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Labor market rigidity and productivity growth in a model of innovation-driven growth

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ABSTRACT

Empirical studies investigating the relationship between productivity performance and labor market rigidity have generated a negative result. In this paper we try to provide a theoretical explanation for this empirical result. In doing so, we construct a no-shirking model of innovation-based growth and investigate the steady-state impact of a set of active labor market policies aimed at reducing labor market rigidity and knowledge mismatch generated by innovations. We find that, while enhancing job finding activity definitively improves the equilibrium growth–unemployment mix of the economy, reducing the knowledge mismatch of innovation through active measures is less effective in reducing the equilibrium unemployment and improving growth.

1. Introduction

Labor market rigidity has always been charged as being responsible for the unsatisfactory mix of low productivity growth and high equilibrium unemployment in the European Union (EU) economy. The received wisdom is that the European economy is rigid and low-performing, while the US economy is dynamic and high-performing (OECD, 2003). Despite the common practice of considering the EU a common market, Europe is far from being a single economy; rather, it is a collection of 27 independent economies, with many of them operating well enough to produce unemployment rates lower than the flexible US. So why is average equilibrium unemployment so high and productivity growth so low in Europe?

To answer this question, the empirical literature has thus far proposed an array of studies on many particular aspects of labor markets such as firing costs and severance payments (Bentolila and Bertola, 1990; Garibaldi and Violante, 2002), the unemployment benefit system (Layard et al., 1991), the loss of human capital during unemployment spells (Ljungqvist and Sargent, 2002), insider–outsider relations (Blanchard and Summers, 1987) and the inability of systems to adjust either to macroeconomic shocks (Blanchard and Wolfers, 2000; Nickell, 2003) or to microeconomic ones (Gottshalk and Moffitt, 1994). The main conclusion of all these papers is that rigid labor markets lead to low productivity performance.

Motivated by the aforementioned empirical evidence, in this paper we try to provide a possible theoretical explanation for the negative relationship between productivity growth and labor market rigidity. Our research goals are twofold. On the one hand, we are interested in building a tractable model of endogenous technological change with shirking unemployment. On the other, we are interested in studying how labor market policies (LMP)[1] could potentially improve the productivity–unemployment mix of the economy.

Our interest in studying the growth implications of LMP is easily explainable. LMP consist of a series of government programs aiming at increasing the probability that the unemployed will find jobs or increasing the productivity of the employed and underemployed. These policies have been at the core of the European Employment Strategy, which has tried to find the best practices to help EU Member countries both fight unemployment and create better jobs.[2] However, evaluations of their impact on equilibrium unemployment and employability are mixed, with many programs being assessed as having little or no impact on the employability of labor market participants.[3]

[1] According to OECD (2003, 2004), active LMP refer to all those labor market policies aiming at facilitating transitions from unemployment to employment in several ways, including: job-placement services, labor market programs (such as job-search assistance, vocational training for the unemployed), job-creation schemes, etc.

[2] For an extended discussion about the genesis and development of the European Employment Strategy, as well as its original motivations and targets, see, in particular, Goetschy (1999) and Marchetti and Ciccarone (2004).

[3] For a comparison between US and EU policy approaches see in particular Heckman et al. (1999), Kluve and Schmidt (2002) and Kluve (2006).

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This paper wants to explore such an ambiguous result from a theoretical point of view and extend the analysis to include the impact of LMP on innovation investment and productivity growth. Our model is a modified version of the Grossman and Helpman (1991) model of growth with creative destruction. To incorporate labor market rigidity into a growing economy, we introduce the efficiency wage scheme proposed by Shapiro and Stiglitz (1984) and make the two following assumptions. First, each time an innovation occurs, we assume that it generates a mismatch between the knowledge required by the new technology vintage and the level of knowledge embodied by the workers. Second, we assume that the probability that an unemployed worker could find a new job in the next period is lower than one and depends on an endogenous job-finding rate. Specifically, we assume that, once in the unemployment spell, the probability that a worker can find a new job depends on both an exogenous term reflecting the condition of the labor market and an endogenous term linked to the innovation intensity of the economy.

The model is solved for the steady state and exploited to study the long-run effects of LMP on productivity growth and equilibrium unemployment. We find that improving the performance of the labor market slightly increases the steady-state rate of innovation in the economy and decreases the equilibrium rate of unemployment. In order to assess which LMP is more suitable to improve the productivity–unemployment mix of the economy, in the final part of the paper we calibrate the model for the steady state equilibrium and find that focusing on LMP that affect the workers' job searching activity (for example, LMP services such as active job-search workshops, social and vocational orientation services, etc.) is more effective in reducing the equilibrium unemployment than focusing on LMP that reduce the knowledge mismatch generated by innovation (for example, active measures such as training, integration contracts, etc.). Our simulations also show that both policies slightly modify income distribution in favor of wage income.

Thus far, the most fundamental papers on growth and unemployment have been mainly based on Pissarides'(1990) standard search models. To the best of our knowledge, this paper is the first contribution that tries to study the issue of growth and LMP in the presence of shirking unemployment.[4]

The outline of the paper is the following. Section 2 sets up the model by describing the case of a Schumpeterian growth model with a rigid labor market. Section 3 describes the steady-state equilibrium of the model. Section 4 studies the impact of a labor market policy aimed at reducing market rigidities, while Section 5 provides a numerical calibration in search of the more effective policy. Finally, Section 6 concludes.

2. The model economy

2.1. An overview of the model

The model is set in a continuous time. The production side of the economy consists of three vertically integrated sectors: a final-goods sector, an intermediate-goods sector, and a research sector. The final-goods sector produces a single homogeneous output (henceforth final output) that is used only for consumption. The intermediate sector consists of a continuum of industries, indexed by $i \in [0, 1]$, each one producing an intermediate component. In each industry i, the labor productivity of the firm is pinned down by the technology vintage of the production process that the intermediate goods producer uses. New vintages entail improvement in labor productivity, which in turn raises the average productivity of the final output sector. We denote the vintage of technology used by the ith industry at time t by $j(i, t)$, with higher values of the index j indicating more efficient production technology. To learn how to introduce the $j(i, t)+1$ vintage, firms participate in sequential and stochastic R&D races. As in Grossman and Helpman (1991) and Aghion and Howitt (1992), we assume free entry into R&D races and a common constant returns to scale technology at the disposal of racers. The discoverer of the $j(i, t)+1$ vintage gets an everlasting patent protection that makes him the only one allowed to use it freely.

Labor is the only factor used in both production activities as well as in research. In contrast to the standard Schumpeterian literature, we introduce two main modifications. First, we assume that the technology monitoring workers' and researchers' effort is not perfect. Second, we assume the presence of some impediments that make the labor market inflexible at both industry and aggregate level. At the aggregate level, labor market rigidity refers to the difficulty with which workers and employers negotiate mutually advantageous labor contracts; at the industry level, labor market rigidity refers to the difficulty with which workers move from one industry to another once a new technology is introduced.

Over time, final output improves as innovations push upwardly the technology frontier. We focus on the steady-state equilibrium where the final-output is the numéraire of the model.

2.2. Consumers/workers

At each instant of time, the economy is populated by a continuum $N(t)$ of identical, infinitely-lived consumers/workers (henceforth individuals) who dislike making effort. Population grows over time at an exogenous rate n, so that at each point in time t, the size of the total population is $N(t)=N(0)e^{nt}$.

Individuals are either employed or unemployed. When employed, individuals decide to either exert effort or not depending on the level of the current wage offered by firms. Following Shapiro and Stiglitz (1984), we assume that workers contribute one unit of labor if they do not shirk, or nothing otherwise. The probability that a worker engaged in shirking is caught and fired is exogenously given and equal to $\xi \in [0,1]$.

We model effort as a binary variable, denoted by ε, depending on whether workers decide to exert effort ($\varepsilon=1$) or not ($\varepsilon=0$). To simplify the model, we assume a linear utility function in consumption c and effort $\varepsilon\chi(t)$, where $\chi(t)>0$ is a measure of the individual's disutility in terms of output units. Denoting expectation at time t by E_t, the representative consumer/worker intertemporal utility function reads:

$$U(c,\varepsilon) \equiv E_t \int_t^{\infty} e^{-\rho(s-t)}[c(s)-\varepsilon\chi(s)]\mathrm{d}s \qquad (1)$$

where $\rho>n$ denotes the subjective discount rate.

The intertemporal maximization problem consists of maximizing Eq. (1) subject to the intertemporal budget constraint:

$$\dot{a}(t) = [r(t)-n]a(t) + z(t)-\tau(t)-c(t) \qquad (2)$$

where $a(t)$ is the individual's financial assets (with $\dot{a}(t)$ denoting changes in wealth), $r(t)$ is the risk-free interest rate, $z(t)$ is the labor income, $\tau(t)$ is the per-head tax[5] and $c(t)$ is the real consumption expenditure.

Labor income $z(t)$ depends on the worker's status at time t. It might include either the current wage rate $w(t)$ when employed or the unemployment benefits $b(t)$ when unemployed, i.e., $z(t)=\{w(t), b(t)\}$. The unemployment benefits are financed by a head tax equal to τ units of output for each household. In the rest of the paper, we assume that both $b(t)$ and $\chi(t)$ increase at the same rate as the average productivity.[6]

[4] For general equilibrium models of growth with search unemployment and labor market policy see in particular Mortensen and Pissarides (2001) and Mortensen (2005).

[5] The paper excludes tax distortion and assumes lump-sum taxation to finance unemployment benefits.

[6] For the sake of simplicity, at this stage of the analysis we take as implicit the dependence $b(t)$ and $\chi(t)$ on the growth rate of the economy.