\theta_1)$. By the properties of the matching technology, $q_1'(\theta_1) \leq 0$ and the absolute value of the elasticity of $q_1(\theta_1)$ is $\eta_1(\theta_1) \in [0, 1]$. The probability to become an employed confirmed worker p_1 is the same for unemployed confirmed workers and beginners searching on the job (older beginners). p_1 is determined as $p_1(\theta_1) = \frac{h_1(V_1,(U_1+\widehat{L}_2)}{U_1+\widehat{L}_2} = h_1(\theta_1, 1) = \theta_1 q_1(\theta_1)$ with $p_1'(\theta_1) \geq 0$.

In the beginner sub-market, the sub-market tightness θ_2 depends on the number of type 2 job vacancies V_2 and on the number of unemployed beginners U_2.

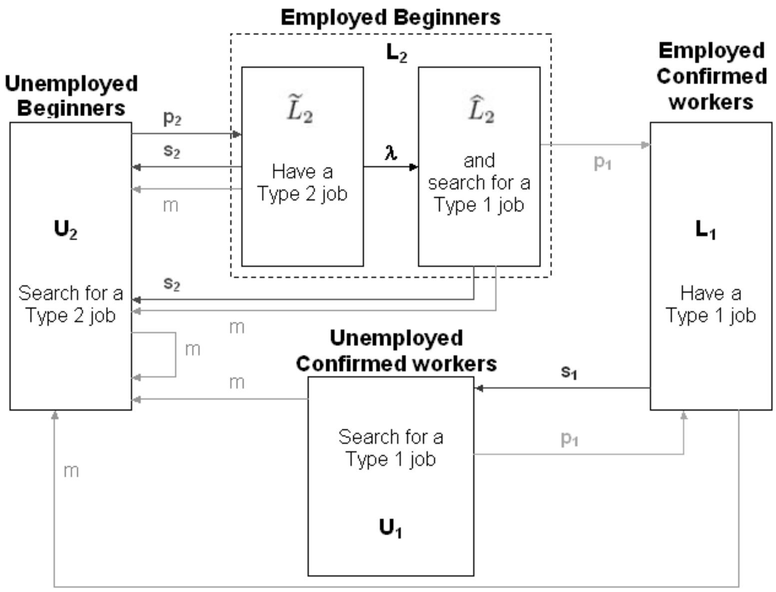
$$\theta_2 = \frac{V_2}{U_2} \tag{3}$$

The matching function is defined by $h_2 = h_2(V_2; U_2)$. According to the matching technology properties, the probability for a vacant type 2 job to be filled is $q_2 = q_2(\theta_2)$ with $q_2(\theta_2) \leq 0$ and the probability for an unemployed beginner to become a beginner employed worker is $p_2(\theta_2) = \theta_2 q_2(\theta_2)$ with $p_2'(\theta_2) \geq 0$. The absolute value of the elasticity of $q_2(\theta_2)$ is $\eta_2(\theta_2) \in [0, 1]$.

Assuming a constant labor force, market flows can be schematized by figure 1. s_2 and s_1 are respectively the exogenous separation rates of type 2 jobs - forcing employed beginners to become unemployed beginners - and the separation rate of type 1 jobs - forcing employed confirmed workers to become unemployed confirmed workers. λ is the probability, for a new beginner to become an older beginner, potentially employable by type 1 firms. On the figure, L_2 is the total beginner labor force with $L_2 = \widetilde{L}_2 + \widehat{L}_2$.

At the steady-state, the total number of newcomers is equal to the total number of outgoers in the labor market. Stability of U_2, U_1, L_1, $\widetilde{L}_2$, $\widehat{L}_2$ and equation (1) give flows

Figure 1: Market Flows



equilibrium relationships that will determine the labor force repartition.

$$U_2(p_2 + m) = s_2(\widetilde{L}_2 + \widehat{L}_2) + m \quad (4)$$

$$U_1(p_1 + m) = s_1 L_1 \quad (5)$$

$$p_2 U_2 = \widetilde{L}_2(s_2 + m + \lambda) \quad (6)$$

$$\lambda \widetilde{L}_2 = \widehat{L}_2(s_2 + m + p_1) \quad (7)$$

$$L_1(s_1 + m) = p_1(U_1 + \widehat{L}_2) \quad (8)$$

One of the equations is redundant and can be left out. Equation (4) means that unemployed beginners are composed of all the workers that had previously exited the market (each worker exiting the market is replaced by a newcomer) and of employed beginners that separate from their job. Moreover, the only way to get out of unemployment in this sub-market is to be employed in a type 2 firm. Equation (5) means that the only way to get out of confirmed unemployment is to permanently leave the market or to find a job in a type 1 firm, and the only way to enter unemployment in this sub-market is to separate from a type 1 job. Equation (6) shows that newly employed beginners are exclusively composed of previously unemployed beginners. Leaving new beginner employment means either becoming an older beginner, leaving the market or separating from the job. Equation (7) shows that older beginners are exclusively composed of previously new beginners. Older beginners can either separate from their job, leave the market or leave their actual job for a type 1 job. Equation (8) means that employed confirmed workers are of two origins: unemployed confirmed workers and older beginners who succeed in finding a type 1 job. Finally, the system composed of (1), (4), (5), (6) and (7) explains sub-markets interactions at the steady-state.

2.2 Firm behavior and Bellman equations

Firms have a production technology uses only labor. Each firm hires a unique worker. A firm opens a job vacancy and is actively engaged in hiring a worker at fixed cost c_2 for type 2 firms and c_1 for type 1 firms. By assumption $c_2 < c_1$ as type 1 jobs are supposed to be more productive than type 2 jobs, it should thus be more costly to leave a confirmed job open. Job creation takes place when a firm and a searching worker meet and agree to form a match according to an employment contract. Firms can be either in a vacant job situation or in an occupied job situation. Firms distribute themselves between the two sub-markets according to the free entry condition.

Let J_1^F be the present-discounted value of expected profit from an occupied job of type 1 and J_1^V that of a vacant job of type 1, the Bellman equations are

$$rJ_1^F = (y_1 - w_1) - (s_1 + m)\left[J_1^F - J_1^V\right] \tag{9}$$

$$rJ_1^V = -c_1 + q_1\left[J_1^F - J_1^V\right] \tag{10}$$

A type 1 firm with an *occupied job* produces y_1 and pays w_1 to its confirmed worker. In the futur, when a type 1 firm separates from its worker, it becomes a firm in situation of job vacancy. The only expectation for a firm with a *vacant job* is to match with a worker.

All type 2 firms are not subject to the same present-discounted value of expected profit because a type 2 firm can either be in situation of employing an older beginner, or filling its job with a new beginner. Let $\widehat{J}_2^F$ be the present-discounted value of expected profit from a type 2 job matched with an older beginner, $\widetilde{J}_2^F$ the present-discounted value of expected profit from a type 2 job matched with a new beginner, and J_2^V that of a vacant type 2 job, the Bellman equations are

$$r\widehat{J}_2^F = (y_2 - w_2) - (s_2 + m + p_1)\left[\widehat{J}_2^F - J_2^V\right] \tag{11}$$

$$r\widetilde{J}_2^F = (y_2 - w_2) - (s_2 + m)\left[\widetilde{J}_2^F - J_2^V\right] - \lambda\left[\widetilde{J}_2^F - \widehat{J}_2^F\right] \tag{12}$$

$$rJ_2^V = -c_2 + q_2\left[\widetilde{J}_2^F - J_2^V\right] \tag{13}$$

The current profit of a type 2 firm with an *occupied job* is given by $(y_2 - w_2)$ in both cases. If in the future, both type 2 firms separate from its workers with the probabilities m and s_2, then these firms will be in a vacant job situation. The firm employing an older beginner also faces a probability p_1 that its worker leaves the job for a higher paid job in a type 1 firm, whereas the firm employing a new beginner only faces the probability λ that its employee becomes "older". This implies $\widehat{J}_2^F < \widetilde{J}_2^F$, the expected utility is lower for $\widehat{J}_2^F$ because the global probability that its employee leaves the job vacant is higher. Then, $[\widetilde{J}_2^F - \widehat{J}_2^F] > 0$ represents the expected utility lost due to type 2 job instability. The only expectation for type 2 firms with a *vacant job* is to match with a beginner.

By assumption we consider that the beginner sub-market wage cannot be bargained. It only follows the State minimum wage. Then,

$$w_2 = \bar{w}_2 \tag{14}$$

The beginners' wage (14) is exogenous. This wage applies to new beginners but also to older beginners as there is no possibility of wage renegotiation even if an older beginner is considered to have more experience than a new one. Based on this information, (14) will always be taken into account from now on.

The *free-entry condition* applies on each labor sub-market. Firms can freely enter the labor market and dispatch themselves on sub-markets as long as profit opportunities exists. The rate of matching a vacant job q_2 and q_1 decreases until no firm can enter sub-markets anymore. In equilibrium all profit opportunities from new jobs are exploited, driving rents from vacant jobs of each firm type to zero. Therefore

$$J_1^V = 0 \tag{15}$$

and

$$J_2^V = 0 \tag{16}$$

are the equilibrium conditions for the supply of vacant jobs in each sub-market of the labor market.

Firms' rents are given this way: Type 1 firm's net return from the job match is either determined by combining (9) and (15) or by combining (10) and (15). Type 2 firm's net return is given by combining (11) and (16) when employing an older beginner ($\widehat{J}_2^F$), and from (13) and (16) when employing a new beginner ($\widetilde{J}_2^F$):

$$J_1^F = \frac{y_1 - w_1}{r + s_1 + m} \tag{17}$$

$$J_1^F = \frac{c_1}{q_1} \tag{18}$$

$$\widehat{J}_2^F = \frac{y_2 - \bar{w}_2}{r + s_2 + m + p_1} \tag{19}$$

$$\widetilde{J}_2^F = \frac{c_2}{q_2} \tag{20}$$

Equation (17) means that a type 1 firm's net return depends exclusively on its current profitability and on the probability that the job match between the firm and its worker ends (m and s_1), whereas equation (19) shows that a type 2 firm's net return from the match also depends on the probability that its worker leaves for a better paid type 1 job.

For an individual firm, $1/q_1$ and $1/q_2$ are respectively the expected mean duration of a vacancy in a type 1 firm and the expected mean duration of a vacancy in a type 2 firm. (18) and (20) suggest that, at the steady-state equilibrium, each sub-market tightness is such that the expected profits, from an occupied type 1 job and from a type 2 job occupied with a new beginner, are equal to the expected cost of opening a vacancy. In the confirmed sub-market and for type 2 firms employing new beginners, competition for vacant jobs drives firms' rents down to the expected cost of finding a worker.

The lost undergone by a type 2 firm, whose new beginner becomes an old beginner, is given by combining (19) and (16).

$$\widetilde{J}_2^F - \widehat{J}_2^F = \frac{p_1(y_2 - \bar{w}_2)}{(r + s_2 + m + p_1)(r + s_2 + m + \lambda)} > 0 \tag{21}$$

This lost depends on the probability that its older beginner leaves for a better paid job in a type 1 firm and on the current profit from a type 2 job. The lost increases with the probability λ that a new beginner becomes an older one.

2.3 Expected workers utilities

Each unemployed worker produces d units of output at home for self-consumption. This private production is the same for unemployed beginners and unemployed confirmed workers. All workers, employed and unemployed, exit the labor market at rate m and get then an expected utility equal to zero.

Let V_1^E denote the present-discounted value of utility of an employed confirmed worker and V_1^U the present-discounted value of utility of an unemployed confirmed worker.

$$rV_1^U = (b+d) + p_1\left[V_1^E - V_1^U\right] - mV_1^U \tag{22}$$

$$rV_1^E = w_1 - s_1\left[V_1^E - V_1^U\right] - mV_1^E \tag{23}$$

Unemployed confirmed workers are subject to unemployment benefits b. When a firm and its employee separate according to the probability s_1, the *employed confirmed worker* becomes an unemployed confirmed worker. When unemployed, the worker's only wish is to find a job in a type 1 firm, with the probability p_1 of actually obtaining one.

Let $\widetilde{V}_2^E$ denote the present-discounted value of utility of an employed beginner who cannot apply for a job in a type 1 firm (a new beginner), $\widehat{V}_2^E$ the present-discounted value of utility of an employed beginner who can apply for a job in a type 1 firm (an older beginner) and V_2^U the present-discounted value of utility of an unemployed beginner.

$$rV_2^U = d + p_2\left[\widetilde{V}_2^E - V_2^U\right] - mV_2^U \tag{24}$$

$$r\widetilde{V}_2^E = \bar{w}_2 - s_2\left[\widetilde{V}_2^E - V_2^U\right] + \lambda\left[\widehat{V}_2^E - \widetilde{V}_2^E\right] - m\widetilde{V}_2^E \tag{25}$$

$$r\widehat{V}_2^E = \bar{w}_2 - s_2\left[\widehat{V}_2^E - V_2^U\right] + p_1\left[V_1^E - \widehat{V}_2^E\right] - m\widehat{V}_2^E \tag{26}$$

New beginners cannot aspire to search for higher paid jobs due to their lack of experience. As a first step, they must go through an *older beginner* stage. The probability $1/\lambda$ represents the expected average duration that a worker must face before having access to this stage. λ is then the probability to be employable by a type 1 firm. The only older beginner's desire is to become confirmed worker, without an unemployment spell, with the probability p_1. When a worker loses her job, at rate s_2, she automatically loses her "older" status (if she previously had it) and thus becomes an unemployed beginner searching for a job in a type 2 firm with the probability p_2 of actually obtaining one, but has no chance to instantaneously become an older beginner. *Unemployed beginners* cannot aspire to receive unemployment benefits, they only produce there self-consumption d.

3 Equilibrium recursive resolution

3.1 Wage setting

We have previously said that the beginner sub-market wage follows the State minimum wage and is thus equal to $w_2 = \bar{w}_2$. Then, only the confirmed sub-market wage is bargained. It is set up following an asymmetric non-cooperative Nash game. The worker and the firm have respectively a bargaining power $\beta \in [0,1]$ and $(1-\beta)$. The wage equilibrium is determined by maximisation of the weighted product of the worker's and the firm's net return from the job match, shared between the firm and the worker.

$$w_1 = argmax[V_1^E - V_1^U]^\beta [J_1^F - J_1^V]^{1-\beta} \tag{27}$$

The first order condition for maximisation satisfies

$$[V_1^E - V_1^U] = \beta[J_1^F - J_1^V + V_1^E - V_1^U]$$

According to the upward free-entry condition, the sharing rule of the global surplus is given by

$$(1-\beta)[V_1^E - V_1^U] = \beta J_1^F \tag{28}$$

$[V_1^E - V_1^U]$ is the rent of a confirmed worker. The present-discounted value of expected profit from an occupied type 1 job can be replaced by (17). Replacing net returns from the job match by their equations leads to the wage equilibrium equation:

$$w_1 = \frac{\beta y_1(r + s_1 + p_1 + m) + (1-\beta)(b+d)(r + s_1 + m)}{\beta(r + s_1 + p_1 + m) + (1-\beta)(r + s_1 + m)} \tag{29}$$

Equation (29) is the first key equation of the model. This equation determines the negotiated wage of the confirmed sub-market. The negotiated wage is above the current income of an unemployed confirmed worker. There is no wage differentiation between workers who start a new type 1 job and workers that have been on the job longer. The wage increases with productivity as well as with the employee's reservation wage $(b + d)$. It decreases with the cost of vacancy c_1 which reduces the confirmed sub-market tightness θ_1.

3.2 Sub-market interactions at steady-state

Segmenting the labor market leads to two equilibrium equations: one in each sub-market.

In the confirmed sub-market, equilibrium is determined by combining (17), (18) and (29); representing the behavior of job creation in this sub-market.

$$c_1[r + m + s_1 + \beta p_1(\theta_1)] = q_1(\theta_1)(1-\beta)(y_1 - b - d) \tag{30}$$

Equation (30) depends exclusively in the confirmed sub-market tightness θ_1^*. This equation is independent of the specific parameters of the beginner sub-market. Hence, exogenous specific parameters of the beginner sub-market $(y_2, s_2, c_2, \bar{w}_2, \lambda)$ do not affect the confirmed sub-market tightness θ_1. Determination of θ_1^* leads to the equilibrium value of the negotiated wage w_1^* via equation (29).

In the beginner sub-market, equilibrium is given by equation (19) and equation (20). Substituting (19), (20) and (21) in $\widetilde{J}_2^F = \widehat{J}_2^F + [\widetilde{J}_2^F - \widehat{J}_2^F]$ gives

$$c_2(r + s_2 + m + p_1(\theta_1))(r + s_2 + m + \lambda) = q_2(\theta_2)(y_2 - \bar{w}_2)(r + s_2 + m + \lambda + p_1(\theta_1)) \quad (31)$$

Equation (31) depends on the beginner sub-market tightness θ_2 but also on the confirmed sub-market tightness θ_1. Exogenous specific parameters of the confirmed sub-market $(y_1, s_1, c_1, b, \beta)$ affect the beginner sub-market tightness θ_2. The interaction between the two sub-markets implies that a modification of the confirmed sub-market equilibrium always leads to modifications of beginner sub-market equilibrium.

3.3 Labor force repartition at steady-state equilibrium

The repartition of the labor force at steady-state determines the equations of the number of employed and unemployed workers in each sub-market. Combining (1), (4), (5), (6) and (7) leads to the equation of the number of workers in each possible state:

$$\widetilde{L}_2 = \frac{p_2 m(s_2 + m + p_1)}{\phi} \quad (32)$$

$$\widehat{L}_2 = \frac{p_2 m\lambda}{\phi} \quad (33)$$

$$U_2 = \frac{m(s_2 + m + p_1)(s_2 + m + \lambda)}{\phi} \quad (34)$$

$$U_1 + L_1 = \frac{\lambda p_2 p_1}{\phi} \quad (35)$$

$$L_1 = \frac{\lambda p_2 p_1(m + p_1)}{\phi(s_1 + m + p_1)} \quad (36)$$

$$U_1 = \frac{\lambda p_2 p_1 s_1}{\phi(s_1 + m + p_1)} \quad (37)$$

where $\phi = m(s_2 + m + p_1)(s_2 + m + p_2 + \lambda) + \lambda p_2(m + p_1)$.

Owing to the interactions between the two sub-markets, the proportion of workers in each possible state of the labor market depends both on the transition probabilities in the confirmed sub-market and on the transition probabilities in the beginner sub-market.

Definition. *The model equilibrium* $\{\theta_1^*, w_1^*, \theta_2^*, \widetilde{L}_2^*, \widehat{L}_2^*, U_2^*, L_1^*, U_1^*\}$ *is defined by a system of equations composed of the equilibrium equations for each sub-market (30) and (31) and of the equations of the labor force repartition at steady-state (32), (33), (34), (35), (36) and (37).*

4 Comparative statics

4.1 Sub-market tightness and confirmed wage

Equation (31) puts to the fore the relationship between θ_1 and θ_2 (see appendix A.1). $\frac{\partial \theta_2}{\partial \theta_1} < 0$ implies that θ_1 and θ_2 vary in opposite direction: when the confirmed sub-market tightness increases, the beginner sub-market tightness decreases.

Result 1. *When the confirmed sub-market tightness θ_1 increases, the probability p_1 to match a job on this sub-market increases for unemployed confirmed workers but also for beginner on-the-job searchers. Older beginners will be less stable in their type 2 job, hence the value of occupied type 2 jobs will decrease. Less jobs will be created in the beginner sub-market and the tightness θ_2 will decrease.*

Table 1 shows comparative statics of this model established from the two sub-market equilibrium equations (30) and (31) and from the equation of the confirmed wage equilibrium (29). Specific parameters of the confirmed sub-market are dependent on the

Table 1: Comparative statics

	θ_1	p_1	q_1	w_1	θ_2	p_2	q_2
λ	0	0	0	0	-	-	+
β	-	-	+	+	+	+	-
y_2	0	0	0	0	+	+	-
y_1	+	+	-	+	-	-	+
$\bar{w}_2$	0	0	0	0	-	-	+
b	-	-	+	+	+	+	-
d	-	-	+	+	+	+	-
s_2	0	0	0	0	-	-	+
s_1	-	-	+	-	+	+	-
c_2	0	0	0	0	-	-	+
c_1	-	-	+	-	+	+	-
r	-	-	+	-	?	?	?
m	-	-	+	-	?	?	?

beginner sub-market, consequently $(y_1, s_1, c_1, b, \beta)$ impact θ_2. To the contrary, as specific parameters of the beginner sub-market does not impact the confirmed sub-market, $(y_2, s_2, c_2, \bar{w}_2, \lambda)$ do not affect θ_1 and w_1. Commonly shared parameters (d, r, m) impact both θ_2 and θ_1 and also w_1.

Generally speaking, parameters that strengthen current profitability of a firm increase the labor market tightness and incite firms to create new vacancies. In this model, this implies that productivity y_1 and y_2 respectively increase the tightness θ_1 of the confirmed sub-market and that of the beginner sub-market θ_2.

A profitability decrease can either be caused by a wage increase or by the decrease in the time of association between the firm and its worker. In the confirmed sub-market, wages increase with the worker's conflict point $(b+d)$ and with the confirmed worker's bargaining power β. The time of association can be reduces either by the exit rate m or by the separation rate s_1. Hence θ_1 decreases with b, d, β, s_1 and m. In the beginner sub-market, an increase of s_2 and $\bar{w}_2$ decreases θ_2.

Finally, considering constant profitability, vacancy creation is decreasing with the cost of creation in both sub-markets, thus c_1 and c_2 respectively decrease θ_1 and θ_2.

Concerning the parameter λ, an increase in the transition probability, to go from the new beginner to the older beginner stage, decreases the value of an occupied type 2 job. Consequently, fewer vacancies will be create and the beginner sub-market tightness finally decreases.

In the confirmed sub-market, when r increases, future profits are viewed as less important than current profits, vacancy creation and the sub-market tightness will decrease, followed by a reduction of p_1 inducing a decrease of w_1. To the contrary, wages will naturally increase with y_1. Finally, an increase of the cost of vacancy creation c_1 and a decrease in the average association period (increase of s_1 and m), reduce the negotiated wage. In the first case, this wage cut is due to the fact that the decrease of θ_1 conducted by c_1 leads to a decrease in job opportunities in the confirmed sub-market. In the second case, type 1 firms will have a shorter period of productivity and the decrease in θ_1 will lead directly to a wage cut.

In the beginner sub-market, firms are negatively affected by an increase in the confirmed sub-market tightness θ_1 (see Result 1). This implies that all specific parameters of the confirmed sub-market that negatively influence θ_1 would increase vacancy creation in the beginner sub-market.

All parameters that strengthen θ_2 increase the probability for unemployed beginners to match a job in this sub-market, in which case the congestion effect[6] decreases the probability of firms in a vacancy situation to match with a worker. Therefore, an increase in w_1 - trough β and b - will increase θ_2. Indeed, the decrease of θ_1 induced by β and b implies that it becomes harder for older employed beginners to match a confirmed job, these on-the-job searchers are then less inclined to quit their type 2 job. As a consequence, the value of an occupied type 2 job increases and more vacancies will be created, increasing θ_2.

The same mechanism is used to explain the effect of c_1 and s_1 on θ_2. Concerning an increase in y_1, the inverse mechanism will lead to a decrease in θ_2.

[6] When the number of vacancies increases for the same number of job searchers, concurrency between firms leads to a congestion effect that reduces the probability to match with a worker.

4.2 Labor force repartition

Table 2 shows the effect of sub-markets tightness (2) and (3) on the labor force repartition at steady-state equilibrium (32), (32), (34), (35), (36) and (37).

Table 2: Comparative statics: labor force repartition

	$\widetilde{L}_2$	$\widehat{L}_2$	U_2	L_1	U_1	$L_1 + U_1$
θ_1	-	-	-	+	?	+
θ_2	+	+	-	+	+	+

Because of the interaction between labor sub-markets, endogenous variables are subject to several effets. Parameters that impact both sub-markets can lead to a *direct effect* but especially to *two indirect effects*. The first indirect effect goes through the confirmed sub-market tightness θ_1, whereas the second indirect effect goes through the beginner sub-market tightness θ_2 which is itself affected by θ_1 (see appendix A.2 and A.2.1).

Concerning the impact of specific parameters of the beginner sub-market, variations depend exclusively on *an indirect effect* going through θ_2 and sometimes on *a direct effect*.

The indecision of the effect of θ_1 on U_1 implies that it is not possible to put to the fore the effect of parameters that impact both sub-markets on U_1. This indecision is caused by the fact that, when p_1 increases, each unemployed confirmed worker can easily match with a firm. But it also generates an increase of the confirmed sub-market size $(U_1 + L_1)$ that more workers can easily join. Thus, more unemployed workers will get a confirmed job, but the sub-market size increase implies that there are also more unemployed workers.

The number of occupied beginners $(\widetilde{L}_2 + \widehat{L}_2)$ decreases with θ_1 and increases with θ_2. As θ_1 and θ_2 vary in opposite directions, the effects of θ_1 and θ_2 combine, which will not cause any trouble on the comparative statics of parameters on L_2. On the other hand, the number of unemployed beginners U_2 varies in the same way with both θ_1 and θ_2. Indirect effects are opposed. The same opposition applies to confirmed employment L_1 and to the number of confirmed workers in the economy $(L_1 + U_1)$. In these cases, the impact of exogenous parameters that concerne both sub-markets cannot be directly put to the fore.

4.2.1 Stability or precariousness of beginners' jobs

Separation rate s_2 has both a direct and an indirect effet on the importance of workers flows and its equilibrium repartition (see table 3). The separation rate can only affect the probability for an unemployed beginner to find a job p_2 as it has no effect on θ_1.

An increase of s_2 naturally provokes a rise in the beginner unemployment level. Concerning new beginners, two opposite effects interact. On the one hand, a rise of s_2 means a greater chance to lose a type 2 job, and on the other hand, increased unemployment means more incomers in this sub-market. Whereas older beginners are directly concerned by this rise, decreasing their employment level. This decrease reduces the number of older beginners potentially employable by type 1 firms. Less on-the-job searchers are able to become confirmed and the number of confirmed workers, employed and unemployed ($U_1 + L_1$), decreases. The reduction of confirmed workers employment (L_1) means less type 1 job creation. The number of unemployed confirmed worker decreases only because the size of the confirmed sub-market has decreased.

Considering that an increase in s_2 can be interpreted as a higher instability of beginners jobs, the model underlines that this growing instability has an unfavorable effect on the overall economy. As beginners keep their type 2 job less time, they have fewer chance to accede to a more productive type 1 job. This leads to a cut in more productive jobs, followed by a decrease in domestic productivity. A mass effect reduced the level of confirmed workers unemployment but this reduction is not sufficient to exceed the global negative effect of the rise of s_2.

Proposition 1. *A higher instability of beginners' jobs (increase of s_2) reduces the number of older beginner - on-the-job searchers - (decrease of $\widehat{L}_2$) and the number of confirmed employees (decrease of L_1), consequently reducing the domestic production ($y_2\widetilde{L}_2 + y_2\widehat{L}_2 + y_1L_1$).*

This suggests that employment policies aiming for an increase in young workers job supply, by promoting short-term contracts or time limited contracts, do not have a positive impact on the domestic economy even if they seem initially favorable to a firms flexibility. Therefore, the promotion of precarious contracts can only have a negative effect on the economy, as it is prejudicial to the beginners' professional insertion in the workplace. Thus, beginners struggle to find stable and productive jobs that improve their career path. For these employment policies to be efficient, beginner employment level should increase significantly in order to compensate for the disadvantages of this increased instability.

4.2.2 Other specific parameters of the beginner sub-market

Specific parameters of the beginner sub-market $(y_2, c_2, \bar{w}_2, s_2, \lambda)$ affect the probability p_2 for an unemployed beginner to become employed, but not the probability p_1 for an older beginner to become employed in a type 1 job, as they have no effect on confirmed sub-market tightness θ_1 (see appendix A.2.2). The parameter λ, for which the effects are ambiguous, is the purpose of a particular analysis in section 4.2.5. With regard to parameters y_2, c_2 and $\bar{w}_2$, the comparative statics on labor force repartition goes exclusively through an indirect effect (see comparative statics of table 3).

Result 2. *All specific parameters of the beginner sub-market for which a variation decreases type 2 firms' profitability lead systematically to a reduction in the number of applicants who are likely to become confirmed. This induces a decrease of L_1 and $(L_1 + U_1)$.*

The increase of the creation cost of type 2 jobs, c_2, necessarily has a negative impact on the number of occupied beginners' jobs. Indeed, the greater the creation cost, the less job creation. As a consequence, unemployment in the beginner sub-market increases. As previously seen, the decrease of the beginner employment level restricts the number of on-the-job searchers. This restriction induces a cut in the number of confirmed workers $(U_1 + L_1)$ and individually a cut in the number of unemployed U_1 and employed L_1 confirmed workers.

Regard a rise in the beginner minimum wage $\bar{w}_2$, the effect is the same as that for the creation cost of type 2 jobs c_2. In this case, wages rise prompt firms not to create vacancies. Both the increase of $\bar{w}_2$ and c_2 is seen, for type 2 firms, as an additional burden and this extra load decreases global productivity of the economy. In these circumstances, any policies that advocate vacancy creations are favorable. To the contrary, our model suggests that increasing the minimum wage cannot be globally favorable[7].

All parameters favorable to beginner sub-market profitability are favorable to its employment level and allow the confirmed sub-market size to increase. Only y_2 can increase beginner sub-market profitability, so that an increase of y_2 enlarges beginner employment level and reduces unemployment on this sub-market. Therefore, the number of on-the-job searchers $\widehat{L}_2$ will increase inducing an enlargement of the most productive jobs $(U_1 + L_1)$. This phenomenon will ultimately increase national production.

4.2.3 Effect of specific confirmed sub-market parameters and commonly shared parameters

Specific parameters of the confirmed sub-market $(\beta, y_1, b, s_1, c_1)$ and commonly shared parameters (d, r, m) intervene on the confirmed tightness θ_1 that impact the beginner sub-market state through θ_2. In addition to an eventual direct effet, only concerning s_1 and m, the labor force repartition depends on the evolution of the probabilities to match a job on each sub-market, p_2 and p_1. This evolution decays into two indirect effects (see appendix A.2.3).

Probabilities p_2 and p_1 operate positively on confirmed employment L_1 and on all the confirmed workers $(U_1 + L_1)$. Thus, L_1 and $U_1 + L_1$ take advantage of an increase of p_2 but also p_1. This multiplies the number of beginner on-the-job searchers.

To the contrary, beginner unemployment U_2 decreases with p_2 and p_1 (see table 2). While it is easier to find a type 2 job, it is also easier to quit it for a type 1 job. Each beginner, who quits her job for a more productive one, does not run the risk of becoming an unemployed beginner again. Each transition represents an additional opportunity for unemployed beginners U_2.

Therefore, parameters have opposite indirect effects on L_1, $U_1 + L_1$ and U_2. The global effect of the variation direction depends on the value of p_2 elasticity with regard to θ_2, $(1 - \eta_2)$. The probability p_2 for an unemployed beginner to match a type 2 job is strongly

[7] In our model, all beginner workers earn the minimum wage. Studying the facts shows that only a share of these beginners earns the minimum wage. We can then expect the negative impact of the minimum wage to be reduced. See Card and Krueger (1995) and Cardoso ans Portugal (2006) for a detail empirical analysis of this phenomenon.

elastic, thus a variation of θ_2 will have as strong an impact on p_2. Two cases should be considered (see table 3):

- $(1-\eta_2)$ is close to zero, p_2 elasticity is *weak*. The matching rate of a beginner on a type 2 job varies weakly with θ_2. Thus, the indirect effect of the evolution of p_1 always overcomes that of the evolution of p_2.

- $(1-\eta_2)$ is close to one, p_2 elasticity is *strong* enough. A small increase of θ_2 can lead to a sufficiently large variation of p_2 to overcome the effect of p_1's evolution. Thus, the indirect effect of the evolution of p_2 dominates that of p_1.

This lead to the following proposition:

Proposition 2. *Effects on labor force repartition, of specific confirmed sub-market parameters and of commonly shared parameters, go through two indirect effects. The overcoming indirect effect depends on the value of* $(1-\eta_2) \in [0,1]$ *(see appendix A.2.3).*

* *Considering* U_2*, let* $\eta_2' = \Gamma'(r, m, s_2, p_1, \lambda) \in [0,1]$ *be the value that cancels both effects,*

$$\frac{dU_2}{dx} \text{ is of the sign of } \begin{cases} -\frac{\partial\theta_1}{\partial x} & \text{if } (1-\eta_2) < (1-\eta_2') \\ \frac{\partial\theta_1}{\partial x} & \text{if else} \end{cases}$$

* *Considering* L_1*, let* $\eta_2'' = \Gamma''(r, m, s_2, s_1, p_2, p_1, \lambda) \in [0,1]$ *be the value that cancels both effects,*

$$\frac{dL_1}{dx} \text{ is of the sign of } \begin{cases} \frac{\partial\theta_1}{\partial x} & \text{if } (1-\eta_2) < (1-\eta_2'') \\ -\frac{\partial\theta_1}{\partial x} & \text{if else} \end{cases}$$

* *Considering* $L_1 + U_1$*, let* $\eta_2''' = \Gamma'''(r, m, s_2, p_1) \in [0,1]$ *be the value that cancels both effects,*

$$\frac{d(L_1+U_1)}{dx} \text{ is of the sign of } \begin{cases} \frac{\partial\theta_1}{\partial x} & \text{if } (1-\eta_2) < (1-\eta_2''') \\ -\frac{\partial\theta_1}{\partial x} & \text{if else} \end{cases}$$

where x *is the studied exogenous parameter, specific to the confirmed sub-market or commonly shared by both sub-market. The overcoming effect differs for strong and weak values of* $(1-\eta_2)$*.*

Therefore, concerning a strong p_2 elasticity, an increase of specific parameters to the confirmed sub-market and commonly shared parameters induces an identical evolution to θ_1's evolution for U_1 and an opposite evolution to θ_1's evolution for L_1 and $L_1 + U_1$. Table 3 sums up comparative statics results from the workers repartition (32), (33), (34), (35), (36) and (37) at steady state.

Result 3. *All parameters, specific to the confirmed sub-market and commonly shared by both sub-markets, increase type 2 firms' profitability but only when the variation induces a decrease in type 1 firms' profitability. For* $(1-\eta_2)$ *weak, this leads to an increase in beginner on-the-job searchers inducing a rise of* L_1 *and* $(L_1 + U_1)$*. On the other hand, parameters that reduce type 2 firms' profitability, decrease* L_1 *and* $(L_1 + U_1)$ *despite improvement of the probability to fill type 1 vacancies.*

Table 3: Comparative statics: labor force repartition (following)

	$\widetilde{L}_2$	$\widehat{L}_2$		U_2		L_1		U_1		$L_1 + U_1$	
		$1-\eta_2$ strong	$1-\eta_2$ weak	$1-\eta_2$ strong	$1-\eta_2$ weak	$1-\eta_2$ strong	$1-\eta_2$ weak	$1-\eta_2$ strong	$1-\eta_2$ weak	$1-\eta_2$ strong	$1-\eta_2$ weak
λ	-	-	+	+	-	-	+	-	+	-	+
β	+	+		-	+	+	-	?		+	-
y_2	+	+		-		+		+		+	
y_1	-	-		+	-	-	+	?		-	+
$\bar{w}_2$	-	-		+		-		-		-	
b	+	+		-	+	+	-	?		+	-
d	+	+		-	+	+	-	?		+	-
s_2	?	-		+		-		-		-	
s_1	+	+		-	+	?	-	?		+	-
c_2	-	-		+		-		-		-	
c_1	+	+		-	+	+	-	?		+	-
r	+	+		-	+	+	-	?		+	-
m	?	?		?	+	?	-	?		?	-

Concerning L_2, parameters that are unfavorable to type 1 job creation (β, b, s_1, c_1 and d) and, as a consequence, unfavorable to external opportunities of employed beginners, increase the beginner employment level. Inversely, productivity y_1 reduces beginner employment level.

In order to specify the mechanisms influencing the parameters, specific to the confirmed sub-market and commonly shared by both sub-markets, the following paragraph studies the case of an increase of one of the principal parameters of economic policy: unemployment benefits b.

4.2.4 Effect of a confirmed unemployment benefits rise

We have previously seen that a rise in confirmed unemployment benefits, by increasing the wage w_1, reduces job creation in the confirmed sub-market. The θ_1 fall that occurs, reduces the probability p_1 of finding a type 1 job. This fall improves firms' profitability in the beginner sub-market, increasing θ_2 and p_2.

Both indirect effects previously describe combined with each other, increasing the number of employed new and older beginners, $\widetilde{L}_2$ and $\widehat{L}_2$. Indeed, it becomes both easier to find a type 2 job (increase of p_2) and harder to voluntarily quit it for a type 1 job (increase of p_1).

The fall of p_1 tends to reduce the confirmed sub-market size by complicating access, for on-the-job searchers $\widehat{L}_2$, to the confirmed sub-market. On the other hand, a rise in the number of employed beginners multiplies the number of type 1 job applicants.

Considering the case in which $(1-\eta_2)$ is strong, the increase of p_2, induced by the decrease of p_1, is strong. The probability of finding a type 2 job strongly increases which leads to a reduction of unemployment and a rise in the number of employees of the beginner sub-market. Each beginner has a weaker probability of finding a type 1 job, but there are a greater number of beginners facing this probability. Thus, even if the probability to find a type 1 job has decreased, the number of employed beginners has so strongly risen that this rise compensates the decrease of p_1. Finally, the number of workers in the confirmed sub-market increases. The rise of confirmed unemployment benefits allows an increase of employment in the confirmed sub-market in spite of the confirmed wage rise. The reduction of the beginner sub-market size and the rise of beginner employment combine to finally lead to a decrease of unemployment in the beginner sub-market.

Considering the case in which $(1-\eta_2)$ is weak, the decrease of p_1 is dominant. The rise of the number of employed beginners is not sufficient to face the reduction of the transition probability into type 1 jobs. The size of the confirmed sub-market and employment in this sub-market decrease after a rise in unemployment benefits. When the confirmed sub-market size decreases, the beginner sub-market size increases. Despite the rise of employment in this sub-market, unemployment of beginners rises too.

4.2.5 Professional experience: transition from the "new beginner" to the "older beginner" stage

A change in the parameter λ captures the idea that previously acquired professional experience can be a more or less important factor for high-skill firms to employ a beginner. A rise in the probability of becoming an older beginner generates two opposite effects (see appendix A.2.4). On the one hand, an increase of λ makes young workers more quickly eligible for type 1 jobs, leading to a rise in confirmed employment (L_1) and to a cut in confirmed unemployment (U_1). The number of on-the-job searchers ($\widehat{L}_2$)increases, followed by a cut in the number of new beginners ($\widetilde{L}_2$). The number of unemployed beginners (U_2) decreases due to the reduction in the beginner sub-market size. On the other hand, an increase of λ reduces the value of occupied type 2 jobs, the consequence being less vacancy creation. Again, the number of new beginners ($\widetilde{L}_2$) decreases, but this time, the number of older beginners ($\widehat{L}_2$) decreases too. Less new beginners can accede to the obligatory older beginner stage, leading to a reduction of employment and an increase in unemployment in the confirmed sub-market. Moreover, type 2 jobs decrease in value, reducing the number of vacancies. The decrease in θ_2 tends towards a rise in the number of unemployed beginners (U_2).

Again, the dominant effect depends on the value of $(1-\eta_2)$ (see comparative statics of table 3) :

- When $(1-\eta_2)$ is weak, the decrease of θ_2 weakly affects the probability, for an unemployed beginner, to find a type 2 job and consequently affects weakly the number of employed beginners. Therefore, the first effect described predominates.

- When $(1 - \eta_2)$ is strong, the decrease of θ_2 strongly affects the number of employed beginners. Therefore, the second effect described predominates.

Remark. *In the case where the probability of finding a type 2 job react weakly with sub-market tightness of the beginner sub-market, an increase in required experienced-time (decrease of λ) combined with an increase in youth employment instability (increase of s_2) should be dramatic for the overall economy as both phenomenons accumulate, leading to a huge cut in the number of the most productive jobs in the economy and to a plummeting youth employment level.*

5 Conclusion

This paper has looked at the macroeconomic consequences of the introduction of on-the-job search in a matching model, in which the labor market has been segmented between beginner workers and confirmed workers. With the object of reducing unemployment in the beginner sub-market, subsidizing job creation turns out to be more favorable than promoting insecure contracts. Actually, a high instability in youth employment leads to a reduction in the number of young on-the-job searchers, potentially able to accede to high-skill jobs. This instability leads to a cut in the number of the most productive jobs in the economy, consequently penalizing the overall economy by dragging domestic production downward.

However, the rise of firms' profitability as a result of an increase in labor market flexibility, that would potentially lead to more employment in the beginner sub-market, is an unforseen circumstance of this model. This instance should be studied as it is consistent with a future change of French laws in favor of more labor market flexibility.

One limit of this model is that firms always offer beginners the legal minimum wage. This assumption is too strong. Even if many young workers do earn the minimum wage, other beginners succeed in bargaining their wage. This should be taken into account. Another arguable limit is to consider that search intensity of on-the-job searchers never changes. Indeed, when facing a change in an economic policy parameter, such as a rise in the minimum wage, search effort of these applicants should be modified as they would compare their present and expected wages. These two points will be the purpose of further research.

A Appendix

A.1 Relation between θ_1 and θ_2

The relation between θ_1 and θ_2 is determined by (31).

$$\frac{\partial \theta_2}{\partial \theta_1} = \frac{p_1'(\theta_1)}{q_2'(\theta_2)} \frac{c_2(r+s_2+m+\lambda) - q_2(y_2-\bar{w}_2)}{(r+s_2+m+\lambda+p_1)(y_2-\bar{w}_2)}$$

At equilibrium, $c_2(r+s_2+m+\lambda) = \frac{q_2(y_2-\bar{w}_2)(r+s_2+m+\lambda+p_1)}{(r+s_2+m+p_1)} > q_2(y_2-\bar{w}_2)$, then around the equilibrium $c_2(r+s_2+m+\lambda) - q_2(y_2-\bar{w}_2) > 0$. It implies $\frac{\partial \theta_2}{\partial \theta_1} < 0$.

A.2 Labor force repartition at steady-state

Exogenous parameters that impacts on the confirmed sub-market and on both sub-markets can undergo a direct effect but also two indirect effects: one directly through θ_1 and the other one through $\theta_2 = \theta_2(\theta_1)$. Let $x = \{\beta, y_1, b, d, s_1, c_1, r, m\}$ be the exogenous parameter and $X = \{\widetilde{L}_2, \widehat{L}_2, U_2, L_1, U_1, L_1 + U_1\}$ the endogenous variable, the effect of x on X is defined such as

$$\frac{dX}{dx} = \underbrace{\frac{\partial X}{\partial x}}_{\text{DIRECT effect}} + \underbrace{\frac{\partial X}{\partial p_1} \frac{\partial p_1}{\partial \theta_1} \frac{\partial \theta_1}{\partial x}}_{\text{INDIRECT effect by } \theta_1} + \underbrace{\frac{\partial X}{\partial p_2} \frac{\partial p_2}{\partial \theta_2} \frac{\partial \theta_2}{\partial p_1} \frac{\partial p_1}{\partial \theta_1} \frac{\partial \theta_1}{\partial x}}_{\text{INDIRECT effect by } \theta_2(\theta_1)}$$

Specific exogenous parameters of the beginner sub-market can undergo a direct effect and an indirect effect directly through θ_2. Let $y = \{y_2, \bar{w}_2, s_2, c_2, \lambda\}$ be the exogenous parameter studied, the incidence of y on X can be written as

$$\frac{dX}{dy} = \underbrace{\frac{\partial X}{\partial y}}_{\text{DIRECT effect}} + \underbrace{\frac{\partial X}{\partial p_2} \frac{\partial p_2}{\partial \theta_2} \frac{\partial \theta_2}{\partial y}}_{\text{INDIRECT effect by } \theta_2}$$

A.2.1 Effect of θ_1 and θ_2 on labor force repartition

Effect on $\widetilde{L}_2$:

$\frac{\partial \widetilde{L}_2}{\partial \theta_2} = p_2'(\theta_2) \frac{\partial \widetilde{L}_2}{\partial p_2} = p_2'(\theta_2) \frac{m^2(m+s_2+p_1)(s_2+m+p_1)(s_2+m+\lambda)}{\phi^2} > 0$

$\frac{\partial \widetilde{L}_2}{\partial \theta_1} = p_1'(\theta_1) \frac{\partial \widetilde{L}_2}{\partial p_1} = p_1'(\theta_1) \frac{-mp_2^2 \lambda s_2}{\phi^2} < 0$

With $\phi = m(s_2+m+p_1)(s_2+m+p_2+\lambda) + \lambda p_2(m+p_1)$

Effect on $\widehat{L}_2$:

$\frac{\partial \widehat{L}_2}{\partial \theta_2} = p_2'(\theta_2) \frac{\partial \widehat{L}_2}{\partial p_2} = p_2'(\theta_2) \frac{m^2 \lambda (s_2+m+p_1)(s_2+m+\lambda)}{\phi^2} > 0$

$\frac{\partial \widehat{L}_2}{\partial \theta_1} = p_1'(\theta_1) \frac{\partial \widehat{L}_2}{\partial p_1} = p_1'(\theta_1) \frac{-\lambda p_2 m(m(m+s_2+p_2+\lambda)+\lambda p_2)}{\phi^2} < 0$

Effect on U_2:

$\frac{\partial U_2}{\partial \theta_2} = p_2'(\theta_2) \frac{\partial U_2}{\partial p_2} = p_2'(\theta_2) \frac{-m(m+s_2+p_1)(m+s_2+\lambda)(m(m+s_2+p_1)+\lambda(m+p_1))}{\phi^2} < 0$

$\frac{\partial U_2}{\partial \theta_1} = p_1'(\theta_1) \frac{\partial U_2}{\partial p_1} = p_1'(\theta_1) \frac{-m(m+s_2+\lambda)s_2 \lambda p_2}{\phi^2} < 0$

Effect on L_1:

$$\frac{\partial L_1}{\partial \theta_2} = p_2'(\theta_2)\frac{\partial L_1}{\partial p_2} = p_2'(\theta_2)\frac{p_1\lambda(m+p_1)m(s_2+m+p_1)(s_2+m+\lambda)}{(s_1+m+p_1)\phi^2} > 0$$

$$\frac{\partial L_1}{\partial \theta_1} = p_1'(\theta_1)\frac{\partial L_1}{\partial p_1} = p_1'(\theta_1)\left[\frac{\lambda p_2(m+p_1)+\lambda p_2 p_1}{\phi(m+s_1+p_1)} - \frac{p_2 p_1\lambda(m+p_1)(m(m+s_2+p_2+\lambda)+\lambda p_2)}{\phi^2(m+s_1+p_1)} - \frac{p_2 p_1\lambda(m+p_1)}{\phi(m+s_1+p_1)^2}\right] > 0$$

Effect on U_1:

$$\frac{\partial U_1}{\partial \theta_1} = p_1'(\theta_1)\left[\frac{p_2 s_1\lambda}{\phi(m+s_1+p_1)} - \frac{p_2 p_1 s_1\lambda(m(m+s_2+p_2+\lambda)+\lambda p_2)}{\phi^2(m+s_1+p_1)} - \frac{p_2 p_1 s_1\lambda}{\phi(m+s_1+p_1)^2}\right] \gtrless 0 \ ?$$

$$\frac{\partial U_1}{\partial \theta_2} = p_2'(\theta_2)\frac{p_1\lambda s_1 m(s_2+m+p_1)(s_2+m+\lambda)}{(p_1+m+s_1)\phi^2} > 0$$

Effect on L_1+U_1:

$$\frac{\partial(U_1+L_1)}{\partial \theta_1} = p_1'(\theta_1)\frac{\partial(U_1+L_1)}{\partial p_1} = p_1'(\theta_1)\frac{\lambda p_2 m(s_2+m+p_2)(s_2+m+\lambda)}{\phi^2} > 0$$

$$\frac{\partial(U_1+L_1)}{\partial \theta_2} = p_2'(\theta_2)\frac{\partial(U_1+L_1)}{\partial p_2} = p_2'(\theta_2)\frac{p_1\lambda m(s_2+m+p_1)(s_2+m+\lambda)}{\phi^2} > 0$$

A.2.2 Effect of specific beginner sub-market parameters

	U_2	$\widetilde{L}_2$
Effect of y_2	$\frac{dU_2}{dy_2} = \frac{\partial U_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial y_2} < 0$	$\frac{d\widetilde{L}_2}{dy_2} = \frac{\partial \widetilde{L}_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial y_2} > 0$
Effect of $\bar{w}_2$	$\frac{dU_2}{d\bar{w}_2} = \frac{\partial U_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial \bar{w}_2} > 0$	$\frac{d\widetilde{L}_2}{d\bar{w}_2} = \frac{\partial \widetilde{L}_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial \bar{w}_2} < 0$
Effect of c_2	$\frac{dU_2}{dc_2} = \frac{\partial U_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial c_2} > 0$	$\frac{d\widetilde{L}_2}{dc_2} = \frac{\partial \widetilde{L}_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial c_2} < 0$
Effect of s_2	$\frac{dU_2}{ds_2} = \frac{\partial U_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial s_2} + \frac{\partial U_2}{\partial s_2} > 0$	$\frac{d\widetilde{L}_2}{ds_2} = \frac{\partial \widetilde{L}_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial s_2} + \frac{\partial \widetilde{L}_2}{\partial s_2} \gtrless 0$?
Effect of λ	see appendix A.2.4	$\frac{d\widetilde{L}_2}{d\lambda} = \frac{\partial \widetilde{L}_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial \lambda} + \frac{\partial \widetilde{L}_2}{\partial \lambda} < 0$

	$\widehat{L}_2$
Effect of y_2	$\frac{d\widehat{L}_2}{dy_2} = \frac{\partial \widehat{L}_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial y_2} > 0$
Effect of $\bar{w}_2$	$\frac{d\widehat{L}_2}{d\bar{w}_2} = \frac{\partial \widehat{L}_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial \bar{w}_2} < 0$
Effect of c_2	$\frac{d\widehat{L}_2}{dc_2} = \frac{\partial \widehat{L}_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial c_2} < 0$
Effect of s_2	$\frac{d\widehat{L}_2}{ds_2} = \frac{\partial \widehat{L}_2}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial s_2} + \frac{\partial \widehat{L}_2}{\partial s_2} < 0$
Effect of λ	see appendix A.2.4

	U_1	L_1
Effet de y_2	$\frac{dU_1}{dy_2} = \frac{\partial U_1}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial y_2} > 0$	$\frac{dL_1}{dy_2} = \frac{\partial L_1}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial y_2} > 0$
Effet de $\bar{w}_2$	$\frac{dU_1}{d\bar{w}_2} = \frac{\partial U_1}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial \bar{w}_2} < 0$	$\frac{dL_1}{d\bar{w}_2} = \frac{\partial L_1}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial \bar{w}_2} < 0$
Effet de c_2	$\frac{dU_1}{dc_2} = \frac{\partial U_1}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial c_2} < 0$	$\frac{dL_1}{dc_2} = \frac{\partial L_1}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial c_2} < 0$
Effet de s_2	$\frac{dU_1}{ds_2} = \frac{\partial U_1}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial s_2} + \frac{\partial U_1}{\partial s_2} < 0$	$\frac{dL_1}{ds_2} = \frac{\partial L_1}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial s_2} + \frac{\partial L_1}{\partial s_2} < 0$
Effect of λ	see appendix A.2.4	see appendix A.2.4

	U_1+L_1
Effet de y_2	$\frac{d(U_1+L_1)}{dy_2} = \frac{\partial(U_1+L_1)}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial y_2} > 0$
Effet de $\bar{w}_2$	$\frac{d(U_1+L_1)}{d\bar{w}_2} = \frac{\partial(U_1+L_1)}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial \bar{w}_2} < 0$
Effet de c_2	$\frac{d(U_1+L_1)}{dc_2} = \frac{\partial(U_1+L_1)}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial c_2} < 0$
Effet de s_2	$\frac{d(U_1+L_1)}{ds_2} = \frac{\partial(U_1+L_1)}{\partial p_2}\frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial s_2} + \frac{\partial(U_1+L_1)}{\partial s_2} < 0$
Effect of λ	see appendix A.2.4

A.2.3 Effects of specific confirmed sub-market parameters and commonly shared parameters

Effects of specific confirmed sub-market parameters and commonly shared parameters, on the labor force repartition, go through two indirect effects. The one that overcomes depends on the value of $(1-\eta_2)$ and thus on η_2.

Proof. Effects of specific confirmed sub-market parameters and commonly shared parameters can be resumed as:

$$\frac{\partial p_1}{\partial \theta_1}\frac{\partial \theta_1}{\partial x}\left[\frac{\partial X}{\partial p_2}\quad \frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial p_1}+\frac{\partial X}{\partial p_1}\right]$$

Noting $\mu = \frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial p_1}$

$$\begin{aligned}
\mu &= \frac{\partial p_2}{\partial \theta_2}\frac{\partial \theta_2}{\partial p_1} = p_2'(\theta_2)\frac{q_2\lambda}{(r+m+s_2+p_1)(r+s_2+m+p_1+\lambda)}\frac{1}{q_2'(\theta_2)} \\
&= \frac{p_2\lambda}{(r+m+s_2+p_1)(r+s_2+m+p_1+\lambda)}\left[\frac{\theta_2 q_2'(\theta_2)+\theta_2}{q_2'(\theta_2)\theta_2}\right] \\
&= \frac{p_2\lambda}{(r+m+s_2+p_1)(r+s_2+m+p_1+\lambda)}\left[\frac{1-\eta_2}{-\eta_2}\right] < 0
\end{aligned}$$

The value of η_2 that cancels both indirect effects is determined by $\left[\frac{\partial X}{\partial p_2}\mu+\frac{\partial X}{\partial p_1}\right]$ where $\mu=\mu(\eta_2)$. ■

Application to U_2:

$$\frac{\partial U_2}{\partial p_2}\mu+\frac{\partial U_2}{\partial p_1} = \frac{-p_2 m\lambda(s_2+m+\lambda)}{\phi^2}\left[s_2+\frac{(s_2+m+p_1)[m(s_2+m+p_1)+\lambda(m+p_1)]}{(r+s_2+m+p_1)(r+s_2+m+p_1+\lambda)}\left(\frac{1-\eta_2}{-\eta_2}\right)\right]$$

Both indirect effects cancel each other for a value of $\eta_2' = \Gamma'(r, s_2, m, p_1, \lambda)$ defined on $[0,1]$:

$$\eta_2' = \frac{(s_2+m+p_1)\left[m(s_2+m+p_1)+\lambda(m+p_1)\right]}{(s_2+m+p_1)\left[m(s_2+m+p_1)+\lambda(m+p_1)\right]+s_2(r+s_2+m+p_1)(r+s_2+m+p_1+\lambda)}$$

Application to L_1:

$$\begin{aligned}
\frac{\partial L_1}{\partial p_2}\mu+\frac{\partial L_1}{\partial p_1} \quad = \quad & \frac{p_2\lambda}{\phi^2(p_1+m+s_1)^2}\Bigg[p_2\lambda(s_1+m)(m+p_1)^2 \\
&+(s_2+m+p_2+\lambda)(s_1+m+p_1)[(s_2+m)(m+p_1)m+p_1 m s_1] \\
&+\left(\frac{1-\eta_2}{-\eta_2}\right)\frac{\lambda m p_1(p_1+m)(s_2+m+p_1)(s_1+m+p_1)(s_2+m+\lambda)}{(r+s_2+m+p_1)(r+s_2+m+p_1+\lambda)}\Bigg]
\end{aligned}$$

Both indirect effects cancel each other for a value of $\eta_2'' = \Gamma''(r, s_2, s_1, m, p_1, s_1, \lambda)$ defined on $[0,1]$:

$$\begin{aligned}\eta_2'' &= \lambda m p_1(s_1+m+p_1)(s_2+m+p_1)(m+p_1)(s_2+m+\lambda)\Big[(r+m+s_2+p_1)(r+s_2+m+p_1+\lambda) \\ &\quad \Big(m(s_2+m+p_2+\lambda)(s_1+m+p_1)[(s_2+m)(m+p_1)+p_1 s_1]+p_2\lambda(s_1+m)(m+p_1)^2\Big) \\ &\quad + \lambda m p_1(s_1+m+p_1)(s_2+m+p_1)(m+p_1)(s_2+m+\lambda)\Big]^{-1}\end{aligned}$$

Application to (L_1+U_1):

$$\frac{\partial(L_1+U_1)}{\partial p_2}\mu+\frac{\partial(L_1+U_1)}{\partial p_1} = \frac{p_2\lambda m(s_2+m+\lambda)}{\phi^2}\left[(s_2+m+p_2)+\frac{\lambda p_1(s_2+m+p_1)}{(r+s_2+m+p_1)(r+s_2+m+p_1+\lambda)}\left(\frac{1-\eta_2}{-\eta_2}\right)\right]$$

Both indirect effects cancel each other for a value of $\eta_2''' = \Gamma'''(r, s_2, m, p_1)$ defined on $[0,1]$:

$$\eta_2''' = \frac{\lambda p_1(s_2+m+p_1)}{\lambda p_1(s_2+m+p_1)+(s_2+m+p_2)(r+s_2+m+p_1)(r+s_2+m+p_1+\lambda)}$$

A.2.4 Effect of λ on labor force repartition

The Effect of λ on labor force repartition goes through two effects: a direct effect and an indirect effect. When both effects vary in opposite direction, the one that overcomes depends on the value of $(1-\eta_2)$.

$$\begin{aligned}\frac{dX}{d\lambda} &= \frac{\partial X}{\partial \lambda}+\frac{\partial X}{\partial p_2}\quad\frac{\partial p_2}{\partial \lambda} \\ &= \frac{\partial X}{\partial \lambda}+\frac{\lambda p_2}{(r+s_2+m+p_1)(r+s_2+m+p_1+\lambda)}\left[\frac{1-\eta_2}{-\eta_2}\right]\quad\frac{\partial p_2}{\partial \lambda}\end{aligned}$$

- Concerning $\widehat{L}_2$, U_1, L_1 and U_1+L_1, the value of η_2, defined on $[0,1]$, that cancels both effects is determined by:

  $$\bar{\eta}_2 = \frac{\lambda^2(s_2+m+\lambda)}{\lambda^2(s_2+m+\lambda)+(s_2+m+p_2)(r+s_2+m+p_1)(r+s_2+m+p_1+\lambda)}$$

  When $\eta_2<\bar{\eta}_2$, $(1-\eta_2)$ is *strong*: $\frac{d\widehat{L}_2}{d\lambda}<0$, $\frac{dL_1}{d\lambda}<0$, $\frac{dU_1}{d\lambda}<0$ and $\frac{d(L_1+dU_1)}{d\lambda}<0$

  When $\eta_2>\bar{\eta}_2$, $(1-\eta_2)$ is *weak*: $\frac{d\widehat{L}_2}{d\lambda}>0$, $\frac{dL_1}{d\lambda}>0$, $\frac{dU_1}{d\lambda}>0$ and $\frac{d(L_1+dU_1)}{d\lambda}>0$

- Concerning U_2, the value of η_2, defined on $[0,1]$, that cancels both effects is determined by:

  $$\bar{\bar{\eta}}_2 = \frac{\lambda(s_2+m+\lambda)[m(s_2+m+p_1)+\lambda(m+p_1)]}{\lambda(s_2+m+\lambda)[m(s_2+m+p_1)+\lambda(m+p_1)]+s_2p_1(r+s_2+m+p_1)(r+s_2+m+p_1+\lambda)}$$

  When $\eta_2<\bar{\bar{\eta}}_2$, $(1-\eta_2)$ is *strong*: $\frac{dU_2}{d\lambda}>0$

  When $\eta_2>\bar{\bar{\eta}}_2$, $(1-\eta_2)$ is *weak*: $\frac{dU_2}{d\lambda}<0$

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