Economic Modelling 35 (2013) 374–383

Contents lists available at ScienceDirect

Economic Modelling

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

Are pollution permit markets harmful for employment?☆

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ARTICLE INFO

Article history:
Accepted 9 July 2013

JEL classification:
E24
J50
L13
Q52
Q58

Keywords:
Monopolistic competition
Equilibrium employment
Pollution permit market
Unemployment benefits

ABSTRACT

This paper analyzes the effects of pollution permit markets on equilibrium employment in a wage-setting/price-setting (WS–PS) model. The employment level is determined according to different methods of financing unemployment benefits: a wage tax or the revenue from a pollution permit auction. We show that a permit market weakens the trade unions' market power. Furthermore, whatever the method of financing unemployment benefits, the choice of the pollution cap is always neutral for employment, and the level of employment always increases as the pollution abatement technology becomes more efficient. Depending on the value of the wage tax, the employment level can be higher or lower when unemployment benefits are financed by pollution permits rather than wage tax.

1. Introduction

Nowadays, pollution permit markets are considered a useful tool to reduce pollution. As far as greenhouse gas emissions (GHG) are concerned, the Kyoto protocol, intended to curb the air pollution blamed for global warming, came into force on February 2005. It stipulated that Appendix I countries had to reduce their GHG emissions by a collective average of 5% below their 1990 levels by 2012. To help countries reach this objective, the Kyoto protocol has implemented an international pollution permit market. The European Union Emissions Trading Scheme (EU ETS), which is fundamental to the strategy of carbon emission reduction in Europe, was launched on January 2005.

The EU ETS is today the largest multi-national pollution permit market in the world. It covers more than 10,000 energy intensive facilities across the twenty-seven EU member states and the entities covered produce about 45% of the EU's carbon dioxide emissions.[1] The scheme distinguishes between three trading periods: Phase I began in 2005 and Phase 2 in 2008, covering the period of the Kyoto protocol. The European Union was committed to reducing its GHG emissions by 8% from 1990 levels between 2008 and 2012. The EU ETS was designed to become increasingly stringent: more sectors are included in the program (for example, the aviation sector since January 2012) and Phase 3, which begins in 2013, is intended to reduce emissions by 21% from 2005 levels. Moreover, auctioning will gradually replace free allocation. During Phase 1, allowances were given freely in all countries on the basis of a "grandfathering" mechanism. However, during Phase 2, the European Directive for the EU ETS allows governments to auction up to 10% of the allowances. In 2013, industrial installations will still receive allowances on the basis of product-specific EU-wide benchmarks, but will have to purchase at least 20% of allowances. This figure will rise to 70% in 2020 and 100% in 2027.

The EU ETS is a rapidly growing market. The first phase of the EU ETS (2005–2008) has been quite successful (Ellerman et al., 2010): emissions have effectively been reduced at a lower cost than in the context of a command and control approach, as predicted by the economic theory (Montgomery, 1972). The price pattern observed at the beginning of Phase 2 (2008–2010) was relatively stable and healthy: spot allowances exchanged on BlueNext oscillated between €10 and €30/t of CO_2, depending on the demand for allowances (Chevallier, 2010). Because of the economic crisis, the carbon price fell below €8 in 2012, but most market commentators project a price of around €30 in 2020. At allowance prices in the range of €10–30 euros/tCO_2, the value of allowances issued every year is quite high (€22–66 billion), compared with the USA's East Coast NO_x or SO_2 trading schemes (€1.1 billion and

☆ We are grateful for helpful comments from anonymous reviewers. This work was supported by the Agence Nationale de la Recherche of the French government through the program "Investissements d'avenir ANR-10-LABX-14-01".
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[1] Industries covered by the scheme include: power generation, iron and steel, glass, cement, pottery and bricks.

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http://dx.doi.org/10.1016/j.econmod.2013.07.009

€2.8–8.7 billion respectively). It could therefore affect the costs of key industrial sectors more than any previous environmental policy and perhaps more than all the others put together (Grubb and Neuhoff, 2006).

However, imposing additional costs on firms raises questions about the effect this could have on employment. In many OECD countries – especially the European ones – unemployment remains high and is a persistent problem. The question of whether environmental and employment policies constitute an inevitable trade-off is therefore crucial.

Economic theory has already explored this problem and has highlighted a very appealing effect: the double dividend. The hypothesis is that if the environmental policy produces revenue for the government, and if the pre-existing taxation in the economy is distortionary, then the revenue collected can be used to reduce distortions. The idea that environmental policy can be pursued while reducing unemployment is very attractive. This strong form of the so-called double dividend hypothesis has been studied in several respects. Using a theoretical general equilibrium framework in which all markets clear – including the labor market – Bovenberg and de Mooij (1994a,b), Goulder (1995), and Bovenberg and Goulder (1996) have shown that the above double dividend form cannot be achieved. However, the assumptions made in these works are questionable, especially as far as the labor market is concerned. Some authors have therefore introduced involuntary unemployment, with several kinds of imperfection in the labor market: matching frictions (Bovenberg and van der Ploeg, 1998; Wagner, 2005), wage bargaining using a right-to-manage model (Koskela et al., 1998; Marsiliani and Renström, 2000), efficiency wages (Schneider, 1997), and monopoly unions (Strand, 1998). All these models exhibit cases where employment may be boosted by such environmental policies.

When seeking to determine the extent to which environmental tools may affect employment, the way the latter and hence wages are determined may also play an important role. In most European countries, trade unions play a very significant role in wage determination, and wage negotiations even determine the wage levels of workers who do not belong to any union. In France, for example, only about 8% of workers are union members, but the wages of over 70% of all workers are covered by union-firm bargaining. The key features of wage determination systems are the extent to which wages are determined collectively, via union-firm bargaining, and the degree to which firms and unions coordinate their wage bargaining activities, given that wages are determined collectively (Nickell, 1997). In Switzerland, Japan and the US, wage-setting occurs more at the firm level, i.e. in a decentralized manner, whereas union-firm bargaining takes place at an intermediate level in countries like Italy, France, UK, Germany and Belgium. Lastly, highly centralized systems also exist, for instance in the Nordic countries and Austria (Calmfors and Drifill, 1988).

Given the fact that major polluting European firms are now subject to the EU ETS, the extent to which a pollution permit market may harm employment is an important issue. However, the above-mentioned analyses are very heterogeneous and none of them allows us to study this particular question. For example, some models study partial equilibria (Koskela et al., 1998), or use the questionable assumption of perfect competition in the product market (Strand, 1998). Furthermore, they all consider a Pigovian tax instead of a permit market.[2] It is true that these two environmental tools appear to be similar if pollution quotas are sold, but some differences must nevertheless be noted. Pollution quotas allow to control the environmental quality ex-ante and to analyze an intermediary situation where pollution permits are freely distributed. Since both the labor and the permit markets are involved, a general equilibrium model would be more appropriate to analyze this question in detail.

The main purpose of this article is therefore to consider the problem set out above. To do so, we develop an extended version of the wage-setting/price-setting (WS–PS) model proposed by Layard and Nickell (1985),[3] where firms have the right to manage employment.[4] Two alternative kinds of initial pollution permit distribution are considered: a free one (such as grandfathering) and a paying one (such as an auction). The employment level is determined according to different methods of financing unemployment benefits[5]: a wage tax and/or the revenue from selling pollution permits.[6]

We first show that the presence of a pollution permit market weakens the unions' market power as far as wage-setting is concerned. As they anticipate that substitution between inputs may be detrimental to employment, unions reduce their mark-up over the reservation wage. Other interesting results stated in the paper are the following: the choice of the pollution cap is always neutral for the determination of the equilibrium employment level, and this level always increases when the pollution reduction technology becomes more efficient. These results hold, whatever the method used to finance unemployment benefits. However, the employment levels are different in each case. Depending on the value of the wage tax, it appears that the employment level can be either higher or lower depending on the method used to finance unemployment benefits (pollution permit revenue or wage tax). Thus, this article gives the regulator a new criterion for choosing the initial distribution of pollution permits.

The structure of the article is as follows. The model is presented in Section 2. Section 3 determines the employment levels corresponding to the different financing schemes studied in this paper and compares them. Section 3 presents a summary of the main results of the paper and some concluding remarks.

2. The model

We first present our assumptions concerning the economy. We then derive the partial and general equilibria.

2.1. The economy

The economy is made up of N identical imperfectly competitive firms, indexed by $i = 1,..., N$. In each firm, wages are set by wage bargaining. The firm then chooses the index of pollution and the level of employment.

2.1.1. Firms

Each firm faces the following demand function[7]:

$$Y_i = (Y/N)p_i^{-\varphi} \tag{1}$$

where Y represents the level of global demand, p_i denotes firm i's real price, and φ denotes the elasticity of substitution between differentiated goods ($\varphi > 1$). Following Jouvet et al. (2005) and Strand (1998),

[2] Koskela et al. (1998) assume imperfect competition on the product market, but consider a Pigovian tax and only one firm. Marsiliani and Renström (2000) retain a general equilibrium with monopolistic firms and a Pigovian tax.

[3] The WS–PS model is presented in detail in Layard et al. (1991).

[4] According to L'Horty and Raux (2003), among others, the WS–PS model appears to be empirically realistic: their WS–PS model estimation leads to an equilibrium rate of unemployment in France that approaches its real level.

[5] In keeping with the existing literature, we do not take into account the innovation process.

[6] Strand (1998) assumes that unemployment benefits are fixed and that permit revenue is used for other purposes like output, employment or investment subsidies.

[7] See Blanchard and Kiyotaki (1987) for the micro-foundations of the demand function (Eq. (1)). The disutility of the total amount of emissions can be explicitly introduced into the preferences of households. With a separability utility function, the pollution cap, like all aggregate variables, is taken as given by consumers and vanishes during utility maximization. This pollution cap is therefore absent from the individual demand functions and hence from Eq. (1). If we relax the separability assumption, emissions will obviously enter the demand function. Hence, changes in the number of permits will influence emissions and thereby the demand function. This case is not analyzed in this paper.