Labour Economics 27 (2014) 16–29

Contents lists available at ScienceDirect

Labour Economics

journal homepage: www.elsevier.com/locate/labeco

Turbulence, training and unemployment ☆

Pascal Belan [a], Arnaud Chéron [b,*]

[a] THEMA, Université de Cergy-Pontoise, France
[b] GAINS-TEPP, Université du Maine and EDHEC Business School, France

ARTICLE INFO

Article history:
Received 12 June 2012
Received in revised form 14 January 2014
Accepted 14 January 2014
Available online 24 January 2014

JEL classification:
J24
J31

Keywords:
Training
Training subsidies
Unemployment
Matching

ABSTRACT

In this paper, we develop a matching model where firms invest in transferable human capital. Workers are endowed with heterogeneous abilities and, as a result of economic turbulence, can undergo a depreciation of their human capital during unemployment spells. Firms take inefficient training decision because they do not fully valuate the additional productivity of the workers in future jobs (poaching externality) and the additional employability after separation (unemployment externality). Higher turbulence reduces the former externality and increases the latter. It then generates some opposite forces on the gap between efficient and equilibrium training, so that it does not necessarily require higher training subsidies. The general equilibrium analysis shows that, even if the Hosios condition holds, unemployment is higher than its efficient level, which requires an additional instrument such as ability-specific employment subsidies. We lastly run some computational experiments based on the French economy to illustrate these results: optimal subsidies are found to increase with turbulence, and the total subsidy turns out to be decreasing with wages, with an efficient rate that is reduced by three from the lowest to the highest wages.

1. Introduction

Ljungqvist and Sargent (1998, 2007) emphasize that economic turbulence, featuring human capital depreciation during unemployment spell, interacts with labor market institutions to generate persistently higher unemployment in Europe than in the US. More precisely, high levels of unemployment insurance benefits and employment protection are shown to explain the unemployment gap between Europe and the US following the observed increase in the probability of skill deterioration after involuntary layoffs. Furthermore, Ljungqvist and Sargent (LS) show the plausibility of this view by assessing the role of turbulence in the context of alternative frictional labor market models. But to some extent, one caveat of this approach is to consider that the process of human capital accumulation is purely exogenous, so that it leaves no room for discussing the role of training policies. This paper aims at filling this gap by examining the efficiency and labor market policy issues of a frictional labor market model *à la* LS extended to account for endogenous training decision. It has indeed long been recognized that frictional labor markets give rise to inefficient training outcomes.

At the end of the nineties, some key contributions revisited Becker's competitive approach to human capital investments. Acemoglu (1997) first emphasizes that frictional labor market may explain the willingness of employers to bear part of the costs of general training, in contrast with the perfect labor market result. For instance, wage bargaining indeed implies that a fraction of additional productivity obtained from worker's training goes to the firm. Then, the point is that training investment in general human capital can also benefit to future employers, hence giving rise to a *poaching externality*: with some probability, an unknown party (the future employer) is getting a proportion of the training benefit when the worker is displaced.[1] Training subsidies are then required to reach optimal investment levels.[2] On another (positive) standpoint, Wasmer (2006) deals with the relative returns to specific *vs.* general human capital investments, which are found to depend both on market frictions and institutions such as employment protection. More particularly, general human capital investments are found to be more valuable in the US than in Europe, due to lower firing costs in the US. Decreuse and Granier (2013) also recently emphasized the impact of labor market institutions on the nature of educational investment, before entering the labor market. Lastly, the interaction between market imperfections and firm-sponsored training has also been documented from an empirical point of view. For instance, Picchio and van Ours (2011) showed that an in increase in labor market flexibility significantly reduces the incentives of firms to invest in training.[3]

☆ We would like to thank two anonymous referees and the co-editor of Labour Economics for their helpful comments and suggestions.

* Corresponding author at: Avenue olivier messiaen, 72035 Le Mans Cedex 9, France. Tel.: +33243833659.
E-mail address: acheron@univ-lemans.fr (A. Chéron).

[1] See also Acemoglu and Pischke (1998, 1999a,b) and Acemoglu and Shimer (1999). Stevens (1994a,b) also emphasized the role of poaching externalities for underinvestment in transferable training in a different context with imperfect competition on the labor market.

[2] On the opposite, Tripier (2011) argues that by considering intrafirm bargaining in a matching economy, efficiency of training investments typically occurs.

[3] A significant part of empirical works have also been devoted to the analysis of the wage returns to continuing vocational training; see Brunello et al. (2012) for a recent study.

0927-5371/$ – see front matter © 2014 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.labeco.2014.01.001

In turn, the primarily goal of this paper is to show how economic turbulence modifies the conventional normative analysis of training. This requires to combine the turbulence explanation of unemployment as developed by LS and the literature of endogenous human capital investments in frictional labor markets. Following LS, we only deal with general human capital investment whose transferability property is assumed to be lost with some probability during workers' unemployment spell, *i.e.* specific human capital investments are not allowed for. More precisely, if we refer to the island metaphor applied to human capital investments, as developed in Wasmer (2006), firms are assumed to eventually provide workers a common technology to all islands (which is highly valuable with connected islands) but with some probability the connection fails; the greater the turbulence, the higher the probability.[4]

A first contribution of this paper is therefore to show how turbulence interacts with the poaching externality.[5] Firms can pay for some vocational training which leads to an endogenous accumulation of transferable skills, whose cost is partly shared with the workers through the wage bargaining process. If the rate of human capital obsolescence during unemployment is increased (higher economic turbulence) the probability that future employers' benefit from present training by the incumbent employer is lower. The size of the poaching externality is therefore reduced so that the gap between the equilibrium and efficient outcomes is also reduced.

Beyond that, our paper points out that taking into account of the impact of general human capital depreciation on matching probabilities can give rise to another source of externality, that we label *unemployment externality*.[6] The baseline idea is that training investments may increase the probability of leaving unemployment and contribute to raise steady-state employment, hence output. But it is obvious that firms do not internalize the consequences of their own training decisions on the unemployment level. The wedge between social and private return on training results in lower training investments than required by the first-best allocation. Furthermore, we highlight that with endogenous matching transition rates, the higher the turbulence, the higher the gap between equilibrium and efficient unemployment rates. *Ceteris paribus*, it is indeed optimal to reduce unemployment duration that exposes to a higher risk of human capital depreciation. Overall, turbulence is thus found to generate some opposite forces on the gap between efficient and equilibrium allocations.

To derive those results we develop a frictional labor market model with heterogenous workers according to observable characteristics (diplomas), where firms can invest in training that brings up-to-date knowledge to workers and raises their productivity. During unemployment spells, the worker may lose his up-to-date knowledge, but firms cannot know *ex ante* who among the unemployed underwent such a skill depreciation. Once hiring decision is taken, worker's skill is revealed and the firm chooses to pay the training cost or not. Turbulent times mean that depreciation of transferable skill during unemployment spell occurs with higher probability.

Our assumptions fit some observed patterns in firm training policies: Ok and Tergeist (2003) indeed showed, (*i*) by collecting data from 19 OECD countries that the participation rate of workers in high-skilled occupations is always higher than that of workers in low-skilled occupations, (*ii*) by running some wages regressions based on the ECHP, that the impact of training is significantly increasing with the level of workers' diploma. Accordingly, we assume that the higher the observable skill characteristic, the higher the training efficiency (see also Cunha et al. (2006) on that aspect). This implies therefore that firms concentrate training investments on high skilled workers. Additionally, accrued productivity due to training allows skilled workers to be more employable.

The theoretical analysis is begun by considering exogenous contact rates between unemployed workers and firms, assuming that high skilled workers, who are likely to be trained, have higher probability to be matched with a job than low skilled ones, who have no chance to be trained. Such a structure in contact rates is shown to be obtained in the more general benchmark matching model with endogenous contact rates. We then make a focus on the poaching and unemployment externalities and discuss the impact of turbulence on those externalities.

We lastly run some quantitative investigations of the general equilibrium model with endogenous contact rates, based on the french economy. In particular, for a calibration that satisfied the Hosios condition, the gap between equilibrium and efficient unemployment is found to rise from zero when there is no turbulence (tranquil times), to more than 2.5 points of percentage when the expected unemployment duration before experiencing human capital loss is two quarters.

Section 2 is devoted to the presentation of the benchmark matching model with turbulence and training. Section 3 characterizes the equilibrium and efficient properties of training by first assuming exogenous contact rates. Section 4 extends those former results to the endogenous matching case and runs the quantitative exercises. Section 5 concludes.

2. A matching model with turbulence and endogenous training investments

2.1. Environment and labor market flows

Time is continuous. The population of workers is a continuum of unit mass. Workers look for jobs and are randomly matched with employers looking for workers to fill vacant units of production. A productive unit is transferable job skills which can be used in present and any future occupation. For instance, workers can be trained in order to use new technologies and be aware of recent innovations in their field. These skills can be used in other jobs, but are not certified by any diploma and is therefore not observable by future employers.Moreover, during unemployment spell, the worker may lose the benefits of past firms training, and will then need a new formation to recover his up-to-date knowledge when matched with a new job. The latter assumption introduces obsolescence of human capital as a result of what Ljungqvist and Sargent (1998) have the association of one worker and one firm. Workers are heterogeneous with respect to ability a, distributed on the interval $[\underline{a}, \overline{a}]$ according to p.d.f. $f(a)$. Ability a is a general human capital index, perfectly observable by firms, due to certification through school or university diplomas.

An individual at skill level a can reach two levels of productivity, $(1+\Delta)a$ or a, with $\Delta > 0$, according to the fact that his knowledge is respectively still up-to-date or not. Additionally, firms can pay for a fixed training cost γ_F in order to provide up-to-date knowledge to the worker. Training brings additional called turbulence. It embodies the possibility of substantial human capital destruction after job loss (Jacobson et al., 1993; Farber, 2005).

For the sake of simplicity, it is assumed that workers cannot accumulate skills according to tenure and experience: either the worker has up-to-date knowledge which improves its efficiency on the job according to its ability (with an additional output equal to Δa), or his knowledge has became obsolete or depreciated which precludes any additional output.

The combination of firm training and human capital obsolescence gives rise to informational asymmetry between workers and firms during the matching process. Once the match is formed, the information on worker's skill is revealed and the negotiated wage takes account of the

[4] Wasmer (2006) argues that in an economy made of very distant islands it is better to learn the technology of the island in which one lives (specific investments), whereas the more connected the islands are, the more profitable it is to learn the common technology (general investments).

[5] Poaching externalities are generally emphasized in the context of on-the-job search. Although our paper does not allow for on-the-job search, we will also refer to poaching externality according to the fact that some employers may benefit from training of other firms.

[6] Pissarides (1992) has already stressed this kind of externality. Nevertheless, to the best of our knowledge, this issue has not yet been connected with vocational training (see Leuven (2005) for a survey).