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# The challenge of a rising skill premium for redistributive taxation

BY

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# The challenge of a rising skill premium for redistributive taxation

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## Abstract

The present paper analyses the challenge to redistribution programs posed by an increase in skill premium. The increase in skill premium, which we observe in most OECD countries, affects taxation through its effect on education and migration incentives. We demonstrate that in countries with a relatively egalitarian wage distribution, the response to an increased gap in wages is likely to be increased redistributive taxation, whereas the response in countries with a more inegalitarian pre-tax income distribution, is likely to be a reduction in taxation and redistribution.

JEL codes: F21, H2

Keywords: Education; Skill premium; Migration; Tax competition

## 1 Introduction

Income inequality has increased in most OECD countries during the last decades, as documented by for instance Atkinson (2003) and Gottschalk and Smeeding (1997). The rise in inequality is primarily due to increased wage dispersion (Saez and Veall, 2005). Economic integration and technological change are important reasons for this development. Economic integration, in the form of increased competition from low-wage countries, and technological advances in information and communication technology, have raised the demand for skilled workers relative to unskilled workers in developed economies

and increased the skill premium.<sup>1</sup> The combined effect of technological advances and reduced market barriers has paved the way for “superstars”, individuals with the highest abilities whose economic outreach has expanded at the expense of the somewhat less talented individuals (Rosen, 1981).

These developments also pose a challenge to national taxation and redistribution programs. The ambition of the present paper is to analyze the effect of an increase in skill premium on redistributive taxation. In our analysis, the unskilled are the decisive voters and thereby determine the tax rate. The skilled individuals can choose whether or not to develop their talents by taking an education, and whether to stay in their native country or to relocate. An increase in the skill premium makes it more attractive for talented people to take an education. In this way, an increase in the skill premium increases the potential for raising the tax level without discouraging skill formation in the economy. On the other hand, an increase in the skill premium also reduces the relative importance of fixed migration costs, and thus increases the mobility of skilled workers. This intensifies tax competition between countries, and may thus reduce taxation and redistribution. Unskilled workers wish to maximize the tax base, and therefore would like the skilled to take an education and stay in the country. Education and migration thus constitute two constraints on the tax policy.<sup>2</sup>

Migration as a constraint on taxation is an important element in our model. While actual migration flows may appear to be too small to represent a real challenge to policies of taxation and redistribution, the *potential* relocation of a relatively small group of *highly paid* professionals may indeed pose a serious challenge for policies of redistribution, as emphasised by for instance Wildasin (2003). By choosing residency, a worker can often choose where to pay taxes. Since the taxation of highly-compensated workers accounts for a very large fraction of tax revenues, the fiscal implications of such relocation can be very high. The importance of high-income tax payers for the total tax income in developed countries can be illustrated by some numbers from the United States. In 1999, one-fifth of personal income taxes were paid by only 0.16 percent of the taxpayers; the top 2 percent of the taxpayers paid over 40 percent of all personal income taxes. Wildasin (2003: 6) stresses that “the presence of absence of these high-income taxpayers is a

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<sup>1</sup>Feenstra and Hanson (1999) show that technological change is the main cause of rising inequality in market incomes in the United States.

<sup>2</sup>In a related paper, we investigate equilibrium taxation in the face of efficiency costs and tax avoidance, see Bjorvatn and Cappelen (2005).

matter of great importance for the US tax system.”

The rest of the paper is organized as follows. In Section 2 we present the model and Section 3 contains the analysis. We start the analysis by studying the education constraint and the migration constraint separately, before we conclude the analysis by combining the two constraints. The final section concludes.

## 2 Model

There are two equally sized countries,  $a$  and  $b$ . In each country there are two types of people, unskilled workers and skilled workers. Prior to any relocation, the number of unskilled workers,  $n_u$ , and skilled workers,  $n_s$ , is assumed to be the same in both countries. Our focus is on tax motivated migration, and we therefore abstract from migration of the unskilled. Furthermore, we normalize the size of the unskilled group in each country to unity. The skilled are, however, mobile, and hence the number of skilled residing in country  $i = a, b$ ,  $n_{si}$ , may be different from the number of skilled born in that country,  $n_s$ . The population in country  $i$ ,  $n_i$ , is therefore  $n_i = 1 + n_{si}$ . We assume that  $n_{si} < 1$ , so that the unskilled always are in majority.

The unskilled have a pre-tax wage normalized to unity, i.e.,  $w_u = 1$  and the skilled earn  $w_{si} = 1 + e_i s$ , where  $s$  is the skill premium and  $e_i$  is a binary variable for education, taking the value zero or one depending on whether or not the skilled in country  $i$  choose to develop their talent. The unskilled have no talent to develop, and hence never take an education. For a skilled person, developing his or her talent by taking an education involves a fixed cost  $c$ . This education cost can be interpreted as tuition fees and forgone income during years of education. We assume that  $c < s$  so that it is always profitable for the skilled to develop their talent in the absence of taxation.

The redistribution program is determined by majority vote, which in the present setup means according to the preferences of the unskilled worker. The vote determines the level of the linear income tax,  $t_i \in (0, 1)$ . Tax revenues are spent on a uniform transfer,  $\theta_i$ , which is received by all residents in the country. In a symmetric equilibrium all the skilled workers make the same educational decision. Transfers can then be expressed as

$$\theta_i = \frac{t_i \omega_i}{1 + n_{si}}, \quad (1)$$

where

$$\omega_i = \begin{cases} 1 + (1 + s) n_{si} & \text{for } e_i = 1 \\ 1 + n_{si} & \text{for } e_i = 0 \end{cases} \quad (2)$$

is the total income generated in country  $i$ . The disposable income of the unskilled median voter in country  $i$ , including transfers, is given by  $I_{ui} = 1 - t_i + \theta_i$  which can be expressed as:

$$I_{ui} = 1 + t_i \left[ \frac{\omega_i - (1 + n_{si})}{1 + n_{si}} \right], \quad (3)$$

where the second term is the net gain to the unskilled from the tax and redistribution program. Similarly, the income of the skilled is:

$$I_{si} = 1 + t_i \left[ \frac{\omega_i - (1 + n_{si})}{1 + n_{si}} \right] + e_i (s(1 - t_i) - c), \quad (4)$$

where the last term captures the net gain from education. Clearly, from (3) we see that for  $e_i = 1$ , the unskilled median voter benefits from higher taxes. But she also has an interest in the skilled taking an education, and in attracting as many educated people as possible to the country (or at least avoiding emigration of its native skilled). Since high taxes may reduce the incentive of the skilled to take an education, and may reduce the number of skilled, there is a trade-off between the benefits of higher taxation and the possible reduction in the tax base that may follow from high taxes. We can thus view education and migration as two constraints on tax policy.

We should emphasise at the outset that the main contribution of the present paper is not the identification of education and migration as constraints on taxation, as these are fairly well known from the literature. Rather, the value added of our paper is the analysis of how these two constraints together affect equilibrium taxation. In particular, we focus on how exogenous changes in the pre-tax skill premium determine the importance of the education constraint relative to the migration constraint. As we shall see, the identification of the binding constraint in turn determines the qualitative effect of changes in the skill premium on equilibrium taxation.

## 2.1 Analysis

We start the analysis by focusing on the education constraint, and assume that workers are perfectly immobile. We then focus on the migration con-

straint, by assuming that the skilled are educated. Finally, we combine the two constraints, and derive the main results of the paper.

## 2.2 The education constraint

In the absence of mobility, i.e., in autarky, we have that  $n_{sa} = n_{sb} = n_s$ . The skilled workers in this case make a single choice, namely whether or not to develop their talent. Each agent behaves atomistically, taking the tax base in his or her country,  $\omega_i$ , and thereby the transfers  $\theta_i$ , as given, and unaffected by the individual educational decision. The skilled workers in country  $i$  choose to take an education if the net gain of doing so is positive, i.e., if  $e_i(s(1-t_i) - c) \geq 0$ . The optimal educational choice is thus given by:

$$e_i^* = \begin{cases} 1 & \text{if } t_i \leq (s-c)/s \\ 0 & \text{if } t_i > (s-c)/s \end{cases} \quad (5)$$

Using (5) in (2) and then substituting into (3), we find the autarky income of the unskilled median voter as:

$$I_{ui}^A = \begin{cases} 1 + \frac{st_i n_s}{1+n_s} & \text{if } t_i \leq (s-c)/s \\ 1 & \text{if } t_i > (s-c)/s \end{cases} \quad (6)$$

Clearly, the median voter will set a tax rate that makes the skilled indifferent between taking an education and not (and therefore choose education). Hence, the tax rate in autarky in both countries is such that the education constraint binds, i.e.,  $e(s(1-t) - c) = 0$ , which can be expressed as.

$$t^A = \frac{s-c}{s}, \quad (7)$$

which applies for  $s \geq c$ , i.e., given that it is profitable for a skilled to take an education, prior to taxation. The equilibrium autarky tax rate is increasing in the skill premium and decreasing in the cost of education.

## 2.3 The migration constraint

Consider now the choice of tax policy when skilled workers are mobile. We abstract from educational choice, and assume that the skilled workers are educated. We also assume that the populations are large, so that each skilled

worker, in deciding whether or not to migrate, ignores the impact of migration on the transfers in the potential destination region.

Migration is costly. We shall assume that these costs are emotional, and therefore do not affect the tax base in the destination country. For simplicity, assume that each migrant faces a fixed emotional cost  $m$  of living in the foreign jurisdiction.

Starting from the symmetric autarky situation, where  $n_{si} = n_s$ , and using (2) and (4), the gain (gross of any migration costs) to a skilled individual moving from region  $j$  to region  $i$  can be found as:

$$I_{si} - I_{sj} = \frac{(t_j - t_i) s}{1 + n_s}. \quad (8)$$

If  $I_{si} - I_{sj} > m$ , implying that  $t_i < t_j - m(1 + n_s)/s$ , there is immigration to country  $i$ , and its income would be given by:

$$\omega_i = 1 + 2n_s(1 + s) \quad \text{if} \quad (t_j - t_i) > \frac{m(1 + n_s)}{s}. \quad (9)$$

If, on the other hand,  $I_{sj} - I_{si} = (t_i - t_j) s / (1 + n_s) > m$ , the skilled workers from  $i$  would emigrate to  $j$ . This takes place if  $t_i > t_j + m(1 + n_s)/s$ , and would result in country  $i$  income:

$$\omega_i = 1 \quad \text{if} \quad (t_i - t_j) > \frac{m(1 + n_s)}{s}. \quad (10)$$

For intermediate tax differentials between country  $a$  and  $b$ , there is no migration. Income for both countries is then:

$$\omega_a = \omega_b = 1 + 2n_s(1 + s) \quad \text{if} \quad -\frac{m(1 + n_s)}{s} \leq (t_j - t_i) \leq \frac{m(1 + n_s)}{s}. \quad (11)$$

The median voters in  $a$  and  $b$  would never choose a tax rate that would trigger a “brain drain” out of their respective countries. Hence, in equilibrium, we know that there will be no migration. This also implies that in equilibrium, it is not profitable for any country to implement a low tax strategy that would attract the skilled from the other country. What is the income country  $i$  could generate from such a low tax strategy? To see this, note first that the optimal tax level in a low tax strategy, from the viewpoint of the median voter in  $i$ , is such that the skilled and educated foreigners are

indifferent between migrating or not (and therefore migrate). This tax level can be found from the condition  $I_{si} - I_{sj} = m$  which results in:

$$t_i^L = t_j - \frac{m(1+n_s)}{s}. \quad (12)$$

From (2) and (3), this would result in an income for country  $i$ :

$$I_{ui}(t_i^L) = 1 - mn_s + \frac{st_j n_s}{1+n_s}, \quad (13)$$

$1 + \left(t_j - \frac{m(1+n_s)}{s}\right) \frac{1+(1+s)n_s-(1+n_s)}{1+n_s} = 1 + \frac{st_j n_s - mn_s - mn_s^2}{1+n_s} = 1 - mn_s + \frac{st_j n_s}{1+n_s}$   
is true is true

Using (6) and (13), we find that in a symmetric equilibrium, where  $t_a = t_b = t$ , the two countries are indifferent between choosing a low tax strategy and a common tax  $t$  (resulting in no migration) when  $I_u^A = I_u(t^L)$ , which can be expressed as:

$$t^C = \frac{2m(1+n_s)^2}{s}.$$

Neither country has an incentive to deviate from this tax level. A marginal increase in taxation by country  $i$  would induce country  $j$  to implement the low tax strategy, which is clearly not in the interest of country  $i$ . A marginal reduction in taxation by country  $i$  would not affect the tax base in either country, and would therefore only lead to a reduction in redistribution in country  $i$ , which is also not in the best interest of its median voters. The median voters in both countries reason in the same way, and hence,  $t^C$  is a Nash-equilibrium.

We observe that  $t^C$  is increasing in the mobility cost  $m$  and the number of skilled people  $n_s$  in the economy, and decreases in the skill premium,  $s$ . The reason why  $t^C$  increases in  $n_s$  is perhaps not obvious. It can be explained as follows. For a given  $t$ ,  $I_u$  is a positive, but concave function of  $n_s$ . Hence, attracting skilled workers, starting from a high  $n_s$ , yields less additional benefit than attracting these individuals starting from a lower  $n_s$ . Intuitively, attracting skilled migrants when the native population of skilled people is low has a much stronger effect on average income, and hence the potential for redistribution, than when the native population of skilled is relatively large. Therefore, a higher level of  $n_s$  weakens tax competition, and leads to a higher  $t^C$ .



## 2.4 The education and migration constraint

We now consider equilibrium tax policy when both constraints apply. The tax rate that maximizes the income of the median voter,  $t^*$ , takes into account that the median voter will never set the tax rate above  $t^C$  or  $t^A$ . In other words:

$$t^* = \min(t^A, t^C).$$

This implies that the effect of an increase in the skill premium,  $s$ , depends on the initial level of the skill premium. The critical level of  $s$  at which  $t^A = t^C$  can be found as:

$$\hat{s} = 2m(1 + n_s(2 + n_s)) + c.$$

For  $s < \hat{s}$ ,  $t^A < t^C$ , implying that education is the binding constraint. An increase in  $s$  would then result in an increase in  $t^*$ . For  $s > \hat{s}$ ,  $t^A > t^C$ , so that migration is the binding constraint. An increase in  $s$  would then lead to a decrease in  $t^*$ . Clearly, an increase in  $m$ ,  $c$ , or  $n_s$  increases  $\hat{s}$  and thereby increases the range of  $s$  for which  $t$  is a positive function of  $s$ , and vice versa. We illustrate the equilibrium tax rate as a function of the skill premium in Figure 1

From Figure 1 we observe that for  $s > c$ , the tax rate is increasing in the skill premium until the skill premium reaches the critical level  $\hat{s}$ . Thereafter, it decreases in  $s$ . There is in other words a hump shaped relationship between the skill premium and the tax rate. An implication of this is that an increase in the skill premium will have qualitatively different effects on the tax rate in a country depending on the initial level of the skill premium. The observation that the qualitative effect of increased wage inequality depends on the level of inequality, provides one possible explanation of what is sometimes called the “redistribution puzzle”. This puzzle refers to the lack of empirical support for the hypothesis, generated by standard median voter models, that increased pre-tax income inequality should result in increased redistribution (Perotti, 1996; Bassett et al., 1999). The figure also illustrates the effect of a reduction in the migration cost,  $m$ . The reduction in  $m$  leads to a downward shift in the  $t^C$ -curve, to  $t_m^C$ . This shift reduces the critical value of  $s$  to  $\hat{s}_m$ . Clearly, the tax rate goes down for  $s > \hat{s}_m$ , and remains unchanged for  $s < \hat{s}_m$ . Hence,

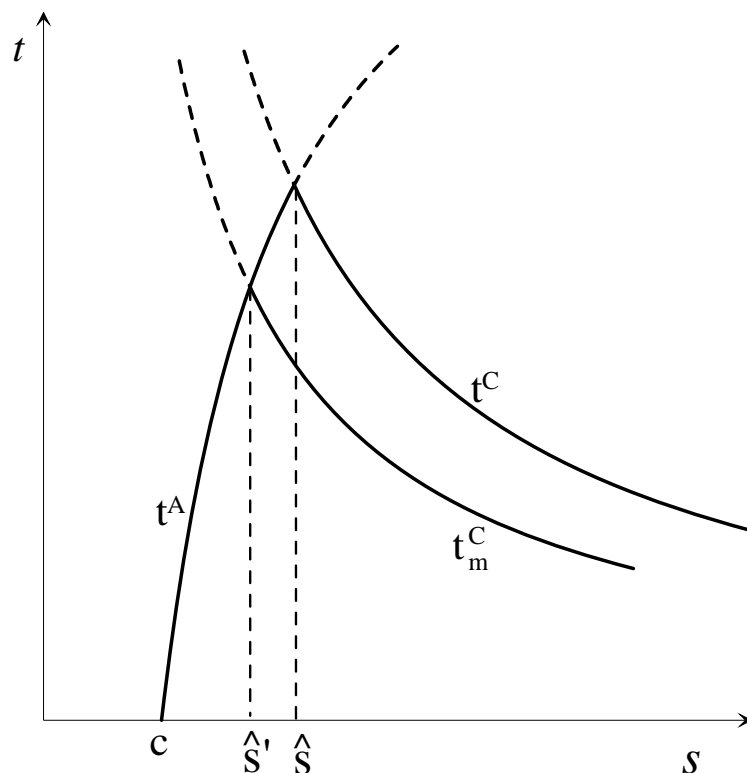


Figure 1: Taxation, migration and the skill premium

the effect of a reduction in the mobility cost depends on the level of the skill premium.

Figure 2 illustrates the effect on the tax rate from a reduction in mobility costs for three countries,  $a$ ,  $b$ , and  $c$ . Country  $a$  has a low skill premium,  $s_a$ , country  $b$  has a moderately high skill premium  $s_b$ , and country  $c$  has a high skill premium  $s_c$ .

Assume that initially the country  $b$  and  $c$  have the same tax rate,  $t_1$ , which is higher than the tax rate of the country with the low skill premium,  $t_2$ . A reduction in mobility costs moves the equilibrium for country  $b$  from point  $b$  to  $b'$  and that of country  $c$  from point  $c$  to  $c'$ , while leaving the equilibrium of country  $a$  unchanged. We observe that this reduction in mobility costs has caused a divergence in the tax rates of the more inegalitarian countries, due to a sharp fall in the tax rate of the most inegalitarian country  $c$  from  $t_1$  to

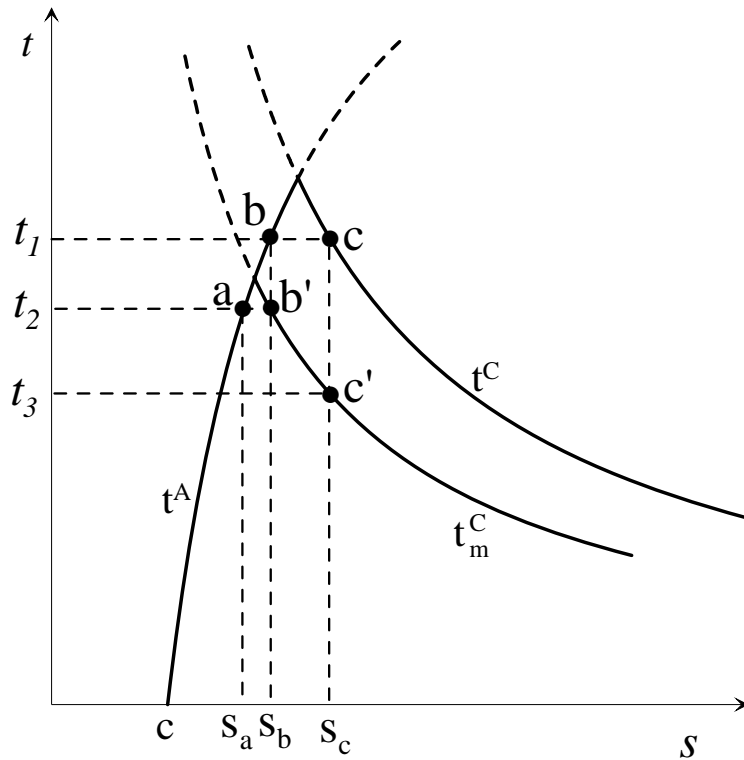


Figure 2: Lower mobility cost, convergence and divergence

$t_3$ , and only a moderate fall in the tax rate of the moderately inegalitarian country  $b$ , from  $t_1$  to  $t_2$ . On the other hand, there has been a convergence between the tax rates of country  $b$  and the most egalitarian country  $a$ , with the tax rate now being identical for the two. Hence, depending on the level of pre-tax income inequality, a reduction in mobility costs may lead to a convergence, divergence, or no change at all in international tax rates.

### 3 Conclusion

Our analysis sheds light on the way in which increased skill premium may affect education and migration incentives, and thereby equilibrium tax policy. The central result of our model is that redistributive tax rates are highest for intermediate levels of the skill premium. Since the skill premium can be

seen as a measure of pre-tax income inequality in our model, the analysis thus predicts that for countries starting with a relatively low level of pre-tax income inequality, the policy response to an increase in the skill premium is first to implement more ambitious redistribution programs. If the process of increased inequality in market incomes continues, however, the policy response will at some point be reversed. The combined effect of increased pre-tax inequality and less ambitious redistribution program will then cause disposable income inequalities to rise sharply.

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