Research in Economics 70 (2016) 20–23

Contents lists available at ScienceDirect

Research in Economics

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

A note on income taxation and occupational choice

Eytan Sheshinski

Department of Economics, The Hebrew University of Jerusalem, Israel

ARTICLE INFO

Article history:
Received 2 April 2015
Accepted 16 May 2015
Available online 5 June 2015

Keywords:
Distribution of aptitudes
Size distribution of income
Logit model

ABSTRACT

This note shows that, in case of suboptimal occupational choice, labor taxation can generate a relevant deadweight loss. With varying aptitudes in different occupations, individuals typically maximize income by specializing in one occupation which promises the highest income, but various labor market imperfections and uncertainties imply that the choice of the best occupation is accomplished with partial success. We use the multinomial Logit approach to evaluate the magnitude of the distortions due to errors in occupational choice caused by income taxation. Under plausible parameterization, we snow that the deadweight loss can be as high as a third of total income.

1. Introduction

With varying aptitudes in different occupations, individuals typically maximize income by specializing in one occupation which promises the highest income. Due to numerous labor market imperfections and uncertainties, this is accomplished with only partial success. We demonstrate that an income tax that reduces the after-tax income differentials across occupations tends to exacerbate the errors of choice made by individuals.

Following a model proposed by Tinbergen (1951) and developed by Houthakker (1974),[1] we use Luce's (1959) multinominal logit approach to evaluate the magnitude of the distortions caused by income taxation. In an illustration with a specific example, we show that at high marginal tax rates these distortions can be in excess of a third of mean income.

2. An occupational choice model

Individuals are endowed with aptitudes in different occupations. These aptitudes are represented by a vector $(y_1, y_2, \ldots, y_n)$, where $y_i(\geq 0)$ is the value of the ith commodity that the individual could produce in a given time period if he/she did nothing else. Since the y_i's are constants and all individuals have a given working time, value maximization implies that each individual will work all the time on the occupation for which y_i is greatest. Generally, there is only one such occupation. If there is more than one, the allocation is indeterminate.

In view of the many imperfections in the labor market, it is unrealistic to assume perfect income maximization. We shall follow the approach suggested by Luce (1959), that individuals maximize "imperfectly", the probability of choosing

E-mail address: mseytan@mscc.huji.ac.il

[1] A related paper is Sheshinski et al. (1983).

http://dx.doi.org/10.1016/j.rie.2015.05.003
1090-9443/

occupation i, p_i, being given by

$$p_i = p_i(y_1, y_2, \ldots, y_n) = \frac{e^{qy_i}}{\sum_{j=1}^{n} e^{qy_i}}, \quad i = 1, 2, \ldots, n \tag{1}$$

where q is a positive constant, representing the 'precision' of choice. As $q \to \infty$, the probability p_i increases monotonically, approaching 1 if $y_i = \text{argmax}(y_1, y_2, \ldots, y_n)$ and decreases monotonically, approaching 0, otherwise. At the other end, as $q \to 0$, p_i approaches $1/n$ which means that all occupations have an equal probability of being chosen, irrespective of individual aptitudes. It is natural to call q the "*degree of rationality*" ($q = \infty$, "*perfect rationality*").

Assume that the aptitude vector $(y_1, y_2, \ldots, y_n)$ varies randomly over the population with a continuous density function $f(y_1, y_2, \ldots, y_n)$. The distribution function $F(y_1, y_2, \ldots, y_n)$ is then also continuous (and differentiable). The marginal density functions in different occupations need not be independent.

Let $G(z)$ be the cumulative distribution function for labor incomes, and $g(z)$ the corresponding density function. It is seen that

$$\begin{aligned} &G(z) \\ &\quad = \sum_{i=1}^{n} \int_0^{\infty} \cdots \int_0^{z} \cdots \int_0^{\infty} p_i(y_1, \ldots, y_{i-1}, x, y_{i+1}, \ldots, y_n) f(y_1, \ldots, y_{i-1}, x, y_{i+1}, \ldots, y_n) \\ &\quad\quad dy_1 \ldots dy_{i-1}\, dx\, dy_{i+1} \ldots dy_n \end{aligned} \tag{2}$$

In subsequent discussion it will suffice to examine the case $n=2$. For this case, (2) is written as

$$\begin{aligned} G(z) &= \int_0^{z} \int_0^{\infty} p_1(y_1, y_2) f(y_1, y_2)\, dy_1\, dy_2 \\ &\quad + \int_0^{\infty} \int_0^{z} p_2(y_1, y_2) f(y_1, x)\, dy_1\, dy_2 \\ &= \int_0^{z} \int_0^{\infty} \frac{e^{qy_1}}{e^{qy_1} + e^{qy_2}} f(y_1,\ y_2)\, dy_1\, dy_2 \\ &\quad + \int_0^{\infty} \int_0^{z} \frac{e^{qy_2}}{e^{qy_1} + e^{qy_2}} f(y_1,\ y_2)\, dy_1\, dy_2 \end{aligned} \tag{3}$$

3. An example

Consider the bivariate exponential density function[2]

$$f(y_1, y_2) = \alpha_1 \alpha_2 e^{-\alpha_1 y_1 - \alpha_2 y_2} \tag{4}$$

and the corresponding distribution function

$$F(y_1, y_2) = (1 - e^{-\alpha_1\, y_1})(1 - e^{-\alpha_2\, y_2}) \tag{5}$$

(a) *Perfect Rationality*

When $q = \infty$, $p_i(y_1,\ y_2)$ is 1 when $y_i \geq y_j$, $i,\ j = 1,\ 2$ and 0 otherwise. Hence, by (3) and (4),

$$\begin{aligned} G(z)_{q=\infty} &= \alpha_1 \alpha_2 \int_0^{z} \int_0^{y_1} e^{-\alpha_1\, y_1 - \alpha_2\, y_2}\, dy_1\, dy_2 \\ &\quad + \alpha_1 \alpha_2 \int_0^{z} \int_0^{y_2} e^{-\alpha_1\, y_1 - \alpha_2\, y_2}\, dy_1\, dy_2 \\ &= (1 - e^{-\alpha_1 z})(1 - e^{-\alpha_2 z}) \\ &= F(z,\ z) \end{aligned} \tag{6}$$

The corresponding density function

$$g(z)_{q=\infty} = \alpha_1 e^{-\alpha_1 z} + \alpha_2\, e^{-\alpha_2 z} - (\alpha_1 + \alpha_2) e^{-(\alpha_1 + \alpha_2) z} \tag{7}$$

has an interior mode and positive skewed shape as observed in empirical income distributions.

Expected income, $\overline{y}_{q=\infty}$, is

$$\overline{y}_{q=\infty} = \frac{1}{\alpha_1} + \frac{1}{\alpha_2} - \frac{1}{\alpha_1 + \alpha_2} \tag{8}$$

(b) *Uniformly Random Choice*

[2] This is the product of two univariate distributions. While not allowing for dependence, this is a simple illustrative case that has zero probability of ties (see below).