NATIONAL CENTER FOR POLICY ANALYSIS

The Economic Burden of Corporate Taxation[1]

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As other countries lower their corporate tax rates, U.S. corporations are reincorporating in lower tax countries (engaging in "tax inversions") to reduce their tax burdens. Permanently eliminating or lowering the U.S. corporate tax rate would reverse this tax calculus and establish the United States as a tax haven. The result would be a huge infusion of capital into the United States, made all the greater by other U.S. advantages, such as access to capital, rule of law and infrastructure.

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Executive Summary

The *Laffer Curve* shows the relationship between the level of taxation and government revenue. Once the corporate tax rate reaches a level where the percentage change in the tax rate is larger than the percentage change in the tax base, there is no additional revenue to be gained from further increases. The policy goal is to choose the rate that makes the optimal tradeoff between the needs of government and the level of economic activity, as measured by the size of the tax base. An important matter to keep in mind when estimating the economy's position on the Laffer Curve is how a reduction in the tax rate on one kind of income might cause total tax revenues to rise because of the resulting expansion in revenues collected on other kinds of income. Thus a reduction in the corporate tax rate might cause corporate tax revenues to fall but cause a larger rise in revenues from income and payroll taxes.

In a simplified, but widely used, model of the economy, there are two factors of production — labor and capital — to be considered in making this tradeoff. A reduction in taxes on capital reduces the *cost of capital* — which is to say, the before-tax return an investment has to yield in order to make the after-tax return high enough to obtain financing. This makes capital cheaper relative to labor and induces the firm to substitute capital for labor, pushing down wages in the process. Second, it increases production and, by doing so, pushes up the demand for labor and therefore wages. Which effect on wages is greater — the positive or the negative effect — depends on how sensitive savers are to changes in the after-tax return to capital.

If a slight fall in the cost of capital (and thus a slight rise in the after-tax return to capital) induces savers to expand greatly the amount of capital they are willing to provide U.S. firms, then the effect on wages will be positive. A reduction in the U.S. corporate income tax would draw a lot financial capital into the United States, causing production and wages to rise. Contrarily, an increase in the corporate tax rate would reduce investment and output. As to distributional considerations, under the (defensible) assumptions made here about the high sensitivity of savers to differences in intercountry tax rates, the burden of the higher tax would fall mostly on labor.

The Economic Burden of Corporate Taxation

The cost of capital depends on taxes imposed at both the firm level and the individual level. The willingness of stockholders to provide financial capital though stock purchases depends on the dividends and capital gains they receive after all taxes are collected at both levels.

An important matter for assessing corporate tax policy is the effective marginal tax rate (EMTR) — the change in tax liability from a one dollar change in taxable and nontaxable income. There have been many estimates of the EMTR in the United States, but previous estimates did not account for all taxes on capital:

- Economist Jack Mintz found that among G-7 countries, the United States had the second *lowest* effective marginal tax rate in 1994, at 25.4 percent, but had the highest EMTR in 2013, of 35.3 percent.
- However, broadening Mintz's methodology to incorporate all taxes on capital at the both the firm and the individual level, we find the U.S. EMTR in 2013 was 48.03 percent.

The United States operates in a way that is particularly punishing to corporate investment. As a result, savers in the United States just move their capital abroad in response to higher U.S. taxes on capital. Under the assumption of a closed economy, taxes on capital will be borne by the owners of capital, but in an open economy, where capital can move freely, the burden falls on labor, lowering average wage rates.

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Introduction

The U.S. corporate income tax has been an increasingly important topic of debate since the beginning of the Obama administration. Attempts by the administration to stop corporate tax inversions (through which a firm moves its domicile to a lower-tax country) are not working.[2] Other countries are lowering their rates, and the United States needs to compete. Permanently eliminating or lowering the U.S. corporate tax rate would reverse the calculus that leads to inversions and establish the United States as a tax haven. This move would result in a huge infusion of capital and labor into the United States, especially given other U.S. advantages, such as access to capital, rule of law and infrastructure. Multinational corporations would reverse course and try to shift the sourcing of income into the United States, instead of away from it. Yet, there is a general unwillingness to recognize these facts. A recent Pew Research poll found that 64 percent of Americans are "bothered a lot by the feeling that some corporations do not pay their fair share of taxes."[3]

This idea is naïve for three reasons: First, corporations vary widely in size and profitability. Second, and far more important, corporate income cannot simply be snatched up by government without negative consequences for everyone, rich and poor alike. The layman seems unable to understand the role of profits in motivating firms to engage in capital formation, without which there would be no economic activity at all. Finally, and as we have pointed out, corporations don't pay taxes. People do, and the people are often workers.

No one would begrudge the owner of a small gift shop the right to make a "fair" profit. Yet, a multibillion-dollar, publicly-traded corporation must also make a fair profit (an understanding of which will emerge from the discussion that follows), the principal difference being that the executives who run the corporation are beholden, not just to themselves, but also to the millions of shareholders who pay their salaries.

Profits are a reward for saving and risk taking. They are not booty to be taken by the Robin Hoods of progressive politics to rectify injustices in the distribution of income. Profits, whether received by a big corporation or a small business, are the return on investment that makes it possible for business owners to attract the financial capital they need to invest in their businesses. Profits are a cost of doing business, just as wages are.

Lifting the Corporate Veil

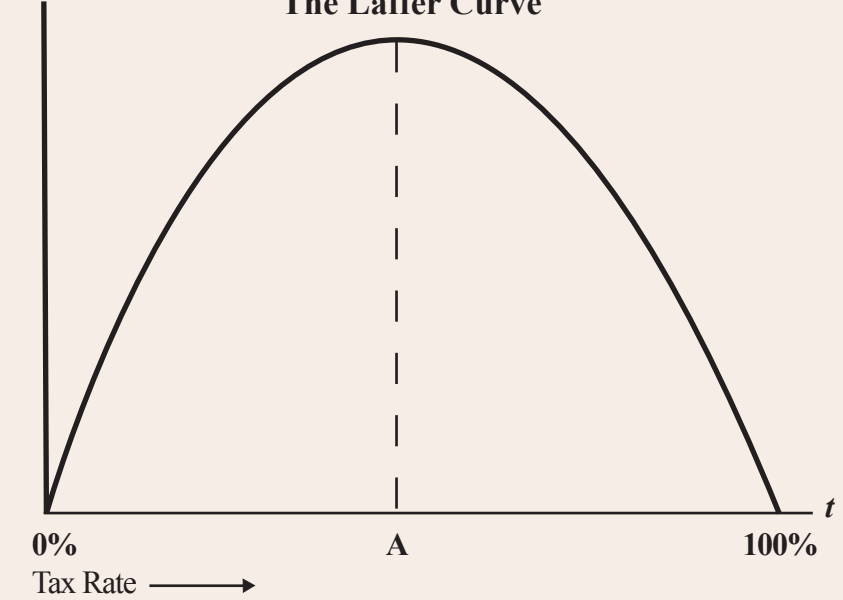
Let us lift the veil that separates a corporation from any other business and ask what is necessary for firms to acquire physical capital and to produce. The short answer is that firms need to compensate adequately the people who provide them with financial capital so that they can acquire physical capital. There are few economic laws that are rigidly true, but there are two in which we can place total confidence — the *Laffer curve* and *the law of diminishing returns.*

The Laffer Curve. The Laffer curve shows the relationship between the level of taxation and government revenue.[4] Consider corporate profits or personal income, either of which might serve as the base for some tax. The formula for the amount of revenue that the government will raise by taxing that base can be written as follows:

(1) $R = tB(t)$,

where R is the amount of revenue collected, t is the tax rate and B is the tax base. The formula implies that the base is sensitive to the size of the tax rate. A curve that relates R to t will have the shape of the curve in Figure I. Suppose B equals corporate profits. It is certain that the government will raise no revenue through the corporate

Figure I
The Laffer Curve



Source: Jack Mintz, "The Corporation Tax: A Survey," *Fiscal Studies*, 1995; and Jack Mintz and Duanjie Chen,"The U.S. Corporate Effective Tax Rate: Myth and the Fact," 2014.

tax if it sets t at either zero or 100 percent. When t = 100 percent, B = 0. No corporation will earn any profits.

As t rises, B will fall. Thus the question whether revenue will rise — that is, whether the percentage change in revenue is positive — will depend on which is numerically larger, the percentage change in the tax rate or the percentage change in the tax base. (Recall that $-\%\Delta B$ — where Δ [delta] represents the change in B — is negative so it must be converted to a positive number for this calculation.) At some point, however, $-\%\Delta B$ will be larger than $\%\Delta t$ and revenue will start to fall. [See point A in Figure I.]

One very simple approach to examining the economic effects of corporate taxes is to see from the data how close to point A the corporate tax rate has gotten. Once the rate reaches that level, there is no additional revenue to be gained from further increases. This is not at all to say that A represents the ideal rate. The policy goal is to choose the optimal rate, somewhere between zero and A, that makes the proper tradeoff between the needs of government and the level of economic activity, as measured by the size of the income base that is taxed. It is important in making this calculus to keep in mind that, even if corporate tax revenues fall from a cut in the corporate tax rate, other revenues (for example, personal income tax revenues) may rise as the economy expands.

Economist Kimberly Clausing examined data for countries belonging to the Organization for Economic Cooperation and Development (OECD) over the period 1979 to 2002 and found a Laffer curve for central government corporate tax revenues that reaches a peak at a tax rate of 33 percent (expressed as corporate revenues divided by GDP).[5]

In a more recent article, Mathias Trabandt and Harald Uhlig found that both the United States and 14 European Union countries are barely on the left side of the peak of a Laffer Curve for capital income. According to Trabandt and Uhlig:

- By increasing the average tax rate on capital income, the United States could increase revenue by 6 percent, and the 14 European Union countries could increase revenue by 1 percent.
- However, they also point out that the optimal tax rate will always be less than the revenue-maximizing tax rate.

They recognize that "there rarely is a free lunch due to tax cuts." Which is to say that, based on their data, a tax cut will generally lead to a loss of revenue when the tax rate is below the peak of the Laffer curve. "However, a substantial fraction of the lunch will be paid for by efficiency gains in the economy due to tax cuts. Transitions matter."[6] That is, tax cuts expand the economy by increasing government efficiency even when they cause revenue losses.

The Law of Diminishing Returns. Simply stated, this law says that if there are two inputs to production, labor and capital, production will rise but will rise more and more slowly as we use more of one of the two inputs, holding the other constant.

Let us consider how corporate taxes affect the size of the capital stock, beginning with an equation for production known as the "Cobb-Douglas" equation:

(2) $Y = ZK^{a}L^{1-a}$.

It is a simple and easily interpreted representation of how technology (Z), capital (K) and labor (L) combine to bring about production (Y).[7] In the *circular flow* that characterizes every economic system, Y stands for both output and income (plus depreciation). By providing the services of capital and labor, people allow firms to produce and, in turn, receive income to buy what the firms produce. Capital is defined as the dollar value of physical capital, that is, the plant and equipment used in production. Labor is the number of man-hours supplied by some composite worker who applies his services to the capital stock. Z is an index of technology.

In the Cobb-Douglas equation, the exponents, α [alpha] and $1 - \alpha$, measure the share of income that goes, respectively, to capital and to labor. In a 2002 article, entitled "Getting Income Shares Right," Douglas Gollin observes that the legitimacy of the Cobb-Douglas formulation has been suspect because it assumes income shares remain constant both over time and across countries.[8] While the shares have been fairly stable over time, conventional measures show wide disparities between countries. He attributes this to a mistaken classification of income earned by small firms as capital rather than labor income. Golling finds that:

- The conventionally-calculated share of total income going to labor for 41 countries ranges from a low

of 16.0 percent (Ecuador and Benin) to a high of 64.4 percent (Finland), with the United States at 58.9 percent.

- However, when the income of small firms is calculated as labor income, the adjusted labor share falls into a much narrower band and ranges from 65 percent to 80 percent.
- The average adjusted labor share for the United States is 72.7 percent.[9]

In their "Reader's Guide" to corporate taxes, de Mooij and Ederveen assume that the labor share equals 80 percent. Then equation (2) becomes:[10]

(3) $Y = ZK^{.2}L^{.8}$.

Elasticity of substitution. The size of the labor share matters for tax policy. Using the Cobb-Douglas equation (and here is where it proves its convenience), there is a simple formula for calculating the effect of a change in the cost of capital on the capital stock. One feature of the Cobb-Douglas function (which has its critics) is that it implies that the *elasticity of substitution* — usually denoted by the Greek letter, σ [sigma] — equals 1, which means: If the cost of capital relative to the cost of labor rises by 1 percent, the ratio of capital to labor falls by 1 percent. Knowing the elasticity of substitution, we can estimate (a) how a rise in the effective marginal tax rate on corporate income will affect the cost of capital and, then, (b) how a rise in the cost of capital will affect corporate investment.

In a 2002 paper, Robert S. Chirinko surveyed 13 academic studies plus several studies by the Joint Committee on Taxation of the U.S. Congress. He found elasticity (σ) values ranging from zero (meaning perfectly inelastic) to 0.93.[11] In a later paper, he said that "the weight of the evidence suggests a value of in the range of 0.40-0.60."[12]

Consider the marginal product of capital, or MP_K, defined as the amount by which production will rise with an additional unit of capital, holding labor constant. For the Cobb-Douglas production function, the equation for MP_K can be written as:

(4) $MP_K = \frac{\alpha Y}{K}$.

Note that, because of the law of diminishing returns, output (Y) will rise more slowly than K as K rises. Thus MP_K will fall as K rises.

The marginal product of labor, defined as the amount by which production will rise with an additional unit of labor, can be written as:

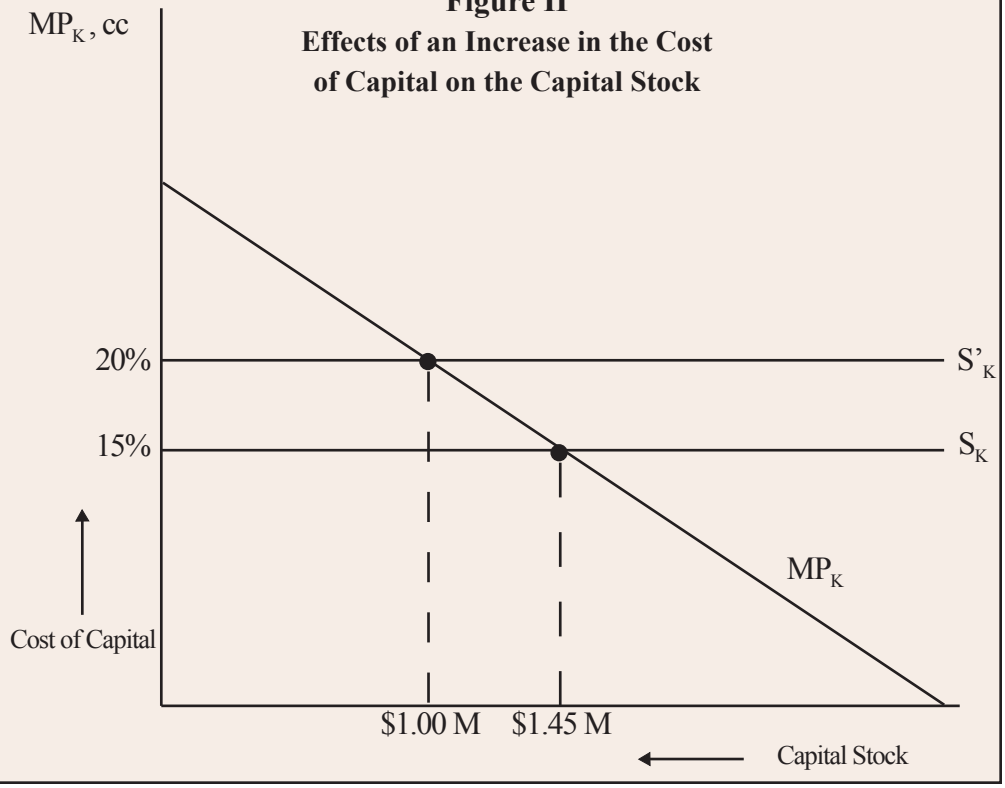
(5) $MP_L = \frac{(1-\alpha)Y}{L}$.

Again, because of the law of diminishing returns, Y will rise more slowly than L as L rises. Thus MP_L will fall as L rises.

Under this approach to tax policy analysis, supply equals demand. There is a supply of capital and a demand for capital, which are equilibrated through adjustments in the cost of capital, *cc*. There is also a supply of labor and a demand for labor, which are equilibrated through adjustments in the cost of labor, W. Let us consider the relevance of these relationships to corporate tax policy.

A curve relating MP_K to K can be interpreted as the

Figure II
Effects of an Increase in the Cost of Capital on the Capital Stock



demand for capital, and will be downward sloping [see Figure II]. In calculating the cost of capital, economists usually assume that the supply of capital, S_K, is constant, as illustrated by the horizontal line. (This assumption will be reconsidered below.) This line intersects the vertical axis at some value of *cc*. The equilibrium capital stock is the size of the capital stock at which MP_K just equals *cc*. If the rate of return to a risk-free bond is 5 percent, if the economic depreciation rate (a measure of the decrease in value of an asset over a period of time) on corporate capital is 10 percent and if there are no taxes or risks to consider, the corporate stock must yield a 15 percent rate of return. This is the cost of capital.

Elasticity of demand for capital. This concept is defined as the percentage change in demand for capital that will result from a 1 percent change in the cost of capital. Using the Cobb-Douglas formulation, we can find the *elasticity of demand for capital*, ε [epsilon], by dividing the elasticity of substitution by the labor income share:

$$(6) \quad \varepsilon = \frac{\sigma}{1-\alpha}.$$

Suppose that a firm currently has $1.45 million worth of capital, and let *cc* rise by one-third, from 15 percent to 20 percent. We will show below how the imposition of a corporate tax will cause *cc* to rise. Knowing that:

$$(7) \quad \varepsilon = \frac{1}{0.8} = 1.25,$$

we can determine the assumed rise in the cost of capital will cause the capital stock to fall from $1.45 million to $1.00 million.[13]

In Figure III, the MP_L curve can be interpreted as the demand for labor. The S_L curve represents the supply of labor (always considered to be upward sloping), and reflects the notion that people require a higher and higher wage to supply more and more labor (meaning a higher and higher cost to firms of acquiring labor as the amount of labor demanded rises).

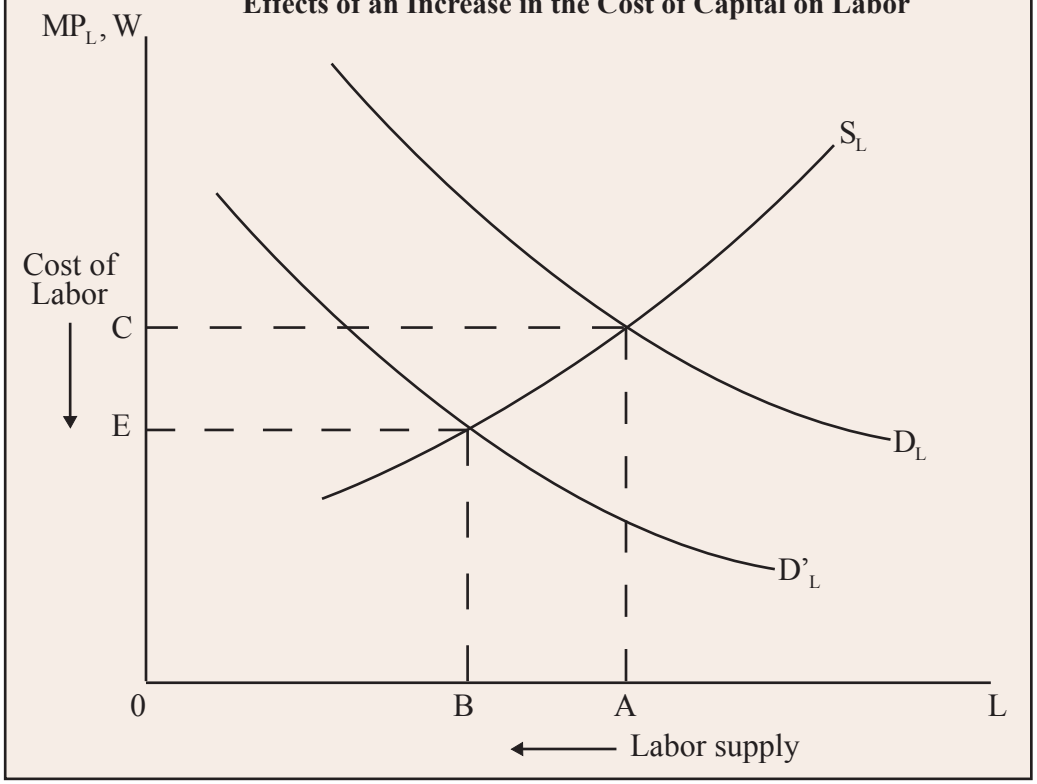
The downward slope of the MP_L curve reflects the law of diminishing returns. The equilibrium flow of labor is the quantity of labor services provided at which the marginal product of labor just equals the cost of labor — that is, the wage the firm has to pay. If there are no taxes on either labor or capital, the equilibrium quantity of labor, *L*, supplied by workers and hired by firms, is at point OA and the equilibrium wage rate, *W*, is at point OC.

How does an increase in the cost of capital affect employment and wages? First, firms reduce the amount of capital they wish to hold. Second, the reduction in capital causes a reduction in output, and a reduction in output causes a reduction in MP_L [equation (4)] and with it, a reduction in the demand for labor, in wages rates and in the amount of labor firms want to employ. This is illustrated in Figure III by the downward shift in the demand for labor curve from D_L to D'_L, causing *W* to fall from OC to OE and *L* to fall from OA to OB.

The imposition of a tax on capital reduces the capital stock (and therefore, as we will see, investment), and output. As to distributional considerations, under the (defensible) assumptions made here, the burden of the tax falls entirely on labor and not at all on

Figure III

Effects of an Increase in the Cost of Capital on Labor



capital.[14]

The Cost of Capital under the Corporate Tax. How does taxing capital raise the cost of capital? We will focus on taxes imposed on corporate profits and on shareholder income, which is to say, dividends. We allow that depreciation is deductible for tax purposes but ignore any tax credits for which the corporation might be eligible.

Suppose a corporation wants to raise $100 million through a stock issue to finance an expansion in its plant. Buyers of the firm's stock would have to receive a return equal to whatever after-tax interest rate they could get by buying a no-risk security like a bank Certificate of Deposit (CD), plus enough to (1) recover the depreciation of the capital goods bought by the firm, (2) cover the risk involved, (3) compensate for expected inflation and (4) cover any taxes that would be imposed on the profits made by the firm. In this instance, the cost of capital depends on taxes imposed at both the corporate and the individual level.

The seminal works on this issue came from Dale W. Jorgensen and Robert E. Hall.[15] The following example applies their methodology as interpreted by Harvey S. Rosen and Ted Gayer in their book *Public Finance*.[16]

Let r stand for the after-tax interest rate on risk-free assets and δ [delta] the rate of economic depreciation. If r equals 5 percent and the rate of depreciation equals 10 percent, the stock would have to offer a dividend yield of at least 15 percent to get people to buy it, absent taxes (and absent risk and inflation). The cost of capital, cc, would be 15 percent.

Now assume that there are taxes on both corporate profits and on the dividends stockholders receive. Corporations pay out all of their after-tax profits as dividends.

Let the corporate tax rate, t_{corp}, be 35 percent and the tax rate on dividends, t_{div}, be 15 percent. Assume also that corporations can write off their capital for tax purposes at the same rate that it depreciates, so that the tax life of the asset is 10 years. Now the cost of capital becomes the before-tax return that the firm must receive so that stockholders will receive an after-tax return, net of depreciation, of 5 percent.

At a 5 percent discount rate, the present value of the firm's deduction (referred to as f in following equations) is about $27,000,000 or 27 percent of the $100 million needed to expand the firm's plant.[17] Because the firm can recover 27 percent of the cost of raising the needed capital by taking advantage of its depreciation allowance, the return that savers must receive on their $100 million stock purchase is only 73 percent of 15 percent, which is about 11 percent. But the post-tax return they will require, and hence the cost to the firm of raising capital, will have to be high enough to cover the taxes involved.

Suppose that the corporate tax rate is 35 percent and the tax rate that applies to dividends is 15 percent. Following Rosen and Gayer, the cost of capital is calculated as:[18]

$$(8) \quad cc = \left[\frac{(1-f)(r+\delta)}{1-t_{div}}\right]\left[\frac{1}{1-t_{corp}}\right].$$

Substituting the assumed values of the variables,

$$(9) \quad cc = \left[\frac{(1-0.27)(0.05+0.1)}{1-0.15}\right]\left[\frac{1}{1-0.35}\right] = 19.81\%.$$

The profit the firm must make on the investment is $19.81 million (= 0.1981 x $100 million). The corporation pays 35 percent of this amount in taxes, which comes to $6.9 million, leaving the difference of $12.9 million to be distributed as dividends to taxpayers, who in turn pay $1.9 million (= 0.15 x $12.9 million) in dividend taxes. After-tax dividends come to $11 million. The total tax bill of $8.8 million comes to 44.75 percent of profit (before rounding).

Effective Marginal Tax Rate. An important matter for assessing corporate tax policy is the effective marginal tax rate (EMTR) faced by the corporation. The EMTR is the change in tax liability, across all entities, that results from a one-dollar change in taxable and nontaxable income. In this example, there is only one corporation and therefore one entity. In this example, the EMTR, by our definition, is 44.75 percent.

We can obtain our measure of the EMTR by applying this definition as follows: Because the corporation can reduce its tax liability by deducting 27 percent of its investment from its gross income to get its taxable income, its stockholders need to get a return of 1 percent (= 0.73 x 0.15) on their investment. This is the after-tax return, r_{at} . Letting the cost of capital equal the pretax return to capital:

$$(10) \quad \text{EMTR} = \frac{cc - r_{at}}{cc} = \frac{19.81\% - 10.95\%\%}{19.81\%} = 44.75\%$$

(before rounding).[19]

Another approach is to subtract depreciation before calculating the pretax return to capital and to consider only corporate taxes. If we apply this formulation, as specified by Mintz, to the current example, we get:

(11) $cc = \frac{(1-f)(r+\delta)}{1-t_{corp}} - \delta = \frac{(1-0.27)(0.05+0.10)}{1-0.35} - 0.10 = 6.85\%$,

and

(12) $\text{EMTR} = \frac{cc-r}{cc} = \frac{6.85\% - 5.00\%}{6.85\%} = 27.01\%$ [20].

There have many studies that estimate the EMTR for the United States. In a survey of 1994 corporate tax rates, economist Jack Mintz reported effective marginal tax rates for the G-7 countries. Jack Mintz and Duanjie Chen did a follow-up survey for 2013. The results are shown in Table I. Note that the United States had the second *lowest* effective marginal tax rate in 1994, but had the highest EMTR in 2013.[21]

Table I
G-7 Effective Marginal Tax Rates, 1994 and 2013

	EMTR (%)	
Country	1994	2013
Canada	23.8	18.6
France	28.3	35.2
Germany	31.2	24.4
Italy	38.9	24.5
Japan	35.0	29.3
United Kingdom	34.1	25.9
United States	25.4	35.3
Average G-7	30.9	27.6

We broadened Mintz's methodology to incorporate all taxes on capital at the both the firm and the individual level. Let

(13) $EMTR = \frac{r^g - r^n}{r^g}$, where

(14) r^g = the gross return to capital and

(15) r^n = the net return to capital.

Here r^g is the cost of capital minus depreciation. Then we can interpret r^g as the pretax return to capital for all businesses, defined to include both C corporations and non-C corporations, that is necessary for the after-tax return to providing capital to equal opportunity cost, after accounting for corporate and property taxes, tax deductions for depreciation, and any tax credits for domestic investment. Opportunity cost equals the pretax return on a riskless loan. The r^n term is the after-tax return to capital, in the form of the after-tax interest income, dividend income and capital gains, received for providing debt and equity capital to both C corporations and non-C Corporations.

The Appendix provides detailed definitions and equations. Table II provides our estimates of the EMTR, based on this approach, for 27 industrial sectors for a current-law and a tax-change scenario. The tax-change scenario assumes that the U.S. government reduces the corporate income tax from its current rate to 25 percent in the top seven tax brackets.[22] (The rate stays at 15 percent in the lowest of the eight brackets.)

The estimated *EMTRs* are higher than those reported by Mintz and higher than any we found in surveying the literature. The explanation lies in the fact that we incorporate almost all taxes on capital income.

In their review of the literature, de Mooij and Sjef find that the average reported elasticity of capital to the cost of capital lies between 0.5 and 1. Despite the evidence just shown, they find that the average value of the computed EMTRs is "quite small." They offer a range of estimates of the *semi-elasticity of investment* [23], defined as the percentage change in the capital stock that results from a 1-percentage-point change in the tax rate, and find that the semi-elasticity of investment for a change in the EMTR is anywhere from -0.55 to -1.1.[24]

As in the foregoing illustration, we can use ε, the elasticity of the capital stock with respect to the cost of capital, to calculate the percentage change in the capital stock that results from a 1 percent change in the cost of capital:

(16) $\frac{\Delta K}{K} = -\varepsilon \frac{\Delta cc}{cc}$.

If the EMTR changes by some amount, the resulting percentage change in the cost of capital can be calculated:

Table II
Effective Marginal Tax Rate on Capital, By Industry

SECTOR	CURRENT-LAW EMTR	TAX-CHANGE EMTR
Agriculture Forestry and Fishing	49.88%	44.53%
Mining	45.43%	40.08%
Construction	50.11%	44.19%
Food and Tobacco Products	45.89%	40.35%
Textiles and Apparel	45.31%	39.83%
Building Materials	46.85%	41.18%
Paper and Publishing	51.31%	45.73%
Chemicals Petroleum Rubber Plastics	48.53%	42.83%
Business Machinery and Instruments	47.17%	41.23%
Electronics and Electronic Equipment	54.48%	48.08%
Motor Vehicles and Other Transportation	54.13%	48.11%
Primary and Fabricated Metal	44.82%	39.46%
Industrial Machinery and Equipment	47.15%	41.41%
Other Manufacturing	49.17%	43.19%
Transportation	44.57%	39.35%
Communications	47.70%	41.89%
Electricity Gas Sanitary	42.25%	37.50%
Wholesale Trade	46.97%	40.97%
Retail Trade	43.80%	38.48%
Banking	56.06%	50.74%
Insurance	56.60%	50.91%
Real Estate	37.39%	32.76%
Personal and Repair Services	54.50%	48.29%
Business Services	49.36%	43.45%
Health Services	45.83%	40.56%
Hotels Amusements Motion Pictures	42.85%	37.57%
Eating Drinking Miscellaneous Services	43.36%	38.37%
AVERAGE	48.03%	42.36%

$$(17)\ \frac{\Delta cc}{cc} = \frac{\Delta EMTR}{1 - EMTR}.$$

If the EMTR = 0.1, and if the EMTR then changes by one percentage point, then:

$$(18)\ \frac{\Delta cc}{cc} = \frac{1}{1 - 0.1} = 1.11.$$

If the elasticity of the capital stock with respect to the cost of capital is 0.5, then substituting into equation (11) we get:

$$(19)\ \frac{\Delta K}{K} = -0.5 \times 1.11 = -0.55.$$

A 1 percentage point rise in the EMTR causes the capital stock to fall by 0.55 percent.

We would get a larger effect if we applied the 2013 EMTR for the United States as reported in Table I above:

$$(20)\ \frac{\Delta cc}{cc} = \frac{1}{1 - 0.353} = 1.55,$$

and

$$(21)\ \frac{\Delta K}{K} = -0.5 \times 1.55 = -0.78.$$

We have presented a number of illustrations of how changes in corporate tax policy affect capital formation. The importance of corporate taxes derives from how they affect the cost of capital and how changes in the cost of capital affect the demand for capital and therefore investment.

The size of the effects depends on the parameters σ, ε and ε^{INV}. And the foregoing review of the empirical literature shows that there are varying estimates of these parameters. Yet, there can be little doubt that, by increasing the cost of capital, the corporate tax reduces the demand for investment and therefore the overall level of economic activity.

Effects of the Corporate Tax

Three topics remain to be considered: (1) the sensitivity of saving to changes in the after-tax return to saving, as brought about by changes in corporate tax policy, (2) who bears the burden of corporate

taxes, and (3) how corporate taxes affect the economy. The preceding exposition assumes, in effect, that there is a fixed pool of saving, so that all that matters is how savers allocate their saving between corporate stocks and other assets. Other assets are perfectly substitutable for stocks sold by U.S. corporations. The sole consequence of a rise in the corporate tax rate is to raise the cost of capital. The after-tax return to saving remains unchanged, because savers will simply switch from stocks to other assets should that return decrease.

These assumptions make sense insofar as savers (including stockholders) live in an integrated world economy, where capital markets work seamlessly to allocate capital to whatever use promises the highest return. Suppose that, as appears to be the case, the United States operates in a way that is particularly punishing to corporate investment. In such a world, savers in the United States will just move their capital abroad in response to higher U.S. taxes on corporate capital. Those one-percenters don't care if they have to move their money out of some firm in Kansas to another in Luxembourg in order to maintain the after-tax rate of return on their saving. The only people who care are workers in Kansas. If this is correct, politicians who attempt to prove their commitment to populist values by punishing corporations are just taking advantage of the corporate veil that we have been shredding over the last few pages.

However, things are not quite so simple, and consideration must be given to the argument that corporate taxes are shifted to stockholders. Arnold Harberger took this view in his seminal 1962 article on corporate taxes. "Even allowing for a rather substantial effect of corporate taxes on the rate of saving," he said, "leads to only a minor modification of my over-all conclusion that capital [which is to say, the stockholder] probably bears close to the full burden of the tax."[25]

Let us therefore see how taxes on capital, including taxes on corporate capital, can impose a burden on savers, including stockholders.

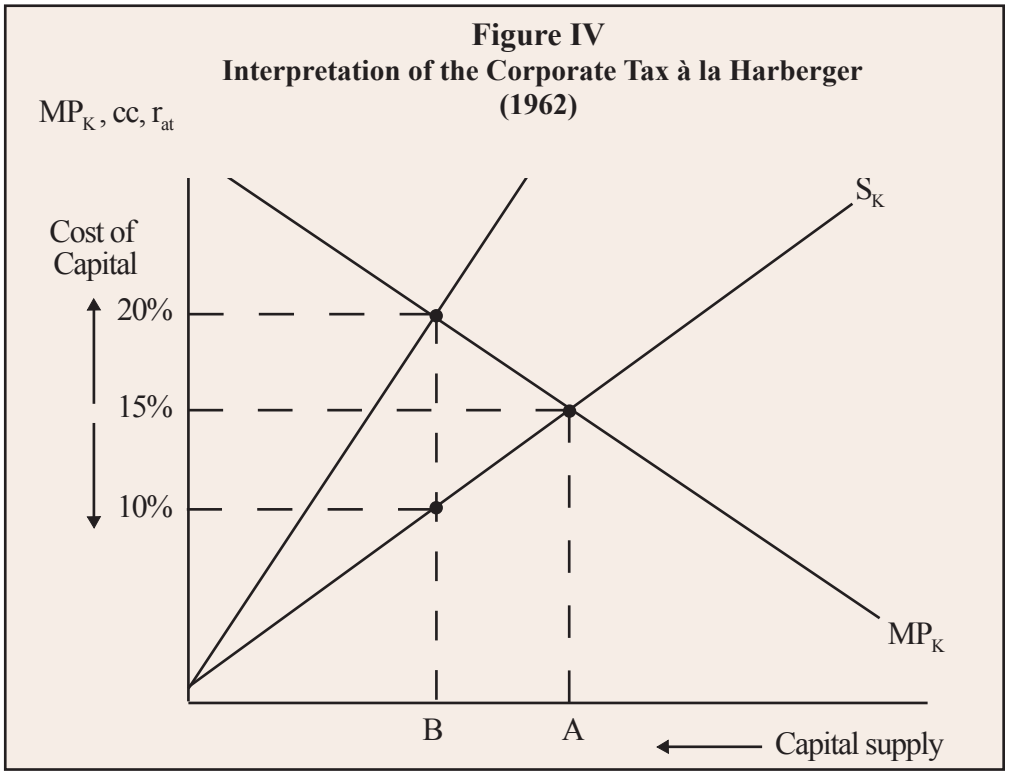
Why People Save. So where does saving come from? People work and save in order to enjoy consumption. People work because they value the reward in the form of enhanced current consumption more than the leisure they sacrifice by working. They save because they place a higher value on the additional future consumption made possible by saving than they value the current consumption forgone.

People do not save in order to provide businesses with financial capital (or to make it possible for government to engage in deficit spending). They save because they expect a reward in the form of increased future consumption in exchange for giving up current consumption.

Suppose that a person expects prices to remain constant and is willing to put $100 into saving in exchange for a reward of $105 a year from now. In other words, he would want to receive interest at the rate of 5 percent. But suppose he expects prices to rise 3 percent over the next year. Then he would want to receive interest at the rate of 8 percent.

Even absent inflationary expectations, no one would be willing to put $100 into saving now in return for a reward of $100 a year from now. There would be no point in forgoing consumption now for the simple privilege of

Figure IV
Interpretation of the Corporate Tax à la Harberger (1962)



engaging in exactly the same amount of consumption later.

Patience and its opposite — impatience — is a personal matter, but we can suppose that few people are willing to save for less than a 3 percent reward for overcoming their impatience (which is to say, they would expect a reward of $103 a year from now).[26] The technical term for this expected reward is rate of time preference. People have some *rate of time preference* that is greater than zero.

Suppose Joe will make $50,000 in wages this year and next and, for the moment, plans to allocate all of his wages to consumption. Now he discovers that he can get a return on investment of 5 percent on money he puts into saving this year. He also figures that he would have to get a return of a least 3 percent to put a dollar into saving. That is, his rate of time preference equals 3 percent. The amount he will actually put into saving depends on another personal calculation, which in economics goes by the name of *intertemporal elasticity of substitution* (IES), which measures the responsiveness of the growth of current consumption to the real interest rate.

Suppose the IES — denoted by θ [theta] — equals 1.5, which is to say, $\theta = 0.67$. If Joe wants his consumption next year to exceed his consumption this year by 3 percent, he will put $721 into saving this year. If a tax on capital income reduces the return on investment (r) to 3 percent, he will reduce his saving to zero.[27]

Now consider the aggregate economy, and assume that U.S. capital markets are walled off from the rest of the world and that all saving takes the form of stock purchases.

Once again, the government imposes a tax on corporate capital — a tax of the kind we have been considering. This will put pressure on r to fall (and with it, $r + \delta$ [delta] in our examples). The lower the IES for the United States as a whole, the more the return on investment (r) is likely to fall without much reduction in saving, burdening stockholders in the process. Contrarily, of course, a low IES augurs badly for any hope that a cut in corporate taxes would increase saving.

There are various estimates of the size of the IES. At one extreme, the measured value is zero,[28] and at the opposite extreme it is 2.[29] By most accounts the IES is small.[30] This means that savers in our hypothetical one-country economy do not reduce their saving much at all in response to the imposition of a corporate tax. The burden of the tax falls largely on them. Given these assumptions, Harberger would be right in his 1962 prediction. There would in fact *not* be "a rather substantial effect of corporate taxes on the rate of saving," and capital would bear "close to the full burden of the tax."

Who Pays the Corporate Tax? In a closed economy of the kind considered by Harberger in 1962, the supply of capital shrinks — not just because the cost of capital rises but also because the return to saving falls. How much it shrinks and how the burden is distributed between labor and capital depends on the elasticity of the supply of capital with respect to the return to capital (which is to say the percentage change in the supply of capital that results from a 1 percent fall in the return to capital). The more elastic it is, the more the burden falls on labor. The less elastic, the more it falls on savers.

Compare Figure IV to Figure II. In Figure II the supply of capital curve is horizontal, indicating the elasticity of supply is infinitely high and savers would merely reallocate their saving from corporate stocks to other assets in response to the tax on corporate profits and dividends. In Figure IV, the supply of capital is upward sloping, indicating the elasticity of supply is much lower and savers are compelled to absorb part of the *tax wedge* (the difference between the before-tax wage and after-tax wage), owing to limitations on the availability of other saving instruments. Figure IV shows that a 50 percent EMTR causes the cost of capital, *cc*, to rise from 15 percent to 20 percent and causes the after-tax return to saving, r_{at}, to fall from 15 percent to 10 percent. Savers would bear half the burden of the tax and workers, owing to the shrinkage in the capital stock, the other half.

Harberger subsequently reversed his original view. In a 1980 article, in which he summarized his work on less developed countries, he draws "the lesson … that the return to capital is brought into rough equalization through the international capital markets."[31] He later explored a scenario in which the United States adopts a 50 percent corporate tax and under which 3/5 of the world's capital stock is held in the United States and the rest in foreign countries. In that scenario, "one-eighth of the tax wedge is absorbed by the worldwide fall in rates of return...The rest of the wedge is fully reflected by a fall in the wage rate in the United States."[32]

There is varying empirical support for this scenario:

- In a 2009 study, three co-authors affiliated with the Oxford University Centre for Business Taxation analyzed data for 55,000 companies in nine European countries and found that about 59 percent of the burden of corporate taxes is on wages.[32]

- R. Alison Felix of the Federal Reserve Bank of Kansas City found that "a one-percentage point increase in the average corporate tax rate decreases annual gross wages by 0.9 percent."[33]

- In an earlier study of state corporate income taxes, Felix and co-author James R. Hines found that an increase in the state corporate tax rate narrows the wage premium that union workers enjoy over nonunion workers: "A one percent higher state tax rate … is associated with roughly a 0.36 percent reduction in union wage premiums."[34]

In his 1980 article, Harberger also noted that he and Martin Feldstein had "become linked with a particular (and probably polar) interpretation" of the incidence question.[35] The source of this dispute is a 1980 article coauthored by Feldstein and Charles Horioka. There the authors recognized that, under the assumption of a closed economy, taxes on capital will be borne by the owners of capital. That conclusion "would be radically altered by replacing this assumption with a model of perfect capital mobility." Insofar as "capital is free to leave the country, a very large part of the burden would be shifted to domestic labor and to foreign capital owners."[36]

According to Feldstein and Horioka, however, capital is not so free, and the reason is that various factors prevent arbitrageurs from equalizing after-tax returns from capital by simply moving capital from locations that offer low returns to those that offer high returns. "For most investors, the uncertainties and risks associated with foreign investment are perceived as so great that investment is restricted to the domestic economy."[37]

From their examination of the data, they conclude that "the evidence of a close relationship between investment and saving is important in a number of ways." Among these are the conclusion that "it is appropriate, at least as an approximation, to study income distribution in general and tax incidence in particular with models that ignore international capital mobility."[38] Thus was born a still-simmering debate over the incidence of corporate taxes.[39]

We believe that most of the burden of the U.S. corporate tax is on labor. Yet, we readily concede that the jury remains out on this matter.

How Harmful Are Corporate Taxes? The jury is in, however, on the matter of whether corporate taxes exert negative effects on investment. We did not come across a single academic article that denies that cutting the corporate tax rate would increase investment and output. The most skeptical assessment we found comes from Jane Gravelle:

"The estimated effect of cutting the corporate rate by 10 percentage points (about 0.7 percent of output) is minimal, increasing output by 15/100 of a percentage point. Moreover virtually all of that gain in the aggregate is paid to foreigners as returns on their investments… Finally, note that if the rate reduction were enacted alone, any gains in output would be more than offset by the crowding out of investment due to an increased deficit."[40]

We find a recent article by Arnold Zellner and Jacques Kibambe Ngoie to be more compelling. Observing that "U.S. corporate income tax rates and dividend tax rates are among the highest in the OECD group and in the world," they make a strong case for reductions in both. "It is striking," they say, "to note how many firms from developed economies have relocated to low tax countries since the beginning of globalization. Many countries that have instituted tax reforms have experienced substantial growth."[41]

Zellner and Ngoie develop what they call a "Marshallian Macroeconomic Model" or MMA (after the economist Alfred Marshall, who laid out the foundations for modern price theory during the early part of the last century) to determine how alternative tax-rate cuts could stimulate the U.S. economy. Their approach, in fact, combines the economics of Marshall with that of John Maynard Keynes, both of whom taught economics at Cambridge University in England.[42]

As the authors explain it in a separate paper, the MMA approach consists of disaggregating the economy into a number of sectors. As they put it:

"We, along with Alfred Marshall and others, have introduced a product market involving demand and

supply equations derived from assumed optimizing behavior of firms and consumers. On aggregating over firms, we obtain the industry supply equation, which depends on the number of firms in operation…To determine the number of firms in operation, we introduce a firm-entry-sector, such that when positive profits exist in the industrial sector, firms enter to compete away profits and to help the sector return to a new equilibrium."[43]

Onto this framework, "which can be found in many price theory texts," they impose a Keynesian equation for the purpose of showing how tax cuts stimulate the economy by diverting money from the public sector to the more-efficient private sector.

In a Keynesian model, there is a stable relationship between consumption and disposable income, such that a one dollar increase in disposable income causes consumption to rise by some fraction, *c*. This fraction is known as the *marginal propensity to consume*. Disposable income, Y_D is what is left over from income, *Y*, after people pay federal and state taxes at rates, denoted, respectively, by t_F and t_S :

(22) $Y_D = Y(1 - t_F - t_S)$.

Consumption equals some constant $\overline{C}$ plus *c* times disposable income:

(23) $C = \overline{C} + cY(1 - t_F - t_S)$.

Substituting into equation (24), we get:

(24) $Y = \frac{1}{1 - c(1 - t_F - t_S)}\left[\overline{C} + \overline{I} + \overline{G} + \overline{NX}\right]$.

where the values of $\overline{C}$, $\overline{I}$, $\overline{G}$ and $\overline{NX}$ are exogenous (determined outside the model) and the values of *Y* and *C* are endogenous (determined by the model).

The expression $\frac{1}{1 - c(1 - t_F - t_S)}$ is the Keynesian multiplier derived by the authors. It tells us the amount by which *Y* will expand for any reduction in t_F and/or t_S.

Working from this assumption, the authors conclude that "permanent cuts of 5 percentage points in the personal and corporate tax rates will induce an increase of 3 percentage points in the annual U.S. GDP growth rate." Moreover, they find that "the government sector, like other sectors, will grow in absolute size but decrease in relative size as a result of proposed tax reforms."[44] These are startling results.

Other writers have provided estimates of the beneficial effects of corporate tax reduction. In an article entitled, "How Lower Corporate Tax Rates Would Spur Economic Growth and Reduce Unemployment," Ilhan Meric, Ira B. Sprotzer and Gusler Meric find that by reducing the top corporate rate from 35 percent to 25 percent, "we can offset the adverse effects of the recent increases in dividend and capital gains rates, and it may increase stock prices by as much as 8.6 percent, encourage new corporate investments, increase economic growth, and lower the unemployment rate significantly."[45]

Conclusion

We believe that a balanced review of the literature on this issue, such as we have tried to present here, leads to specific conclusions:

- First, the corporate tax allows politicians to pose as champions of the poor and the middle class when, in fact, in the globalized economy of today, the corporate tax burdens labor, probably more than it burdens capital. The corporate tax is just a veil behind which politicians seek to hide the consequences of their actions regarding tax policy;
- Second, it distorts the allocation of resources in a particularly harmful way, by raising the cost of capital, diminishing investment and thus reducing output and living standards;
- Third, it causes managers to invest time and energy in tax avoidance — time and energy that would be better spent running their businesses;
- Fourth, for all the harm it does, it is a particularly poor source of revenue. The United States could easily get along without the revenue it raises by raising taxes elsewhere (and with less harm) or, better still, by cutting government expenditures.

It is easy, however, to call for repeal. What is difficult is figuring out what new tax would take the place of the corporate tax if it were repealed. Or what government spending would be eliminated if revenue losses occur.[46] A detailed discussion of either issue is beyond the scope of this study.

Appendix
Equations for Calculating the Effective Marginal Tax Rate

EMTR	effective marginal tax rate on capital income
r^g	gross return to capital
r^n	net return to capital
r^{bt}	return to capital before personal taxes but after corporate taxes
δ	economic depreciation rate
u	average marginal tax rate on C-Corps
t_{pk}	property tax rate as a proportion of the value of property
t_{pp}	property tax expressed as a fraction of
φ	average tax credits
A	present value of tax depreciation on an asset as a fraction of its cost
β	share of financing done by issuing debt
(1- β)	share of financing done by issuing ownership claims
γ	share of debt financing going to C-corps
(1 - γ)	share of debt financing going to non-C-corps
i	before-tax interest rate
ρ	pretax return on equity investment in C-corps before personal taxes
λ	pretax return on equity investment in non-C-corps before personal taxes
θ	personal tax rate on equity investment for all entities
ε	fraction of equity financing that goes to C-corps
(1- ε)	fraction of equity financing that goes to non- C-corps
b	fraction of the return non-C-Corp income received as capital gains
(1-b)	fraction of the return on non-C-Corp income received as profit
w	tax rate on non-C-Corp income
m	tax rate on interest income
u_f	federal marginal tax rate on C-Corp income
u_{si}	state and local marginal tax rate on C-Corp income

$$\rho = \lambda$$

$$r^g = \left(\frac{\delta + r^{bt}}{1 - u - tpp(1-u)} \right) \left(1 - \phi - uA\right) - \delta$$

$$r^{bt} = \beta i \left[\gamma(1-u) + (1-\gamma) \right] + (1-\beta) \left[\varepsilon \left(\rho \right) + (1-\varepsilon)\lambda \right]$$

$$r^n = \beta i \left(1-m\right) + (1-\beta)\left(\varepsilon\rho(1-\theta) + (1-\varepsilon)\lambda(1-\eta) \right)$$

$$u = u_f + u_{sl}\left(1-u_f\right)$$

$$\eta = b\theta + (1-b)w$$

$$t_{pp} = t_{pk} \,/\, r_{bt}$$

$$EMTR = \frac{r^g - r^n}{r^g}$$

Notes

1. Adapted from David G. Tuerck and James P. Angelini, "The U.S. Corporate Income Tax: A Primer for Policymakers," Beacon Hill Institute/National Center for Policy Analysis, July 2015. Available at http://www.ncpa.org/pdfs/sp_The%20U.S.%20Corporate%20Income%20Tax.pdf.
2. Amanda Athanasiou, "Is the Anti-Inversion Notice Doing Its Job?" *Tax Notes Today*, March 3, 2015.
3. "Federal Tax System Seen in Need of Overhaul," Pew Research Center, March 19, 2015.
4. Legend has it that economist Arthur Laffer drew this curve on a cocktail napkin while dining with Congressman Jack Kemp, thus setting the stage for the supply-side revolution and the Reagan-era tax cuts.
5. Kimberly A. Clausing, "Corporate Tax Revenues in OECD Countries," *International Tax and Public Finance*, Vol. 14, No. 2, 2007, pages 115-133.
6. Mathias Trabandt and Harald Uhlig, "The Laffer Curve Revisited," *Journal of Monetary Economics*, Vol. 85, No. 4, May 2011, pages 305-327.
7. Charles Cobb and Paul Douglas, "A Theory of Production," *American Economic Review*, 1928, pages 139-165.
8. Douglas Gollin, "Getting Income Share Right," *Journal of Political Economy*, Vol. 110, No. 2, April 2002, pages 458-474.
9. Ibid.
10. R.A.d. Mooij and Sjef Ederveen, "Corporate Tax Elasticities: A Reader's Guide to Empirical Findings," *Oxford Review of Economic Policy*, Vol. 24, No. 4, Winter 2008, pages 680-697.
11. Robert S. Chirinko, "Corporate Taxation, Capital Formation and Substitution between Labor and Elasticity between Labor and Capital," *National Tax Journal*, 2002, pages 339-355.
12. Robert S. Chirinko, "σ : The Long and Short of It," *Journal of Macroeconomics*, Vol. 30, No. 2, 2008, pages 671-686. He also observed that "there is little evidence to sustain the assumption of a Cobb-Douglas function." Fortunately, for current purposes, we use that function mainly because of its simplicity. Whether the world is Cobb-Douglas or not does not affect the force of the arguments made here.
13. Here the cost of capital, and therefore MP_K, rise by 29% (= $\ln(.20) - \ln(.15)$). Multiplying by 1.25, we can figure that the capital stock falls by 37% (before rounding). If the capital stock is $1.45 million before the tax is imposed, it falls to $1 million (= exp(ln($1.45 million)) – 0.37) after the cost of capital rises.
14. This does not seem apparent inasmuch as the capital stock shrinks. But in these examples, "capitalists," that is, savers who provide financial capital to corporations, are unaffected. They just allocate their saving to untaxed or less-highly-taxed uses such as buying bonds or foreign stocks or putting their money in bank saving accounts. We discuss this further below.
15. Dale W. Jorgensen, "Capital Theory and Investment Behavior," *American Economic Review*, Vol. 53, 1963, pages 247-259; and Robert E. Hall and Dale W. Jorgensen, "Tax Policy and Investment Behavior," *American Economic Review*, Vol. 57, 1967, pages 391-414.
16. H.R. Rosen and T. Gayer, *Public Finance* (New York, N.Y.: McGraw Hill, 2008).
17. $\$100,000,000 * .1 * .35\left[\frac{1}{1.05^1} + \frac{1}{1.05^2} + ... + \frac{1}{1.05^{10}}\right] = \$27,026,072.$
18. Ibid.
19. There are other ways to calculate the cost of capital and the EMTR. See D. Chua, "The Concept of the Cost of Capital: Marginal Effective Tax Rate on Investment," in P. Shome, ed., *Tax Policy Handbook* (Washington, D.C.: International Monetary Fund, 1995), pages 161-165; and J.G. Gravelle, *The Economic Effects of Taxing Capital Income* (Cambridge, Mass.: MIT Press, 1994).
20. Jack Mintz, "The Corporation Tax: A Survey," *Fiscal Studies*, Vol. 16, No. 4, November 1995, pages 23-68.
21. Jack Mintz and Duanjie Chen, "The U.S. Corporate Effective Tax Rate: Myth and the Fact," 2014. Available at http://taxfoundation.org/article/us-corporate-effective-tax-rate-myth-and-fact.
22. We provide our estimates of the variables in Keshab Bhattarai, Jonathan Haughton, Michael Head and David G. Tuerck, "Simulating Corporate Income Tax Reform Proposals With a DCGE Model," National Center for Policy Analysis, Special Publication, September 2015. Available http://www.ncpa.org/pub/simulating-corporate-income-tax-reform-proposals-with-a-dcge-model#sthash.dt9ZTDCz.dpuf.
23. Semi-elasticity is the percentage change in Y with respect to the change (non-percentage) in X.
24. R.A.d. Mooij and Sjef Ederveen, "Corporate Tax Elasticities: A Reader's Guide to Empirical Findings."
25. Arnold C. Harberger, "The Incidence of the Corporation Income Tax," *Journal of Political Economy,* 1962, page 236.
26. It is true that people currently put money into saving even though their nominal reward is barely 1 percent. One motive is that people want to have money available to them as a precaution against future setbacks and expenses.
27. Let C be consumption this year and C_+ be consumption next year, and assume that all of next year's income goes to consumption. Then, $r = .05$, and $C_+ = \$50,000 + (\$50,000 - C)1.05$. But $C_+ = C(1.03)$. Substituting and solving, we get $C = \$49,279$. Saving equals $50,000 - $49,279 = $721. If $r = 3\%$, $\%\Delta c = 0$ and there will be no saving.

28. Robert E. Hall, "Intertemporal Substitution Effects," *Journal of Political Economy*, 1988, Vol. 96, No. 2, pages 339-357.
29. Jonathan Gruber, "A Tax-Based Estimate of the Elasticity of Intertemporal Subsitution," *Quarterly Journal of Finance*, 2013, Vol. 3, No. 1, pages 1-20.
30. David Romer, *Advanced Macroeconomics, 4th ed*. (McGraw-Hill, 2012).
31. Arnold Harberger, "Vignettes on the World Capital Market," *American Economic Review*, 1980, Vol. 7, No. 2, pages 330-337.
32. Arnold Harberger, "The ABCs of Corporation Income Taxation," *Tax Policy and Economic Growth* (Washington, D.C.: American Council for Capital Formation, 1995), pages 51-73.
33. R. Alison Fenix, "Passing the Burden: Corporate Tax Incidence in Open Economies," Kansas City Federal Reserve Bank, 2007. Available at https://www.kansascityfed.org/Publicat/RegionalRWP/RRWP07-01.pdf.
34. R. Alison Fenix and James R. Hines, Jr. "Corporate Taxes and Union Wages in the United States," National Bureau of Economic Research, Working Paper No. 15623, August 2009.
35. Arnold Harberger, "Vignettes on the World Capital Market," *American Economic Review*, 1980, Volume 70, No. 2, pages 331-37.
36. Martin Feldstein & Charles Horioka, "Domestic Saving and International Capital Flows," *Economic Journal*, Vol. 90, No. 358, June 1980, pages 314-329.
37. Ibid.
38. Ibid.
39. Jennifer C. Gravelle, "Corporate Tax Incidence: Review of General Equilibrium Estimates and Analysis," Congressional Budget Office, Working Paper 2010-03, May 2010. Available at https://www.law.upenn.edu/live/files/367-gravellepdf. According to her analysis, "an assumption that 40 percent of the corporate tax burden falls on labor and 60 percent falls on capital is consistent with open-economy models and with the current empirical evidence regarding the appropriate parameter values for those models."
40. Jane G. Gravelle, "Raising Revenue from Reforming the Corporate Tax Base,"in J. W. Diamond & G. R. Zodrow (Eds.), *Pathways to Fiscal Reform in the United States* (Cambridge, Mass.: MIT Press, 2014), pages 290-334.
41. Arnold Zellner and Jacques K. Ngoie, "Evaluation of the Effects of Reduced Personal and Corporate Tax Rates on Growth Rates of the U.S. Economy," *Econometric Reviews*, Vol. 34, No. 1-2, 2015, pages 56-81.
42. John M. Keynes, *The General Theory of Interest, Employment, and Money* (London: Macmillan, 1936); and Alfred Marshall and C.W. Guillebaud, *Principles of Economics*, 9th (variorum) ed., with annotations by C. W. Guillebaud, ed. (London, New York: Macmillan for the Royal Economic Society, 1961).
43. Jacques K. Ngoie and Arnold Zellner, "The Use of a Marshallian Macroeconomic Model for Policy Evaluation: Case of South Africa," *Macroeconomic Dynamics*, Vol. 16, No. 3, 2012, pages 423-448.
44. Arnold Zellner and Jacques K. Ngoie, "Evaluation of the Effects of Reduced Personal and Corporate Tax Rates on Growth Rates of the U.S. Economy."
45. Illhan Meric, Ira B. Sprotzer and G. Meric, "How Lower Corporate Tax Rates Would Spur Economic Growth and Reduce Unemployment," *Journal of Taxation and Investments*, Vol. 31, No.1, 2013, pages 45-52.

46. This will depend on whether the economy is to the left or right of point A in Figure I.