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Unemployment equilibrium and economic policy in mixed markets☆

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ABSTRACT

This paper features a simple static Cournot–Nash model of an exchange economy with two productive sectors at flexible prices and wages. The traders in the atomless sector are price-takers, while the atoms behave strategically. We focus on the consequences of strategic interactions on the market outcome. Firstly, strategic interactions create underemployment on the labor market. Secondly, when the number of atoms increases without limit, the CWE coincides with the competitive equilibrium. Thirdly, we compare the welfare reached by traders at both equilibria. Fourthly, we consider the implementation of a tax levied on strategic supplies. Finally, we compare the approach retained with the monopolistic competition framework.

1. Introduction

A vast literature has been devoted to un(der)employment equilibrium without rigidities in a partial equilibrium framework (Cahuc and Zylberberg, 2004).[1] The motivations in this paper are twofold. Firstly, it aims at providing a conceptual framework into which the determination of market general equilibrium outcome is based on strategic interactions at flexible prices and wages. Secondly, it analyzes the working and the consequences of the strategic interactions within a sector on a perfectly competitive sector with a labor market. This paper therefore considers a simple static Cournot–Nash model of an exchange economy with two productive sectors.

Two main approaches model strategic interactions in general equilibrium. First, the strategic market games consider decentralized trading posts (Shapley and Shubik, 1977; Dubey and Shubik, 1978; Sahi and Yao, 1989). This approach was elaborated in order to circumvent the auctioneer. Second, the Cournot–Walras equilibrium (CWE) approach initially developed by Gabszewicz and Vial (1972) in an economy with production, and pursued by Codognato and Gabszewicz (1991, 1993), Gabszewicz and Michel (1997) and by d'Aspremont et al. (1997) for pure exchange economies, considers a market clearing price mechanism together with a non cooperative game on quantities. This literature focuses on the consequences of market power in general equilibrium. More specifically, the CWE models make the equilibrium prices and the allocations the results of a market price mechanism in strategic multilateral exchange. As a consequence, the market demand which addresses to each producer is made endogenous. We here propose to investigate the question of underemployment equilibrium in strategic multilateral exchange with competition *à la* Cournot–Walras.

Many models deal with un(der)employment in general equilibrium under imperfect competition without rigidities. Models of cooperation failures put forward un(der)employment equilibrium. Inefficiencies may be caused by local market power of firms and consumers, which stems from the fact that all goods (and all labors) are imperfect substitutes (Blanchard and Kiyotaki, 1987; Layard et al., 1991), or that some deficiency of aggregate demand occurs (Hart, 1982; d'Aspremont et al., 1989, 1990). Monopolistic competition models do not provide microfoundations which explain why monopolistic agents could not interact strategically when determining their price. In addition, no market price mechanism by which equilibrium prices would be detemined is provided. In other (oligopolistic) models, each seller either objectively knows or must conjecture subjectively the demand which addresses to her (Bénassy, 1991; Negishi, 1961). Otherwise, models of coordination failures feature some indeterminacy (Heller, 1986; Manning, 1990; Roberts, 1987), so multiple equilibria make economic policy difficult (Cooper, 1999, 2005).

In this paper, we consider a model in which the equilibrium prices are determined by a market mechanism and in which the demand functions are micro-founded. We extend the basic model of an exchange economy with a productive sector of Gabszewicz and Michel (1997). The economy includes two productive sectors and a competitive labor market.[2] In one sector (the atomless sector), all the agents are price takers, while the agents in the other sector (the atomic sector) behave strategically. We therefore refer to the concept of "mixed markets" rationalized by Shitovitz (1973) in a pure exchange economy. The following results are obtained. First, the

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[1] Without being exhaustive, one could make reference to search theory, matching approaches, wage bargaining theories….

[2] The production activities in time were considered in a bilateral oligopoly model in Cordella and Datta (2002), but with storage functions and without a labor market.

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economy has a CWE with underemployment at flexible prices and wages.[3] Second, when the number of atoms increases unboundedly, the underemployment CWE coincides with the full employment competitive equilibrium. Third, we compare the individual welfare reached at both equilibria. Fourth, we consider economic policy by introducing a tax levied on strategic supplies in order to reduce market distortions caused by strategic behaviors. In addition, it is shown that the tax enhances the welfare of agents belonging to the atomless sector. We compute the Chamberlin–Walras equilibrium for the same basic economy. Thus, the CWE is not Pareto dominated by the Chamberlin–Walras equilibrium. In addition, the tax policy has more impact on the market outcome in the CWE.

The paper is organized as follows. In Section 2, we describe the basic economy. Section 3 is devoted to the CWE with underemployment. Section 4 considers the implementation of a tax policy. Section 5 computes the Chamberlin–Walras equilibrium and compares it with the results previously obtained. In Section 6, we conclude.

2. The economy

Consider an exchange economy with two productive sectors. The first sector (the atomless sector) includes two continua of agents represented by the intervals of mass 1 $T_i=[0, 1]$, $i=0, 1$, with the Lebesgue measure μ, where $T_0=[0,1]$ is the set of negligible firms, and where $T_1=[0, 1]$ is the set of negligible consumers. For $t\in T_i=[0, 1]$, $i=0, 1$, one gets $\mu(t)=0$. Therefore, both sets include agents who behave competitively as price takers. The second sector (the atomic sector) embodies n atoms $a_1, a_2\ldots,a_n$, with typical element $\{a_j\}$, each of measure $\mu(\{a_j\})=1, j=1,\ldots,n$. Let us denote $T_2=\{1,\ldots,n\}$ the finite set of atoms (indifferently the large traders or the oligopolists) who behave strategically.

There are two produced consumption goods, and one nonproduced good, labor. Both consumption goods and labor are perfectly divisible. Let us denote p_1, p_2 and w respectively the prices of good 1, of good 2, and the wage rate. We assume that good 1 is the *numéraire*, so $p_1=1$. As a consequence, both relative prices shall be denoted as $\frac{p_2}{p_1}=p$ and $\frac{w}{p_1}=w$.

2.1. Preferences, endowments and technologies

The preferences toward consumption goods are assumed to be represented by a Cobb–Douglas specification. We consider preferences that feature generalization in consumption activities.[4] The utility function of trader $t\in T_1$ defined as U_t:$T_1\times\mathbb{R}^3_+\to\mathbb{R}$, with $\mathrm{U}(t,x,l)=\mathrm{U}_t(x, l)$, is measurable. It is assumed to have the desired properties (continuity, monotonicity and strict concavity). It is also assumed to be additively separable in consumption demands $x(t)$ and leisure, and homogenous of degree 1 in consumption of both goods.[5] So we consider the following specification[6] for any $t\in T_1$:

$$U_t(x(t),l(t)) = \left[\frac{x_1(t)}{\alpha}\right]^{\alpha}\left[\frac{x_2(t)}{1-\alpha}\right]^{1-\alpha} - \frac{1}{1+\varepsilon}[l(t)]^{1+\varepsilon}, \alpha\in(0,1), \varepsilon>0, \tag{1}$$

where $x_1(t)$, $x_2(t)$ and $l(t)$ denote respectively the demand of commodities 1 and 2 and the labor supply for $t\in T_1$. Additionally, $\alpha\in(0, 1)$ is the constant elasticity of utility with respect to consumption, which also measures the strength of the demand linkage across both sectors. Additionally, ε represents the Frisch elasticity of labor supply (constant marginal utility of wealth).[7]

The utility function of any atom $\{a_j\}$, $j\in T_2$, defined as $U_{a_j}:\mathbb{R}^2_+\to\mathbb{R}$, is assumed to have a desired properties (continuity, monotonicity and strict quasi-concavity). It is also continuous and homogenous of degree 1 consumption of both goods. It may thus be written:

$$U_{a_j}(x) = \left[\frac{x_1\left(a_j\right)}{\alpha}\right]^{\alpha}\left[\frac{x_2\left(a_j\right)}{1-\alpha}\right]^{1-\alpha}, \ \alpha\in(0,1) \text{ for } j\in T_2, \tag{2}$$

where $x_1(a_j)$ and $x_2(a_j)$ represent the demand functions for goods 1 and 2 of atom a_j, $j\in T_2$.

Neither consumption good is initially possessed by any type of agents, whereas the consumers in the atomless sector are endowed with one unit of the nonproduced good, so the structure of the initial endowments is given by:

$$\begin{aligned} \omega(t) &= (0,0,0),\ t\in T_0, \\ \omega(t) &= (0,0,1),\ t\in T_1, \\ \omega\left(\left\{a_j\right\}\right) &= (0,0,0),\ j\in T_2. \end{aligned} \tag{3}$$

In addition, each firm $t\in T_0$ and each atom $\{a_j\}$ have inherited a technology which specifies how to produce some amounts of only one good. This assumption features specialization in production. Let the production set of any agent $t\in T_0$ be $Y(t)=\{(y(t),\ n(t))\in\mathbb{R}^2_+\,|\,y(t)\le\frac{1}{\beta}[n(t)]^{\beta}$, where $y(t)$ and $n(t)$ represent the production of good 1 and the demand of labor. The production set is assumed to be strictly convex, so $\beta\in(0, 1)$, where β measures the productivity of labor. Therefore, the production function of any agent $t\in T_0$, is defined by all vectors $(y(t), n(t))\in supY(t)$, and may be written:

$$y(t) = \frac{1}{\beta}[n(t)]^{\beta},\ \beta\in(0,1),\ t\in T_0. \tag{4}$$

Let $Y_{a_j}=\{(y(a_j), (z(a_j))\in\mathbb{R}^2_+\,|\,y(a_j)\le\frac{1}{\gamma}z(a_j)\}$ be the production set of $a_j\in T_2$, where $y(a_j)$, $z(a_j)$ and $\gamma>0$ represent respectively the amount of output 2, the demand of output 1 as an input and the inverse of the productivity.[8] Thus, the production function of firm $\{a_j\}$ is defined by all vectors $((y(a_j), (z(a_j))\in supY_{a_j}$, and may consequently be written:

$$y\left(a_j\right) = \frac{1}{\gamma}z\left(a_j\right),\ j\in T_2. \tag{5}$$

The atoms have two decisions to make: which quantities y_j of good 2 to produce (which determines through Eq. (4) the amount $z(a_j)$ of good 1 to be bought as an input), and which amount $y(a_j)$ of good 2 to supply in exchange for good 1 on the market. The only strategic decision concerns the quantity $z(a_j)$ brought to the market. Thus, production activities do not involve strategic interactions.

2.2. Strategy sets

The convex strategy set of each type of traders may be written:

$$S_{a_j} = \left\{s\left(a_j\right)\in\mathbb{R}_+\,|\,0\le s\left(a_j\right)\le y\left(a_j\right),\ j\in T_2, \right. \tag{6}$$

$$S_t = \{\varnothing\},\ t\in T_0. \tag{7}$$

[3] The existence and the uniqueness analysis are beyond the scope of this paper, which aims at characterizing the Cournot–Walras equilibrium. The existence of a general oligopoly equilibrium usually rises specific problems (Bonnisseau and Florig, 2003; Gabszewicz, 2002).

[4] Some models assume agents do not consume the good they produce in order to circumvent "Ford effects" (Diamond, 1982; Heller, 1986; Roberts, 1987; Weitzman, 1982).

[5] The separation property simplifies welfare comparisons.

[6] We can notice that for $\alpha=0$ the economy is autarkic; and for $\alpha=1$ commodity 2 is a pure input and agents only consume good 1.

[7] Moreover, $\varepsilon-1$ is the elasticity of marginal disutility with respect to work.

[8] This specification simplifies the computation of the general oligopoly equilibrium.