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Inflation, Taxation, and Interest Rates

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ABSTRACT

This paper demonstrates that the response of nominal interest rates to changes in inflationary expectations should lie between that predicted by the "Fisher" and "Darby" effects. The exact nature of the response will depend on the relative size of the income and capital gains tax rates, and the relative size of the derivatives of investment and savings to their respective after-tax real rates. The other major conclusion of this paper is that capital gains taxation offsets the negative effect on investment produced by treating depreciation on a historic rather than a replacement cost basis.

IN THE 1960s AND early 1970s, the economics profession and the financial community increasingly accepted Irving Fisher's analysis of the effect of changes in anticipated inflation on the rate of interest. In the last several years, Darby [4] and Feldstein [5] have elaborated Fisher's theory and have arrived at the conclusion that, in a world with taxes, an increase in inflationary expectations should result in a more than proportional increase in the nominal rate of interest, since investors base their investing and saving decisions on the after-tax and not the pretax expected consequences of their actions. Darby [4] has argued that if income taxes are proportional at rate T and interest receipts are taxable and interest payments are tax deductible, the real after-tax interest rate is

$$r^* = (1 - T)i - \pi \tag{1}$$

where r^* is the after-tax real rate of interest, assumed to be constant, i is the nominal rate of interest, and π is the expected rate of inflation. Solving for the nominal rate produces the "Darby Effect":

$$i = r^* + \pi/(1 - T) \tag{2}$$

The effect of inflation on the nominal interest rate is given by

$$di/d\pi = 1/(1 - T) \tag{3}$$

A similar though not identical result was reached by Feldstein [5] by solving a one sector neoclassical growth model. A simplified version of his model, which ignores the effect of inflation on money balances and therefore on capital deepening, produces the following effect of inflation on the nominal rate of interest:

$$di/d\pi = 1/(1 - \lambda) \tag{4}$$

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where λ is the corporate tax rate. In Darby's formulation it is the income tax on individuals which matters, while in Feldstein's model it is the corporate tax which matters.[1]

Despite the apparent reasonableness of the argument that savers and investors should respond to the real after-tax rate of return, this runs counter to the stubborn fact that there exists little empirical support for the contention that nominal rates of interest increase by a multiple of the increase in inflationary expectations.

This failure to find a significant tax effect on interest rates occurs whether one infers inflationary expectations from past price movements or from surveys of actual price expectations. Carr, Pesando, and Smith [3], defining price expectations from both an adaptive and rational expectations approach, have found only limited evidence for the effect of taxes on the rate of interest paid on longer maturity securities and none whatsoever for short-term rates. Cargill [1], using the Livingston data base for the 1960s, found that nominal rates of interest respond to a change in inflationary expectations by slightly more than the one-for-one response called for by the conventional "Fisher Effect." However, none of the discrepancies between these results and the "Fisher Effect" were statistically significant. Carlson [2], also using the Livingston data base, has found some limited support for the existence of the "Darby Effect" during the 1960s, but this support disappeared when the data period was extended to 1975.

The troubling question is why, given the surface plausibility of the tax effect argument, there is so little convincing empirical evidence which challenges the naive Fisherian model and supports a model with multiple effects of inflation on nominal interest rates in an environment of high marginal tax rates. Feldstein and Summers [6] have produced one possible explanation. They have attributed the absence of a tax effect to the depressing influence that historic-cost depreciation rules have had on investment in the face of inflation. They have concluded that the two influences have cancelled each other. In this paper, I offer an alternative explanation for the failure to find empirical support for a tax augmented "Fisher Effect." I show that under certain circumstances the naive or conventional "Fisher Effect" is still possible even in a world of high marginal tax rates. These results depend on the size of the interest elasticities to save and invest and on the size of the tax on capital gains relative to that on ordinary income.[2]

These results are derived from a model in which the nominal and real rates of interest are determined by the supply and demand for loanable funds. Saving and investment are assumed to be stable functions of the appropriate real *after-tax*

[1] The question of whether it is the corporate or personal tax rate that is relevant in the determination of nominal interest rates depends on which tax rate is used to construct the after-tax rate of interest that discounts the future stream of earnings from investment. Since the individual is the ultimate wealth holder, it seems reasonable to use the personal tax rate. In this case, if the marginal investment is debt-financed, the corporate tax rate affects the after-tax return from investment, along with its after-tax cost, in an offsetting fashion and can be ignored. In the rest of this paper I consider the effect of only a single income tax.

[2] While completing this paper, I became aware that Nielson [9] arrived at similar results using a two-period model.

interest rates. Changes in price expectations alter the real after-tax rates of interest, thereby altering the supply and demand for funds. Nominal interest rates are determined by the equilibrium condition that supply equals demand. For simplicity, the government budget is assumed to be balanced and any increase in tax revenues is returned to the public in a manner which leaves savings unaltered.

I use a simple one-sector model in which savings is a positive function of the real after-tax interest rate received by savers, r_s:

$$S = f(r_s)$$

$$\partial S/\partial r_s \geq 0 \tag{5}$$

Investment, the change in capital times the price of capital, P_k, is a negative function of the real after-tax rate paid by investors, r_b:

$$I = P_k \, \Delta K = f(r_b)$$

$$-\infty < \partial I/\partial r_b < 0 \tag{6}$$

For the sake of simplicity, it is useful to think of investment and saving as distinct acts. Therefore, I assume that all savings is done in the form of financial assets while all investment is financed by incurring debt.[3] In addition, I assume that the price of capital, P_k, relative to the price of output, P, is fixed and that both prices are set equal to unity in the initial period. Finally, I assume that savers and investors operate in a world of complete certainty in which actual inflation is always equal to the expected rate of inflation.

In Section I, the effect of changes in price expectations on nominal interest rates is analyzed for three tax environments. The first regime presented assumes the absence of all taxes. In the second regime, ordinary income is taxed at a proportional rate, but capital gains are not taxed. Regime three is similar to Regime two, except that capital gains are taxed on an accrual basis.

In Section I, capital is assumed to be infinitely lived. This assumption is dropped in Section II and the effect of inflation on the nominal rate of interest is analyzed under different tax and depreciation rules.

I.

A. *Regime 1: No Income Tax*

In equilibrium the present value of the marginal investment must equal unity, the cost of the investment:

$$\int_0^\infty \frac{MP_k e^{\pi t}}{e^{it}} \, dt - 1 = 0 \tag{7}$$

where MP_k is the marginal product of capital, π is the rate of inflation, and i is

[3] Direct or equity investment can be considered a case of an investor issuing debt to himself and then using proceeds from this loan to buy real assets. Since interest expense is tax deductible and interest income taxable, viewing the act of direct investment as a two part act has no net tax consequences.

the nominal rate of interest.[4] Equation 7 yields the traditional equilibrium condition that the marginal product of capital is equal to the real rate of interest, r_b, paid by borrowers.

$$r_b = MP_k = i - \pi \tag{8}$$

In a world without taxes the real yield obtained by savers, r_s, is equal to

$$r_s = i - \pi \tag{9}$$

In equilibrium, saving must equal investment. To solve for the effect of a change in π on nominal interest rates, the total derivative of saving with respect to π is equated to the total derivative of investment with respect to π:

$$\frac{dS}{d\pi} = \frac{\partial S}{\partial r_s}\frac{dr_s}{d\pi} = \frac{dI}{d\pi} = \frac{\partial I}{\partial r_b}\frac{dr_b}{d\pi} \tag{10}$$

Differentiating r_s and r_b with respect to π and substituting into (10) gives the following solution:

$$\frac{\partial S}{\partial r_s}\left(\frac{di}{d\pi} - 1\right) = \frac{\partial I}{\partial r_b}\left(\frac{di}{d\pi} - 1\right) \tag{11}$$

Rearranging terms produces

$$\left(\frac{di}{d\pi} - 1\right)\left(\frac{\partial S}{\partial r_s} - \frac{\partial I}{\partial r_b}\right) = 0 \tag{12}$$

which in turn yields

$$\frac{di}{d\pi} = 1 \tag{13}$$

the standard Fisherian conclusion that a one percent increase in the expected rate of inflation leads to a one percent increase in the nominal rate of interest.

B. *Regime 2: Income Tax; No Capital Gains Tax*

Now let us consider the case where a proportional tax of T percent is levied on all income except for capital gains which are tax free. In this case, the after-tax contribution of an additional dollar investment to the investor, the ultimate wealth holder, is equal to

$$\int_0^\infty \frac{(1 - T)MP_k e^{\pi t}}{e^{(1 - T)it}}\, dt - 1 = 0 \tag{14}$$

The after-tax stream of future nominal earnings, $(1 - T)MP_k\, e^{\pi t}$, is discounted by the after-tax nominal interest rate, $(1 - T)i$, which is the relevant opportunity

[4] The discounted value of interest payments on a dollar's worth of borrowing is equal to one dollar.

$$\int_o^\infty ie^{-it}dt = 1$$

cost of investing a dollar of capital in bonds rather than in real capital.[5] Simplifying Equation (14) produces

$$\frac{(1-T)MP_k}{(1-T)i-\pi}=1 \tag{15}$$

which can be reduced to

$$r_b = MP_k = i - \frac{\pi}{1-T} \tag{16}$$

With a tax on income, the real after-tax interest rate received by savers on financial assets is equal to

$$r_s = (1-T)i - \pi \tag{17}$$

Performing the same exercise as in the case of zero taxes, the equilibrium condition for saving and investment becomes

$$\frac{\partial S}{\partial r_s}\left((1-T)\frac{di}{d\pi}-1\right)=\frac{\partial I}{\partial r_b}\left(\frac{di}{d\pi}-\frac{1}{1-T}\right) \tag{18}$$

Rearranging terms yields

$$\frac{di}{d\pi}\left(\frac{\partial I}{\partial r_b}-(1-T)\frac{\partial S}{\partial r_s}\right)=\frac{1}{(1-T)}\frac{\partial I}{\partial r_b}-\frac{\partial S}{\partial r_s} \tag{19}$$

and further simplification produces the "Darby Effect":

$$\frac{di}{d\pi}=\frac{1}{1-T} \tag{20}$$

The results depend critically on the assumption that capital gains are not taxed. In the initial period, a marginal dollar of investment in real assets has an after-tax discounted value of one dollar.[6] In subsequent periods, the revenue from the real asset increases with inflation, and the nominal value of the asset increases over time. The "Darby Effect" occurs because these inflation-induced capital gains on real investment are not taxed while the inflation premium incorporated in nominal interest rates is fully taxed when received by savers and fully tax deductible when paid by borrowers. This tax advantage increases the willingness to borrow and reduces the willingness to save in the form of financial assets. The multiple impact of π on nominal rates represented by the "Darby Effect" is required to compensate for the tax advantage enjoyed by real assets and to make the return from both types of assets equal.

[5] The present value of a tax deductible interest expense on a one dollar investment is equal to one dollar.

$$\int_0^\infty \frac{(1-T)i}{e^{(1-T)it}}dt = 1$$

[6] In the case of a bond financial investment, the discounted value of the after-tax revenue stream is exactly offset by the discounted value of the after-tax cost of servicing the bond issue.

C. Regime 3: Income Tax Including Tax on Accrued Capital Gains

The results are quite different when the inflation-induced capital gains on real assets are taxed as they accrue. In this case, the effect of a change in the expected rate of inflation on nominal interest rates depends on the relative size of the income and capital gains taxes, and on the elasticity of investment and saving to their respective real after-tax interest rates.

With capital gains taxation the marginal condition becomes

$$\int_0^\infty \frac{(1-T)MP_k e^{\pi t}}{e^{(1-T)it}}\,dt - \int_0^\infty \frac{\theta\pi e^{\pi t}}{e^{(1-T)it}}\,dt - 1 = 0 \tag{21}$$

The first integral is identical to that which appears in the previous case, Equation (14). The second integral represents the discounted value of the future stream of nominal capital gains tax liabilities. It represents the taxation at rate θ of the capital gains, derived from the inflation-induced rise at rate π, in the nominal value of one dollar of capital.[7]

Evaluating the integrals yields

$$\frac{(1-T)MP_k}{(1-T)i-\pi} - \frac{\theta\pi}{(1-T)i-\pi} = 1 \tag{22}$$

which reduces to

$$r_b = MP_k = i - \frac{(1-\theta)}{1-T}\pi \tag{23}$$

When capital gains are taxed not when the asset is sold but as they accrue, the equilibrium condition for investment depends on the relative size of the two tax rates.[8] To obtain a general solution to the impact of changes in π on i when capital gains are taxed as they accrue, differentiate the appropriate definitions of r_b and r_s with respect to π and substitute them into the equilibrium conditions for saving and investment (Equation 10):[9]

$$\frac{\partial S}{\partial r_s}\left((1-T)\frac{di}{d\pi} - 1\right) = \frac{\partial I}{\partial r_b}\left(\frac{di}{d\pi} - \frac{(1-\theta)}{1-T}\right) \tag{24}$$

Rearranging terms yields

$$\frac{di}{d\pi} = \left(\frac{(1-\theta)}{1-T}\frac{\partial I}{\partial r_b} - \frac{\partial S}{\partial r_s}\right)\Big/\left(\frac{\partial I}{\partial r_b} - (1-T)\frac{\partial S}{\partial r_s}\right) \tag{25}$$

Multiplying both sides by $(1-T)$ and rearranging gives

$$\frac{di}{d\pi} = \frac{1}{1-T} - \frac{\theta}{1-T}\left(\frac{\partial I/\partial r_b}{\partial I/\partial r_b - (1-T)\partial S/\partial r_s}\right) \tag{26}$$

[7] Since I assumed that the relative price of capital goods is constant, the reproduction cost of a unit of capital must increase at the same rate as the rate of increase in the price of output, i.e., π. Since the depreciation rate on capital is zero, the value of a dollar's worth of capital bought in any previous year must also increase at the same rate of the reproduction cost of capital.

[8] When the capital gains and ordinary income tax rates are equal, the real return from investment expressed in Equation (23) is the same in the zero tax case, Equation (8).

[9] The real after-tax return from savings in the form of financial assets is still $(1-T)i-\pi$.

or dividing the numerator and denominator of the bracketed term by $\partial I/\partial r_b$,

$$\frac{di}{d\pi} = \frac{1}{1-T} - \frac{\theta}{1-T}\left(\frac{1}{1-(1-T)\dfrac{\partial S}{\partial r_s}\Big/\dfrac{\partial I}{\partial r_b}}\right)^{10} \tag{27}$$

From this relationship, we can see that even in the presence of taxes, there are certain conditions under which the "Fisher Effect" as conventionally understood can still occur.

Since the derivative of savings with respect to r_s is positive and the derivative of investment with respect to r_b is negative, the value of the bracketed term in Equation (27) will lie between zero and unity. When the tax rate on capital gains, θ, is equal to the income tax rate, T, the derivative of i with respect to π will approach unity as the value of the bracketed term approaches unity. More formally,

$$\frac{di}{d\pi} = 1 \quad \text{when} \quad \theta = T \quad \text{and} \quad \left(\frac{1}{1-(1-T)\dfrac{\partial S}{\partial r_s}\Big/\dfrac{\partial I}{\partial r_b}}\right) = 1 \tag{28}$$

The bracketed expression will be equal to unity when either $\partial S/\partial r_s$, the response of saving to the real after-tax return from saving is zero or $\partial I/\partial r_b$, the response of investment to the real after-tax rate of interest is infinite. Therefore,

$$\frac{di}{d\pi} = 1 \quad \text{when} \quad \theta = T \quad \text{and} \quad \partial S/\partial r_s = 0 \quad \text{or} \quad \partial I/\partial r_b = -\infty \tag{29}$$

On the other hand, the "Darby Effect" will occur when either the capital gains tax is zero or $\partial I/\partial r_b = 0$ or $\partial S/\partial r_s = \infty$. Therefore, the derivatives of savings and investment with respect to their real rates of interest, and the relative size of the tax rate on capital gains, will determine where the response of the nominal interest rate to changes in price expectations will lie between the conventional "Fisher Effect" and the newer "Darby Effect."

$$1 \leq \frac{di}{d\pi} \leq \frac{1}{1-T}^{11} \tag{30}$$

Two of the polar assumptions associated with this result deserve further analysis. Consider the case of a small country. If there exist offshore tax havens, the amount of saving available to that country's capital market may be highly elastic with respect to the real after-tax return. Under these circumstances, the "Darby Effect" should prevail, regardless of the size of the tax rate on capital gains.

The other polar assumption that may be empirically important concerns the elasticity of investment. Thus far, little has been said about the determination of the marginal product of capital. The equilibrium condition, that the after-tax real rate paid by investors, r_b, equals the marginal product of a dollar of capital, MP_k,

[10] For the result in the case where the real rate of interest is assumed constant, see Levi and Makin [8] footnote 4, page 803.

[11] I assume here that $\theta \leq T$. In the case where $\theta > T$, then it is possible that the complete "Fisher Effect" will not prevail, i.e., $di/d\pi < 1$.

can be realized by changes in either r_b or MP_k. In the neoclassical one-sector model, the marginal product of capital is a function of the capital to labor ratio. Any change in r_b will cause a shift in the desired capital to labor ratio. If the analysis period is short enough and the capital stock large enough, MP_k can be considered fixed and the derivative of investment with respect to r_b could be very large relative to the derivative of saving with respect to r_s. From Equation (27), it is apparent that if $\partial I/\partial r_b$ is very large in absolute value relative to $\partial S/\partial r_s$, the conventional "Fisher Effect" will be approached if θ is equal to T.

II.

In this section, I drop my earlier assumption of infinitely lived capital and consider three cases involving depreciation of capital: the zero tax regime, plus two regimes in which both income and capital gains are taxed. In the first tax regime, depreciation for tax purposes is calculated on capital valued at replacement cost, while in the other case it is valued at historic cost.

A. *Regime 4: Depreciation and no Taxation*

I define depreciation to be a continuous process in which marginal product of a unit of capital declines at a constant rate δ from the moment of its creation. In that case, the equilibrium condition for the marginal dollar of investment is

$$\int_0^\infty \frac{MP_k e^{\pi t}}{e^{it} e^{\delta t}}\, dt = 1 \tag{31}$$

This reduces to

$$r_b = MP_k = i + \delta - \pi \tag{32}$$

This is the classical result that the gross marginal product of capital must equal the real rate of interest plus the rate of depreciation. Since the derivative of δ with respect to the expected rate of inflation π is zero, the effect of changes in π on the nominal rate of interest is not affected by the presence of δ and is the same as in the zero tax case without depreciation, i.e., $di/d\pi = 1$.

B. *Regime 5: Depreciation Calculated at Replacement Cost with Income and Capital Gains Taxation*

When both income and capital gains are taxed, the equilibrium condition for investment where depreciation for tax purposes is based on valuation of capital at replacement cost is as follows:

$$\int_0^\infty \frac{(1-T)MP_k e^{\pi t}}{e^{(1-T)it} e^{\delta t}}\, dt - \int_0^\infty \frac{\theta \pi e^{\pi t}}{e^{(1-T)it} e^{\delta t}}\, dt + \int_0^\infty \frac{T\delta e^{\pi t}}{e^{(1-T)it} e^{\delta t}}\, dt - 1 = 0 \tag{33}$$

The first two integrals are identical to Equation (21) in Regime 3, except that in the current case both the nominal marginal product of capital $MP_k e^{\pi t}$ in the first integral and the nominal capital gains tax $\theta\pi e^{\pi t}$ in the second integral are both reduced over time by depreciation at rate δ.[12] The third integral is the present value of the stream of future income saved by deducting depreciation based on the replacement cost of capital from taxable income.

Solving Equation (33) yields

$$\frac{(1-T)MP_k - \theta\pi + T\delta}{(1-T)i + \delta - \pi} = 1 \tag{34}$$

This simplifies to

$$r_b = MP_k = i + \delta - \frac{(1-\theta)\pi}{1-T} \tag{35}$$

and

$$\frac{\partial r_b}{\partial \pi} = \frac{\partial i}{\partial \pi} - \frac{(1-\theta)}{1-T}{}_{13} \tag{36}$$

The derivatives of r_b and r_s with respect to π are identical to those obtained in Regime 3, the comparable tax case presented in Section I. Therefore, the effect of changes in inflation on the nominal rate will be the same as in the earlier case and will be between 1 and $1/1 - T$ depending on the relative size of $\partial S/\partial r_s$ and $\partial I/\partial r_b$ and the relative size of θ and T, the tax rates on capital gains and ordinary income.

C. *Regime 6: Allowance for Depreciation at Historic Cost with Equal Tax Rates on Income and Capital Gains*

It will now be shown that as long as the tax rate on capital gains is equal to the tax rate on ordinary income, it makes no difference for investment or interest rates whether depreciation is calculated for tax purposes on capital valued at replacement or at historic cost.

In this regime, the investor may not deduct the full amount of the real depreciation in the value of his capital from his taxable income, since inflation does not increase the nominal value of depreciation for tax purposes. But this is not the only modification of the equilibrium condition for investment that is necessary. When a taxpayer deducts depreciation of a capital asset from his taxable income, he reduces the cost of the asset by the amount of the depreciation for the purposes of capital gains taxation. Since the allowed depreciation is increasingly less than the actual, capital gains will no longer accrue at a rate π each period. Instead, the taxable value of the asset will rise at a slower rate.

[12] Because of depreciation, the price of the unit of capital does not increase at rate π. Instead, it increases at a rate equal to $\pi - \delta$. However, since for tax purposes the effective cost of the asset must be reduced by the amount claimed as a depreciation deduction, the capital gain subject to tax is still π times the value of the asset.

[13] Recall that the derivative of δ with respect to π is zero.

The new equilibrium condition for investment is therefore equal to

$$\int_0^\infty \frac{(1-T)MP_k e^{\pi t}}{e^{(1-T)it}e^{\delta t}}\,dt - \int_0^\infty \frac{\theta\pi e^{\pi t}}{e^{(1-T)it}e^{\delta t}}\,dt + \int_0^\infty \frac{T\delta}{e^{(1-T)it}e^{\delta t}}\,dt + \int_0^\infty \left(\frac{\theta\delta e^{\pi t} - \theta\delta}{e^{(1-T)it}e^{\delta t}}\right)dt - 1 = 0 \qquad (37)$$

The first two integrals are identical to the first two terms of Equation (33) of the previous regime. The third integral of Equation (37) differs from that of Equation (33) in that the revenue stream accruing from the tax deductibility of depreciation does not increase in value along with inflation. The fourth integral in Equation (37) corrects for the overstatement of capital gains taxation contained in the second integral. Solving for Equation (37) yields

$$\frac{(1-T)MP_k - \theta\pi + \theta\delta}{(1-T)i - \pi + \delta} + \frac{T\delta - \theta\delta}{(1-T)i + \delta} = 1 \qquad (38)$$

If we assume $T = \theta$, that the tax rates on capital gains and income are equal, this simplifies to

$$\frac{(1-T)MP_k - T\pi + T\delta}{(1-T)i - \pi + \delta} = 1 \qquad (39)$$

which in turn is equivalent to

$$r_b = MP_k = i + \delta - \pi \qquad (40)$$

Recall that the equilibrium condition for investment when depreciation is valued at replacement cost was calculated to be

$$r_b = MP_k = i + \delta - \frac{(1-\theta)\pi}{1-T} \qquad (41)$$

This is identical to the present regime when depreciation is valued at historic cost if θ is equal to T. The reason for this is simple. Since the tax rates on ordinary income and capital gains are equal, the extra tax paid because of the increasing difference between historic and replacement cost calculation of depreciation is exactly offset by a reduction in the capital gains tax. This reduction in the capital gains tax is the result of the fact that for each period the cost of the asset is marked down by the amount of the depreciation allowed for tax purposes rather than that which actually occurred.

This yields an important result, namely, that in a world where capital gains are treated the same for tax purposes as ordinary income, the fact that the depreciation is allowed on a historic rather than replacement cost basis has no effect on investment. In fact, if no deduction were allowed for depreciation at all, the result would be the same. All that would happen is that what is lost due to the lack of a depreciation deduction would be offset by a lower capital gains tax since no markdown in asset cost would be required.

Since we assume $T = \theta$, the effect of changes in inflationary expectations on the nominal rate will depend in this case solely on the relative size of $\partial S/\partial r_s$ and $\partial I/\partial r_b$ and will lie between 1 and $1/1 - T$.

III. Conclusion

In this paper I have attempted to demonstrate that there are situations in which the "Fisher Effect" as conventionally defined could occur even when the tax rates on income are quite high. Nominal interest rates would rise by the increase in the expected rate of inflation, i.e., $di/d\pi = 1$, if the following two conditions prevail: if (1) the tax rate on capital gains were equal to the tax rate on ordinary income, and (2) the derivative of investment with respect to its after-tax real rate were very large in absolute value relative to the size of the derivative of savings with respect to its after-tax real rate.

Since in the real world capital gains are taxed only when realized and not as they accrue, the effective tax on capital gains is less than that on real income. Thus, the response of nominal interest rates to changes in inflationary expectations should normally lie between that predicted by the "Fisher" and "Darby" effects. The exact nature of the response will depend on the relative size of the two tax rates and the relative size of the two derivatives. Given this complexity, it is not surprising that empirical investigations have had relatively little success in demonstrating the existence of the "Darby Effect."

The other major conclusion I draw from the above analysis is that capital gains taxation offsets the negative effect on investment produced by treating depreciation on a historic rather than a replacement cost basis. In fact, if no deduction were allowed and capital gains and ordinary income were taxed equally, the incentive to invest would be the same as in the case where depreciation is deducted on a replacement cost basis.

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