Labour Economics 17 (2010) 291–301

Contents lists available at ScienceDirect

Labour Economics

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

Tax policy and returns to education

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ARTICLE INFO

Article history:
Received 15 April 2008
Received in revised form 9 December 2008
Accepted 23 March 2009
Available online 7 April 2009

JEL classification:
H24
H3
J22
J24
J31

Keywords:
Increasing returns
Tax policy
Gender
Labour supply
Education

ABSTRACT

This paper considers how asymmetric tax treatment, where labour market earnings are taxed but household production is untaxed, affects educational choice and labour supply. We show that taxes on labour market earnings can generate a large (non-marginal) switch to home production and the ensuing deadweight losses are large. Using a cross-country panel, we find that gender differences in labour supply responses to tax policy can explain differences in aggregate labour supply and years of education across countries.

1. Introduction

This paper considers how asymmetric tax treatment, where labour market earnings are taxed but household production is not, affects educational choice and labour supply in a perfectly competitive labour market. While the present paper builds on Booth and Coles (2007), it differs in introducing taxation and focusing on the subsequent deadweight losses.[1] To keep the analysis of the tax program relatively straightforward, we also in the present paper assume that the labour market is perfectly competitive.

A key insight of the model of the present paper is that individuals have an incentive to specialise; either to focus on home production, or to invest in general human capital and work mainly in the labour market. For reasons that will become clear, we show why women, who typically have greater labour supply elasticities than men, might face increasing returns to education. We further show that a tax on labour market earnings can generate a large (non-marginal) switch to home production and that the ensuing deadweight loss is not a small Harberger triangle.

There is a large literature which analyses optimal education choice and dynamic labour supply within a lifecycle framework (see Trostel and Walker (2006) and the references therein). As checking second order conditions is complicated in such frameworks, the typical approach is to assume an interior solution and characterise a solution to the first order conditions. But there is good reason to believe the second order conditions might fail. For example consider a one-period textbook case where the agent chooses education e, labour supply l and consumption c to solve the utility maximisation problem

$$\max_{e,c,l} u(c, 1-l) \text{ s.t. } pc \le M + [wH(e)]l - \gamma e,$$

where $H(e)$ describes the worker's general human capital given education e, w is the market wage rate for skills, and γ is the cost of acquiring education. As labour market earnings $wlH(e)$ exhibit increasing returns to scale in education and labour supply, this

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[1] In Booth and Coles (2007), we showed how increasing returns to education interact with imperfectly competitive labour markets. In that model there was no taxation, in contrast to the present paper. Moreover, in that earlier paper we showed an additional effect absent from the current paper, namely that increasing returns to education are exacerbated by frictional labour markets because of an increasing wage-competitiveness effect. This arises because, in a frictional labour market, firms bid more competitively for workers' services as the value of employment increases. And since, in frictional labour markets, wage compression decreases at higher productivity levels, the marginal returns to education are further increased as education increases. This effect is not found in the current paper, where we examine instead the impact of taxation in perfectly competitive labour markets, and demonstrate how tax policy can have deadweight losses for some individuals in the economy.

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doi:10.1016/j.labeco.2009.03.005

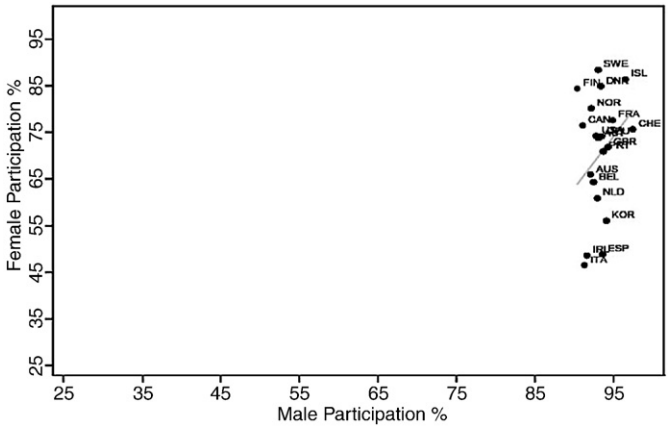

Fig. 1. Female and male labour force participation. (Pooled OECD data, 1980–2001, age group 25–54).

problem is not a concave programming problem. Thus second order conditions are likely to fail and corner solutions apply. For example, it is an empirical fact that many individuals exit education at compulsory school leaving age. It is also an empirical regularity that some do not participate in the workplace and instead focus on home production. The same second order condition problem is faced by more complicated dynamic models in which earnings are also of the form wHl.[2]

In this paper we extend the above simple optimisation problem to allow for a two-period model of home production and individual heterogeneity in home and workplace productivity. As education and labour supply are complements in the above earnings function, $wH(e)l$, and in the model to be developed below, educational choice and labour supply will be positively correlated across individuals. By increasing earned wages in the workplace, more education tends to increase individual labour supply. But it is not difficult to see that the return to education is affected crucially by the anticipated utilization of education; i.e., by expectations of future labour supply. If one does not anticipate being in the workplace for long, there is little sense in making a costly educational investment that will bring only a small market return. Thus more education and greater labour supply are mutually reinforcing choices. Using cross-sectional data across a huge array of countries, Trostel and Walker (2006) show there is a universal strong positive correlation between individual education choice and labour supply. Their insights are also consistent with the trend increase in female education and participation rates in virtually all OECD countries (see Jaumotte, 2004).

But here we go a step further and argue these reinforcing effects may generate increasing marginal returns to education. Specifically, we will show that the expected marginal return to education is proportional to $l^*(e;\theta)\, wH'(e)$. This term is composed of two effects:

i. $wH'(e)$ is the Mincerian return to education — it describes the increase in the market wage rate through an increase in education;
ii. $l^*(e;\theta)$ is the optimal labour supply choice of an individual with education e and characteristics θ, and thus describes the utilisation rate of human capital in the workplace.

When utility is linear in consumption, we will show there are increasing marginal returns to education if $l^*(e;\theta)wH'(e)$ is increasing in education, which in turn requires that labour supply is sufficiently elastic. As Trostel and Walker (2006) find that the elasticity of $l^*(e;\theta)$ with respect to education is, on average, around four times larger for women than for men, then women are much more likely to face increasing returns to education. Indeed there are necessarily increasing returns for individuals at the non-participant margin, as the marginal return to education is zero when $l^*=0$.

Of course in a competitive environment with no taxation, the phenomenon of private increasing returns to education does not, by itself, yield a market failure. But in the analysis to be developed below, we show that – once taxes are imposed on labour market earnings while home production remains untaxed – private increasing returns lead to large switches in behaviour. A worker who otherwise might invest in education and participate in the labour market (paying income tax to the government), instead switches to non-participation and pure home production (paying no tax). An important contribution of this paper is to show that it is typically women who experience the correspondingly large deadweight losses.

Our paper also uses a cross-country panel dataset to illustrate correlations between different tax policies and average working-age male and female participation rates and years of education. As Fig. 1 clearly demonstrates, male labour-force participation rates are typically high and closely clustered, in contrast to the much lower and more heterogeneous female participation rates. Later in the paper, we shall show, using fixed-effects estimation and controlling for demographics, that average tax rates, taxes on second earners and child benefits are significantly negatively correlated with both female participation rates and years of education.

1.1. Related literature

Time-use studies show that non-participating women of working age are typically engaged in home-production rather than leisure (see for example Apps and Rees, 1996; Apps, 2003). Indeed Burda et al. (2007) establish that female and male leisure hours are roughly equal. Instead it is the allocation of work hours between the workplace and domestic production which differs significantly between the sexes. The central theme of this paper is to consider how tax policy distorts the allocation of work hours between the workplace and domestic production, and how education choice is also affected.[3]

Perhaps the closest paper to ours is Bovenberg and Jacobs (2005) (but also see Jacobs, 2005; Jacobs and Bovenberg, 2007). That paper considers optimal tax policy where the government taxes labour income but, as workers also underinvest in education, it in addition offers education subsidies. As their framework is closely related to the one to be developed in our paper, it is at first sight surprising they do not need to consider increasing returns. However, the critical difference between the frameworks is they assume marginal home productivity is zero at the non-participation margin; i.e. where $l=0$. Whenever marginal home productivity is sufficiently large, non-participation may become a binding constraint and increasing returns are then a robust phenomenon. Unfortunately increasing returns imply first order conditions are no longer sufficient to describe optimal behaviour.[4] Furthermore a marginal tax analysis is no longer valid, as we shall show that small changes in tax rates can lead to discontinuous jumps in educational investment and labour supply. It is not surprising then that the theoretical literature typically avoids this non-concavity issue. But the optimisation theory, when properly

[2] For example see the influential paper Trostel (1993) among many others.

[3] Important papers, Apps and Rees (1996, 1999) and Alesina et al. (2007) consider how tax policy affects labour supply and household production. They do not consider educational investments, which are our main focus here. In order to focus on education in a tractable framework, we have made simplifying assumptions about the household, as will be explained below. See Booth and Coles (forthcoming) for a more complicated analysis of education and labour supply in a framework with two-person households who match endogenously but in which there is no taxation.

[4] If marginal home productivity is very small, the Bovenberg–Jacobs approach may still apply, as increasing returns only occur over a small region and a solution to the first order conditions will describe optimality.