

## Taxes, Uncertainty, and Human Capital

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Human capital is the most important determinant of wealth and income for most individuals. However, income-tax analysis has devoted far less effort to understanding the taxation of human capital than the taxation of physical capital and labor supply. A separate treatment is necessary since human capital is neither just capital nor just labor supply.

This essay begins by examining optimal taxation in a dynamic model with human capital. I then try to apply the insights from these models to tax policy, quickly finding that even a superficial treatment forces consideration of issues in political theory, contract theory, and financial theory. I take issue with some of the usual assumptions of the literature and show how alternative views affect the interpretation of optimal-tax rules. In particular, I argue that many so-called consumption-tax proposals are not true consumption taxes and are biased against human capital.

### I. Optimal-Tax Results

I first review some results from an optimal-tax analysis. Education is an investment good since it increases wages, but it may also have consumption value. Peter Diamond and James Mirrlees (1971a, b) argue for no taxation of intermediate goods. Judd (1985) argues for no tax on capital in the long run for any Paretian objective and for Uzawa preferences, showing instead that only wage (or consumption) taxation is desirable in the long run. Since human capital is a mixture of labor supply, capital in-

vestment, and final good, the implications of these ideas for human capital are unclear.

Judd (1997a) examines these issues in a dynamic model. Specifically, the paper assumes that the representative individual solves the following problem:

$$\max_{c,n,g,x} \int_0^{\infty} e^{-\rho t} u(c, n, H, g) dt$$

subject to

$$\dot{A} = \bar{r}A + \bar{w}L(H, n) - c - x - \tau_H H$$

$$\dot{H} = x$$

where  $H$  is human capital,  $L(H, n)$  is effective units of labor given  $n$  hours of labor and human capital  $H$ ,  $A$  is financial assets,  $\tau_H$  is a tax on human capital,  $\bar{r}$  is the after-tax return on financial assets,  $\bar{w}$  is the after-tax wage for a unit of effective labor, and  $x$  is human-capital investment. The production function is  $f(k, L(H, n), g, t)$  where  $k$  is physical capital,  $g$  is government consumption, and the argument  $t$  models exogenous productivity trends. The government chooses  $\bar{r}$ ,  $\bar{w}$ , and  $\tau_H$  to maximize the representative agent's utility subject to the government's intertemporal budget constraint.

The incorporation of human capital in this problem generates a tension. If one thinks of human capital as capital then the logic in Judd (1985) argues for no taxation of  $H$ , leaving only labor-income taxation in the long run. However, it is difficult to tax labor income without distorting human-capital investments. Judd (1997a) shows that if  $u_H = 0$  then there should be no long-run net taxation on returns to human-capital investment, only taxation of hours of labor supply. This can be implemented by taxing labor income but immediately expensing all human-capital investment expenditures. To do this, I set  $\bar{w} < f_L$  and choose negative values for

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$\tau_H$  so that taxable income equals  $Lf_2 - Hf_1$ , which is labor income minus the opportunity cost of human capital.

If  $H$  is a final good (or bad), that is,  $u_H \neq 0$ , a positive tax on human-capital formation may be desirable. While it may seem odd to take seriously the notion of human capital being a consumption bad, this is the case if there are nonpecuniary and non-time costs associated with acquiring human capital. For example, some students find the cost of taking a calculus course to exceed the monetary value of the time spent in lecture and doing homework.

## II. Tax Treatment of Human-Capital Investments

The tax rules derived above are clear in a simple model, but interpreting them for the real world is difficult. I will first consider the case where  $H$  is not a final good, implying that all human-capital expenditures should be expensed. The U.S. tax code takes a mixed approach. On-the-job training and a student's own time are both effectively expensed, while expenditures such as tuition and books are generally not deductible. It also appears that human capital is taxed less, since human capital is taxed only at the personal level whereas asset income is also taxed at the corporate level.

However, the picture is more complex. The typical analysis treats educational expenditures of state and local governments as subsidies. The Tiebout theory of local publicly provided goods argues otherwise. Local education expenditures are financed largely by local taxation and controlled largely by local political entities. The Tiebout view argues that public education expenditures are effectively equivalent to private expenditures. Combining Tiebout with the optimal-tax analysis, I conclude that local public education expenditures should be deducted from the tax base. The general point is that if citizens of a community decide to finance jointly the education of their children through local taxes and those expenditures respond to the after-tax cost, then a deduction is desirable.

This is currently implemented partially by the deductibility of state and local income and property taxes in the federal income tax. In

contrast, some parents pay substantial nondeductible tuition to send their children to private schools. This difference creates a bias in favor of public schools. Also, itemization is more common among high-income families, implying a regressive tax on human-capital accumulation. The optimal-tax results argue for the deductibility of all these expenditures in all communities.

The subsidy view of education is also challenged when one looks at allocation rules. Tuition at state universities is generally lower than cost, but that does not imply a net subsidy to individuals, since admission is often rationed. Since even rationed markets must "clear" there will be some other private costs to equate demand and supply. For example, a student may work harder during high school to get into a preferred university.

Contrary to common opinion, financial investments may be taxed less than human-capital investments. Pension funds, IRA's, and 401(k) plans allow workers to avoid personal taxation of their retirement savings. Investments in corporate debt also avoid the corporate income tax. Furthermore, owner-occupied housing is treated favorably. Finally, in a progressive tax system, the deduction of a student's time occurs when his tax rate is low but the return to human capital is greatest during working years when the tax rate is highest. In contrast, pension-fund contributions are deducted at working-year tax rates, but pension distributions are taxed during retirement years when the tax rate is likely to be lower.

These considerations are not minor. In fact, 1990 total expenditures on education (other than federal aid) was \$370 billion compared to \$576 billion in gross investment in nonresidential fixed capital. Human-capital tax issues are not small relative to intensely debated business-taxation issues.

The relative importance of these factors differs substantially across individuals. The combination of a Tiebout model and low taxation of financial assets often applies to a stereotypical upper middle-income family owning their home in a suburban community, but it is less plausible for a poor inner-city family renting an apartment. Also, one story may be true for most individuals, but another true for most wealth. Fortunately, the ideal tax system is

much clearer: no taxation of intermediate goods and services, and to the extent that education is an intermediate good its costs should be expensed.

### III. Human Capital and Idiosyncratic Risk

The previous analysis has ignored risk. All investments are risky, but the risk to human-capital returns has extra dimensions. Investors can diversify across various firms in their financial portfolios, but human-capital diversification is difficult. Jonathan Eaton and Harvey Rosen (1980) have modeled wage uncertainty as idiosyncratic, uninsurable risk and argued for a subsidy to education. If true, then arguments for generous tax treatment of education would be strengthened. Since risk is an important feature of any investment, one needs to take this issue seriously in any analysis.

Unfortunately, any conclusion is sensitive to the kind of idiosyncratic risk. To see this, consider the simple model of human-capital accumulation with moral hazard examined in Judd (1997b). Suppose one can invest  $s$  in a safe asset with return  $R$  or  $h$  in human capital. Assume that an individual's output will be  $f(h)$  with probability  $p$  and zero otherwise, where  $p$  is chosen by the worker and not observed by his employer. The employer pays a wage  $w_1$  if the worker is successful and  $w_2$  otherwise. An optimal (and competitive-equilibrium) contract with a risk-neutral employer then specifies  $h$ ,  $s$ ,  $p$ , and state-contingent wages to maximize the worker's expected utility so that his wage income equals his output in expectation, and so that the choice of  $p$  is incentive-compatible. This leads to the following problem:

$$\max_{w_1, w_2, s, h, p} E\{u(w + sR)\} - v(p)$$

subject to

$$pf(h) - T - E\{w\} = 0$$

$$u(c_1) - u(c_2) - v'(p) = 0$$

$$1 - s - h = 0$$

where  $u(c)$  is utility over consumption and  $v(p)$  is the disutility of effort.

A straightforward analysis shows that  $pf'(h) - R = 0$  in equilibrium. Therefore,  $h$  is chosen to equate the expected marginal product of  $h$  with the rate of return on the safe asset, implying no risk premium. Furthermore, since the contract is constrained efficient, there is no efficiency argument for subsidization of human capital. This illustrates a more general point. If private agents have as much information as the government and can write flexible contracts, then it is unclear how relatively inflexible tax policies can dominate private contracts.

### IV. Education and Tax Reform

The exercises above argue that the most important features for human capital are its productivity and final-good properties. Perhaps the idiosyncratic risk features are also important, but the results are not robust to alternative models of idiosyncratic risk. With this in mind, I next discuss some tax-policy proposals.

There are several proposals for radical income-tax reform which claim to be consumption taxes, the flat tax proposal of Robert Hall and Alvin Rabushka (1995) being a typical example. However, their view of investment is limited. If one defines consumption to be output minus investments, then the flat tax fails to be a consumption tax since it denies expensing of many human-capital investments. It would be worse than the current tax system for some, since it would eliminate the deductions for state and local taxes and charitable contributions.

Since taxation of physical capital would be eliminated, these so-called consumption-tax proposals would produce biases in favor of physical capital. This may be justified by concerns for simplicity or a belief that we should discourage state and local governments from spending money on education, but not by consumption-tax principles.

### V. Is Education Only an Intermediate Good?

The above examples appear to come to a simple conclusion: all educational expenditures should be treated as investment, and all investment should be expensed in an ideal tax system. However, they rely on the common assumption, which I provisionally made

above, that human capital is only an intermediate good. I complete this essay by asking, "Is education only an intermediate good?"

This can be determined by comparing financial returns of alternative assets. If human capital has a lower financial return than financial assets of *comparable riskiness*, then human capital must have some nonpecuniary returns. As Gary Becker (1975) argues, education and corporate equity have roughly the same mean financial return. Why does education have as high a risk premium as equity? Unfortunately, there is little empirical work on this. Perhaps the premium is due to idiosyncratic risk. However, the moral-hazard example showed that there is no justified premium in some circumstances. Wage income may have a positive covariance with profits, but wages are less cyclical than profits. Furthermore, the price of risk for human capital depends on the covariance between profits and the *marginal* impact of human-capital investment on risky wages (see Judd, 1997b). Since the less-educated and less-experienced are the most likely to experience unemployment during a recession, education would appear to reduce one's exposure to systematic risk. Therefore, the price of risk to be attached to human-capital investments appears to be smaller than that associated with corporate equity.

If future empirical analysis confirms these impressions, then human capital has a mean return greater than comparable financial assets. In a perfectly competitive market, this implies that human capital is a consumption bad, and according to the optimal-tax analysis, that human capital should be taxed. Of course, there are other explanations for the risk premium which could be put forward, such as liquidity constraints, political inefficiency, and imperfect altruism, many of which imply underinvestment in education. These alternative explanations would have substantially different implications for tax policy.

## VI. Conclusion

The theory of optimal taxation of human capital is rather simple, but it is difficult to apply it since there is so little empirical evidence about the critical determinants. In particular, there is a need for better understanding of local government decision-making and the riskiness of human-capital investment. I have no answers to these issues. These simple examples, though, show how asking simple questions about the taxation of human capital quickly leads to a variety of difficult, important, and unresolved problems.

## REFERENCES

- Becker, Gary. *Human capital: A theoretical and empirical analysis*. Chicago: University of Chicago Press, 1975.
- Diamond, Peter A. and Mirrlees, James A. "Optimal Taxation and Public Production: I—Production Efficiency." *American Economic Review*, March 1971a, 61(1), pp. 8–27.
- . "Optimal Taxation and Public Production II: Tax Rules." *American Economic Review*, June 1971b, 61(3), pp. 261–78.
- Eaton, Jonathan and Rosen, Harvey S. "Taxation, Human Capital, and Uncertainty." *American Economic Review*, September 1980, 61(4), pp. 705–15.
- Hall, Robert E. and Rabushka, Alvin. *Low tax, simple tax, flat tax*, 2nd Ed. New York: McGraw-Hill, 1995.
- Judd, Kenneth L. "Redistributive Taxation in a Simple Perfect Foresight Model." *Journal of Public Economics*, October 1985, 28(1), pp. 59–83.
- . "Optimal Taxation and Spending in General Competitive Growth Models." Mimeo, Hoover Institution, 1997a.
- . "Is Education as Good as Gold?" Mimeo, Hoover Institution, 1997b.