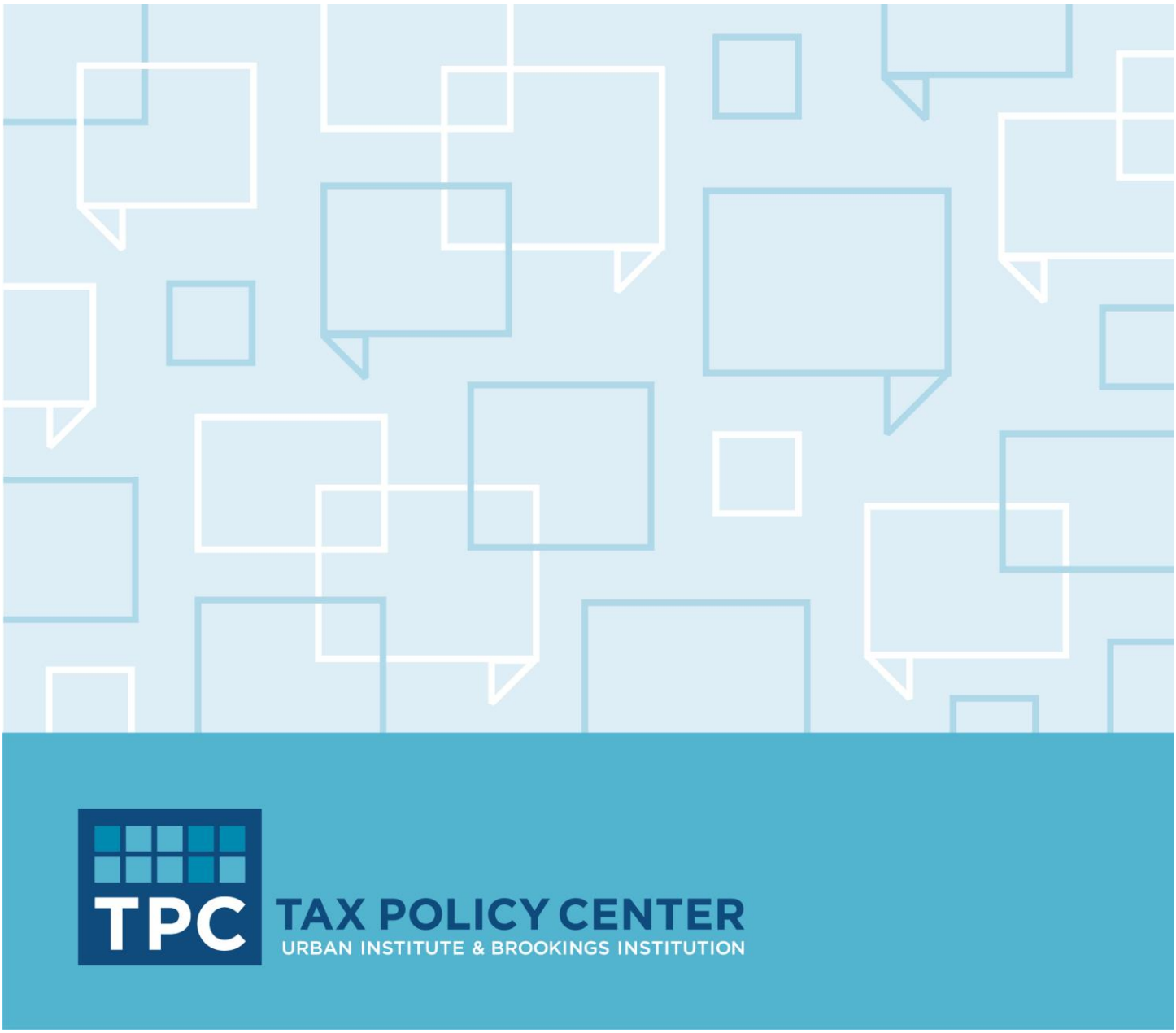

TAX POLICY AND INVESTMENT BY STARTUPS AND INNOVATIVE FIRMS

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ABSTRACT

We examine how tax policies alter investment incentives, with a particular focus on startup and innovative businesses. Consistent with prior work, we find that existing policies impose widely varying effective tax rates on investments in different industries and activities, favor debt over equity, and favor pass-through entities over corporations. Targeted tax incentives lower the cost of capital for small businesses, startups, and those that invest in intellectual property. Those advantages are weakened, and in some cases reversed, however, by two factors. First, businesses that invest heavily in new ideas rely more on higher-taxed equity than do firms that focus on tangible investment. Second, startups that initially make losses face limits on their ability to realize the full value of tax deductions and credits. These limits can more than offset the advantage provided by tax incentives. We also examine the effects of potential tax reforms that would reduce the corporate income tax rate and achieve more equal tax treatment across the various forms of business investment.

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INTRODUCTION

New investment, whether in software, factories, or innovative ideas, is a key driver of productivity growth and rising living standards. America's future prosperity depends, in significant measure, on the amount and type of investments that existing businesses and new entrepreneurs make today and in coming years.

Taxes are one factor influencing their investment decisions. High taxes can discourage some investments, while tax incentives can encourage others. Wide differences in effective tax rates, moreover, alter the composition of investment, boosting it in some areas while reducing it in others. Some differences in tax treatment across forms of investment might be warranted on policy grounds (for example, encouraging investments that produce extra societal benefits), but differential tax incentives usually inefficiently distort investment decisions and reduce total economic output. Policymakers should therefore give careful attention to those incentives and disincentives and their effects on investment and innovation.

Such attention is particularly important given recent interest in tax reform. Policymakers from across the political spectrum have recently proposed major rewrites of business and corporate taxation. Last year, for example, then-House Ways and Means Chairman Dave Camp offered a far-reaching plan that attempts to address many of the problems and tradeoffs in our current system of business taxation. The Senate Finance Committee and the Obama Administration have also offered business tax proposals, suggesting there might be bipartisan interest in pursuing reform. At the same time, the influence of tax considerations on a wave of expatriation transactions (so-called inversions) by U.S. multinational corporations has further focused attention on the way we tax businesses.

Given that context, it is a propitious time to examine how the current U.S. tax system affects incentives to invest and how those might change under various tax reforms. Of particular interest is how the tax system affects the most innovative parts of our economy, including entrepreneurial ventures and firms large and small that invest in new ideas.

To that end, this paper proceeds in five steps. In section 1, we survey the most important tax policies that affect financial incentives to invest and innovate. These policies occur in both the corporate and individual portions of the tax code, affecting businesses and potential investors.

In section 2, we lay out the conceptual framework for our analysis, documenting how tax provisions affect the cost of capital facing businesses. Our framework focuses on a workhorse quantitative model that measures the marginal effective tax rate (METR) on capital investment. This approach provides a convenient, single measure of how all features of the tax code combine to affect potential returns; the higher the METR, the higher the cost of capital. Building on prior

studies, we examine how METRs depend on key tax parameters, asset mix, financing structures, and organizational form.

In section 3, we apply that framework to today's federal tax code. Like prior studies, we find that debt-financed investments enjoy a significant advantage over equity-financed ones, and that pass-through entities face lower effective tax rates than C corporations. We also find that investments in intellectual property, especially research and development, face significantly lower effective taxes than do tangible investments in equipment, structures, and inventory. Favorable depreciation rules reduce effective tax rates for startups and other small businesses that invest in equipment. Favorable capital gains treatment for investors can also help startups, but the effect is small compared to other tax provisions. Tax benefits for innovative businesses are partly offset, however, by their greater reliance on higher-taxed equity.

In section 4, we examine an important tax disadvantage facing many startups: limits on their ability to receive the full benefit of tax deductions and credits. If a company is making losses during its initial years of operation, it may not receive any immediate benefit from write-offs or credits resulting from new investment; instead, those benefits are in many circumstances delayed until the company becomes profitable. That delay, along with rules that reduce the value of accrued tax losses if a company is acquired, increases the effective tax rate on startup investment. We extend our framework to account for these limitations, and find that they have a substantial effect. In some cases, the reduction in benefits from these loss limitations more than offsets the benefit provided by tax incentives aimed at small and new businesses.

In section 5, we simulate stylized tax reforms that would reduce the corporate income tax rate and achieve more equal treatment across forms of business investment (e.g., slowing depreciation allowances, reducing interest deductibility, and eliminating favorable treatment of R&D). These proposals would reduce the variation in tax rates across industries and assets, but would generally increase overall average effective tax rates on new investment, as the loss of tax incentives more than offsets the gain from lower corporate tax rates. Such proposals would also hit partnerships, LLCs, and other pass-through entities harder than corporations, since they would not gain from the lower corporate tax rate. Finally, incentives to innovate would change depending on policy choices about the research and experimentation (R&E) tax credit and limits on the ability to utilize current tax losses.

In the concluding section, we discuss the implications of these findings for policy debates about taxes, investment, and innovation.

Our goal is to illuminate how tax policies affect investment incentives for startup and innovative businesses. Some policies are aimed specifically at those new firms and activities. The R&E tax credit, for example, is intended to foster innovative investment, and the capital gains tax exemption for long-term investments in startups is intended to encourage equity investment in new ventures. Many important policies affect a wider group of economic activities, but can appreciably raise or lower the return to startup and innovative investment. These include statutory rates on corporate and personal income, depreciation and other cost recovery rules, differing treatment of organizational forms, and limits on firms' ability to realize tax savings from losses.

These general policies can affect startups and innovative businesses more than others, even if they are not specifically targeted that way. Favorable depreciation rules for small businesses, for example, help startups, but are by no means limited to those firms, while some rapidly-expanding startups may outgrow them. Favorable tax treatment for pass-through entities generally benefits smaller firms, including startups, more than larger ones. However, some large businesses are structured as pass-throughs, and some small ones are C corporations. Limits on using losses apply to all firms, but can hit startups harder than mature firms that can offset losses against previous profits. And preferences in the form of deductions or non-refundable credits may fail to help startups as much as established firms that have current income against which to claim the deductions or current tax liability the credits can offset. The net effect of tax policies on any particular firm will thus depend on its specific circumstances.

Here we discuss the most important tax policies affecting investment, distinguishing those that apply to business income and those that apply to returns to the savers who finance them.[1]

BUSINESS TAX PROVISIONS

Corporate Income Tax Rate

The federal government levies a 35 percent top rate on corporate income.[2] That rate applies once a company has at least $10 million in annual profits. Less profitable companies, which are

[1] This section draws heavily on Gale and Brown (2013) and Marron (2014). Other benefits that may apply to innovative businesses, particularly small ones, but not discussed here include the option to use cash accounting (Marron 2014), exemption from the corporate Alternative Minimum Tax, amortization of business start-up costs, a tax credit to help small businesses enroll employees in retirement plans, a tax credit for employers to make business more accessible to disabled workers, and some additional capital gains relief (Gale and Brown 2013).

[2] Here and throughout the analysis we focus on federal tax policies. State and local tax policies can also matter for investment decisions—e.g., they increase the statutory corporate tax rate to an average of 39.1 percent (OECD, 2014)—but are beyond the scope of this analysis.

sometimes smaller, closely-held firms, benefit from lower, graduated rates: 15 percent on the first $50,000 of taxable income, 25 percent on the next $25,000, and 34 percent up to $10 million. A 5 percent additional tax between $100,000 and $335,000 recaptures the benefits of the 15 and 25 percent brackets. A 3 percent additional tax between $15 million and $18.3 million recaptures the benefits of the 34 percent bracket. Corporate profits are taxed a second time at the individual level either when distributed as dividends or when investors realize capital gains attributable to reinvested earnings of corporations.

Pass-through Entities

Many businesses structure themselves as S corporations, partnerships, limited liability companies (LLCs), and sole proprietorships that do not pay the corporate income tax. Instead, their profits are reported and taxed on the returns of their owners. The earnings from pass-through entities are thus taxed at ordinary individual income tax rates, currently as high as 39.6 percent (passive owners may also be subject to the 3.8 percent net investment income tax created to help finance health reform). Pass-through earnings thus escape the double taxation that otherwise can apply to the income of C corporations.

Interest Deductibility

The corporate income tax and the individual income tax on pass-throughs generally allow firms to deduct the cost of any interest expenses. That makes sense given their goal of taxing net income. If a business borrows to finance an investment, it is reasonable to deduct any resulting interest payments in calculating its taxable profits. As discussed below, however, when combined with other features of the tax code, this provision can distort financing decisions and result in under-taxation of investment returns. First, it may encourage corporations to rely more on debt and less on equity financing. And, when combined with preferential treatment of investment returns, it may result in low or even negative effective tax rates for projects that are highly-leveraged. For that reason, some reform proposals have considered limiting interest deductibility.

Capital Cost Recovery

The tax code generally requires businesses to capitalize investments in tangible property—equipment, software, and structures—and then write those costs off over the useful life of the assets. The resulting stream of depreciation allowances depends on the recovery period and the depreciation method. Under current law, most business property is depreciated under the modified accelerated cost recovery system (MACRS) which, as its name implies, allows firms to claim depreciation deductions more rapidly than the rate at which the value of assets declines (economic depreciation). MACRS assigns investment goods to one of 9 major property classes, with a specific recovery period ranging from 3 to 39 years and depreciation method (200 percent declining balance switching to straight line for recovery periods of ten years or less, 150 percent declining balance switching to straight line for recovery periods of up to 20 years, and straight

line depreciation for longer recovery periods). Taxpayers may elect to use the Alternative Depreciation System (ADS), which has longer recovery periods and straight line depreciation.

Bonus Depreciation and Expensing

Policymakers often adjust depreciation schedules for various policy reasons. For example, the code currently includes a provision known as bonus depreciation (or partial expensing) that allows for faster depreciation by allowing an additional deduction when a business first purchases an eligible asset. For example, 50 percent bonus depreciation would mean a firm could immediately deduct 50 cents of every dollar spent on qualifying investment purchases, with the remaining 50 cents deducted according to the normal depreciation schedules. Some reformers propose moving to full expensing—or 100 percent bonus depreciation—which would allow for a full and immediate write-off of investments. Bonus depreciation on most equipment investment (i.e., MACRS property classes with recovery periods of less than 20 years) has been in effect in some form since 2008 and in all but 3 years since 2001. The stated policy rationale for recent bonus depreciation provisions has been a desire to provide short-term stimulus to the economy, although the regularity to which it has been maintained suggests policymakers—and perhaps businesses—increasingly view it as a permanent feature of the tax code.[3]

Small Business Expensing (Section 179)

Under Section 179 of the Internal Revenue Code, businesses can immediately expense the cost of qualifying investments up to a specified dollar limit. Those investments would otherwise need to be depreciated over time. Such expensing benefits firms by reducing their tax liabilities immediately and eliminating the record-keeping burden of tracking basis and depreciation and mostly helps small businesses because the benefit phases out as the level of investment increases. In 2014, the maximum amount that firms could immediately expense was $500,000; this benefit was then taken back dollar for dollar for investments in excess of $2 million. [4]

Research and Development

The tax code encourages research and development in two ways. First, firms can expense the costs of R&D investments immediately rather than having to capitalize and depreciate them, as happens for tangible investments (section 174). Second, qualifying research and experimentation investments are eligible for a tax credit (section 41). The basic R&E tax credit provides a 20

[3] The appeal of bonus depreciation as a stimulus tool arises from its temporary nature. As such, it temporarily lowers the cost of capital and encourages firms to accelerate investment purchases at a point in time when the economy has insufficient aggregate demand. In addition, since bonus depreciation merely accelerates deductions without changing their total nominal amount, the up-front revenue loss from higher deductions is, in large part, offset by higher future tax collections.

[4] The limits applicable in 2014, and some expansions in the categories of investment eligible for expensing, expired on December 31, 2014. If Congress does not extend these temporary provisions retroactively, the limits for 2015 and beyond revert to their permanent, much less generous, levels: a maximum of $25,000 in investment, phasing out dollar for dollar beginning at $200,000.

percent non-refundable credit for R&D spending above a base amount.[5] Firms may also elect an alternative simplified credit equal to 14 percent of qualifying spending above 50 percent of the average over the prior three years.

Other Tax Credits

In the past, the tax code provided a tax credit for investments in qualifying assets, mostly machinery and equipment. That broader credit was eliminated in the Tax Reform Act of 1986, but some targeted tax credits still exist. The largest, by far, is the R&E tax credit; other credits reward fairly specific investments, most notably investment in selected clean energy projects.

SAVER/INVESTOR TAX PROVISIONS

Taxation of Investment Returns

Personal taxes on investment returns vary along several dimensions. First, interest income and short-term capital gains (less than one year) are generally subject to ordinary income tax rates (currently as high as 39.6 percent plus the 3.8 percent investment income surtax created to finance health reform), while dividends and long-term capital gains are subject to lower rates (currently as high as 20 percent plus the 3.8 percent surtax). Second, investment income can be sheltered in tax-advantaged accounts such as 401(k)s and individual retirement accounts (IRAs). These accounts allow individual savers to defer taxes on earnings they save and any returns on that savings until the money is withdrawn or, in their Roth form, to pay taxes on earnings upfront and then pay no taxes on future investment income and withdrawals. Third, the effective tax rate on capital gains is lower than the statutory rate because taxes are not paid until realization, thus allowing investors to defer tax payments. Fourth, capital gains taxes can be entirely avoided if the individual holds appreciated assets until death (and then benefits from the so-called step-up in basis), or gives appreciated assets to charity.

Exclusion of Gain on Small Business Stock (Section 1202)

The tax code offers favorable treatment to some capital gains from individual investments in small businesses. For investments made in 2014, capital gains (up to the larger of $10 million or ten times the taxpayer's basis in the stock) resulting from new equity investments in qualifying small businesses (C corporations with less than $50 million in assets) were exempt from income taxes if the stock is held for more than five years. For new investments, that treatment expired on December 31, 2014. Unless reinstated, this provision will return to permanent law which excludes 50 percent of such gains from taxation.

[5] The base amount is determined based on the average percentage of research expenses to gross receipts in the 1984-1988 period (or a fixed 3 percent if the firm did not exist during that period).

The individual and corporate income taxes create a complex set of incentives for investment and saving that vary across asset types, industries, organizational forms, financing arrangements, and ownership structures. This section outlines our conceptual framework for assessing the impact of tax policy on investment incentives and notes several key insights.

THE USER COST OF CAPITAL AND MARGINAL EFFECTIVE TAX RATES

The standard framework for measuring the incentive effects of capital income taxation is based on the seminal work of Hall and Jorgenson (1967). They defined the *user cost of capital* as the pre-tax rate of return (gross of depreciation) that would exactly compensate investors for undertaking a potential investment project. In other words, the user cost of capital is the hurdle rate that a project must achieve, covering taxes, depreciation, and investors' opportunity cost.

The user cost of capital can be expressed as:

$$c = \frac{(r + \delta)(1 - Z\tau - k)}{1 - \tau} \qquad [1]$$

where r is the firm's real discount rate, δ is the rate of economic depreciation, Z is the present discounted value of tax depreciation allowances, τ is the firm's income tax rate, and k is the rate of any investment tax credit.[6]

The intuition behind this formula is straightforward. In a world without taxes, the firm would have to earn enough to satisfy investors' required rate of return and cover economic depreciation, which together total $r + \delta$. If the firm's earnings are taxed, however, the hurdle rate must be higher. To deliver the same after-tax return, the before-tax rate of return would have to rise to $(r + \delta)/(1 - \tau)$—the higher the tax rate, the higher the cost of capital. That increase is partly offset by the value of depreciation allowances and any investment tax credits. Those benefits reduce the effective cost of investing by a factor of $(1 - Z\tau - k)$ and thus yield the cost of capital in equation [1].

Firms finance new investments with a mix of debt and equity. The firm's real discount rate is the weighted average cost of these two financing sources:

[6] Here and throughout the paper, we largely follow the notation used in the literature, for example Auerbach (1987), Gravelle (1994), Mackie (2002), CBO (2005).

$$r = \gamma[i(1-\tau) - \pi] + (1-\gamma)E \quad [2]$$

where γ is the fraction of investment financed by debt, *i* is the nominal interest rate paid on that debt, π is the inflation rate, and *E* is the required real rate of return on equity. The effective cost of nominal interest expenses is reduced by the factor *(1 - τ)* because they are tax-deductible under current law; that term would be reduced under reforms that limit interest deductibility and disappear under reforms that completely eliminate tax deductibility.

The impact of taxes on the return earned by savers is complicated by several factors. First, investors face different tax regimes. The tax rate facing individual investors varies, for example, with their income levels and whether investments are held in tax-advantaged accounts like 401(k)s or IRAs. Institutional investors may be taxable (e.g., insurance companies) or tax-exempt (e.g., universities and other charitable institutions or qualified company retirement plans). In addition, tax rates on equity returns vary depending on how those returns accrue (dividends, retained earnings, capital gains) and when they are realized.

For those reasons, the mathematical relationship between taxes and saver returns is a bit more complex:

$$s = \gamma[i(1-b\tau_i) - \pi] + (1-\gamma)E(1-a\tau_e) \quad [3]$$

where, *s* is the after-tax return to saving, γ is the fraction of investment financed by debt, *i* is the nominal interest rate , π is the inflation rate, and E is the real rate of return on equity. This expression includes two new tax rates: τ_i is the tax rate on interest income and τ_e is the tax rate on equity income, taking account of the mix and timing of dividends and capital gains. The parameters a and b represent the fraction of equity and interest returns, respectively, that are subject to tax.

The *marginal effective tax rate (METR)* is a summary measure of the tax burden that arises from the various tax provisions affecting investment and saving. It equals the difference between the real pre-tax rate of return that a hypothetical project would generate, i.e., the user cost of capital less economic depreciation *(c – δ)*, and the real after-tax rate of return that savers would receive (*s*), measured as a percentage of the real pre-tax rate of return:

$$METR = \frac{(c-\delta) - s}{(c-\delta)} \quad [4]$$

The METR thus measures the fraction of pre-tax returns that go to taxes.

Tax policies affect the METR in two ways. First, business taxes affect the required rate of return facing firms that want to make investments, relative to the amount they pay to savers who finance them. Second, personal taxes lower the after-tax rate of return that savers receive. The METR combines these two effects into a single measure of the "wedge" that the tax system creates between what a project must generate and what savers receive.

Applying these formulas is straightforward for investments made by both corporations and pass-through businesses. Equations [1] and [2] measure how tax policy increases the cost of capital facing the business, equation [3] measures how tax policy reduces the return received by savers, and the METR equation [4] combines those two effects into an overall measure of the wedge created by tax policy.

INSIGHTS FROM THIS FRAMEWORK

This framework provides several immediate insights about how tax policies affect investment incentives. First, equity investments in corporations face a higher METR—and therefore a higher cost of capital—than equity investments in other businesses. The reason is that shareholder taxes—the τ_e in equation [3]—adds a second layer of tax on corporate equity returns. This second layer of tax does not exist for partnerships, LLCs, and other pass-throughs (represented in our framework as $a = 0$).

Second, interest deductibility lowers the METR on debt-financed corporate investments relative to equity-financed ones. Because corporations can deduct interest payments but not dividends and other equity returns, the tax system encourages corporations to finance themselves with debt rather than equity.[7]

Third, businesses that primarily invest in research and development have a tax advantage over businesses that primarily invest in equipment and structures. The reason is two-fold. First, research and development investments can usually be immediately expensed, corresponding to $Z=1$ in equation [1], while tangible investments are typically depreciated over time resulting in a Z less than 1. Tangible investments thus face a higher METR. Second, qualifying investments also receive the R&E tax credit—a positive k in equation [1]—while other investments do not.

This framework also provides insight about two ways that a tax system could place the same METR on all types of investments. One would be a pure income tax in which all investments face an METR equal to the statutory rate on business income. Such a pure income tax would require that we eliminate any double taxation of corporate equity income (either by allowing shareholders to claim credits for corporate taxes paid or allowing corporations to deduct payments to equity holders), eliminate tax credits, and set depreciation schedules so that they

[7] A similar bias for debt may also arise in the case of pass-through businesses, resulting from the fact that the average tax rate at which businesses deduct interest expense is generally higher than the average tax rate lenders pay on the resulting interest income.

exactly match the rate of economic depreciation ($Z = \delta / [r + \delta]$). The second way would be a pure consumption tax, which would result in an METR of zero for all marginal investments. Such a pure consumption tax would allow immediate expensing ($Z = 1$), eliminate interest deductibility, eliminate tax credits, and levy no taxes on savers' returns.[8]

CAVEATS

This framework provides a helpful way to summarize the effect of tax policy on investment incentives. Before applying it to our current tax system and possible reforms, however, we note some caveats.

First, the framework focuses on a hypothetical marginal investment project—one that earns exactly the hurdle rate necessary to secure financing. That is useful analytically, because it helps us understand how taxes may move that hurdle rate up or down, thus influencing which investment projects get undertaken and which do not. This approach has less to say, however, about projects whose returns are expected to significantly exceed the hurdle rate. Taxes can still influence such investments, for example decisions about locating domestically or abroad, but the user cost of capital approach does not focus on those effects.

Second, this approach does not include several factors that can drive investment decisions. Some firms may be credit-constrained, for example, and thus have limited investment options not because taxes have increased their cost of capital but because of imperfections in financial markets. In addition, firm managers may undertake or forego investment opportunities for other reasons, such as a focus on accounting measures of performance (rather than purely economic ones), empire-building, and the like.

Third, such concerns may be particularly important for startups. Entrepreneurial opportunities may be more likely to expect to earn excess returns or take place in an environment where opportunities are unlikely to scale all the way to the marginal project.

Finally, it is important to emphasize that our framework examines the effect of the tax system on financial rewards to investing, but it does not measure actual investment outcomes. The empirical literature suggests that there is indeed a link between user cost and the level of investment, with an elasticity (a measure of responsiveness) between 0.5 and 1.0 (Hassett and Hubbard, 2002). That means that higher marginal effective tax rates do appear to reduce investment. However, there is considerable uncertainty about these responses, and there may well be differences among different types of investments and organizations.

[8] This does not mean that a pure consumption tax would raise no revenue. Our framework focuses on how taxes affect the hurdle rate for new investments; by definition, an investment that earns its hurdle rate just breaks even. Under a well-designed consumption tax, investments that return more than their hurdle rate would generate a positive present value of tax revenue, discounted at the normal rate of return, over the life of the investment.

We estimate marginal effective tax rates under today's tax law using the Urban-Brookings Tax Policy Center's new Investment and Capital Model (ICM).[9] The model combines information about the current tax code with information about investment and financing practices. The appendix provides details on the model and its baseline parameters.

EFFECTIVE TAX RATES VARY BY ASSET TYPE, FINANCING, AND BUSINESS FORM

Consistent with prior studies—Auerbach (1987), Gravelle (1994), Mackie (2002), CBO (2005), and CBO (2014)—we find that marginal effective tax rates differ substantially across different types of assets, financing, and business form (Table 1).

TABLE 1. EFFECTIVE TAX RATES VARY WITH ASSET TYPES, FINANCING, AND BUSINESS FORM

Marginal effective tax rate on new investment by a large, taxable firm

	Corporate	Pass-through
Business Investment	26%	19%
Equipment	22%	16%
Structures	30%	22%
Intellectual Property Products	0%	-5%
Inventories	40%	32%
Financing		
Debt	-6%	12%
Equity	33%	20%

Source: Urban-Brookings Tax Policy Center Investment and Capital Model, version 1.0.

Corporate investment faces higher taxes than does investment undertaken by partnerships, LLCs, and other pass-throughs. On average, new corporate investment faces a marginal effective tax rate of 26 percent, while investment by pass-throughs faces a marginal rate of only 19 percent. That difference primarily exists because corporate returns face two layers of tax, one at the corporate level and one at the personal level, while pass-through returns are taxed just once at the personal level.

[9] The estimates in this paper reflect 2014 tax laws, including 50 percent bonus depreciation and the R&E tax credit. METRs are weighted by the industry-asset share of the 2010 capital stock, as reported in the BEA fixed asset accounts. Land is excluded from the analysis.

Tax rates also differ across types of investment. Investments in intellectual property face the lowest tax rates since they are generally expensed and are often eligible for the R&E tax credit. In the corporate sector, METRs on such investments average zero percent; for pass-throughs, such investments actually receive a small net tax rebate.

At the other extreme, inventory investments are taxed quite heavily because they are not eligible for any deductions until sold. Because of their longer service lives and less favorable tax depreciation treatment, structures typically face higher METRs than do investments in new software and equipment. Equipment also benefits disproportionately from special accelerated depreciation rules in the tax code, including 50 percent bonus depreciation.

METRs also vary greatly with financing, with debt financing facing lower effective rates than equity financing. In fact, a corporate investment (hypothetically) financed entirely by debt would receive a net subsidy from the tax system, while an investment financed entirely by equity would face a marginal rate of more than 30 percent. The preference for debt financing also exists for pass-throughs, but the spread is greatly reduced as a result of the lack of a second layer of tax on equity returns, the lower overall average effective income tax rate at the owner level, and the higher average effective tax rate at the saver level (resulting from a larger fraction of pass-through interest income subject to maximum statutory rates).[10]

EFFECTIVE TAX RATES VARY BY INDUSTRY

Building or expanding a business usually requires a combination of investments, with the mix varying across industries. Launching a retail store, for example, would require new structures, equipment, and inventory, while developing a new medicine would emphasize investment in R&D. It is thus important to understand how the tax code affects incentives to invest in combinations of assets used by a firm, not just individual types.

To do so, we consider investment combinations for different industries. Government data distinguish 62 industries across 17 major sectors, which we aggregate into 13 broad industry groups that represent a range of asset mixes (Table 2). We estimate a weighted average of corporate and pass-through rates (using averages for the economy as a whole), so our estimates do not reflect any difference in the composition of organizational form across industries. In addition to easing the exposition, this approach reflects the fact that firms are not locked into a given organizational form and that the goal of many startups is to eventually enter the corporate form, either via merger or IPO.

Financing structures also vary across industries. Using data on the composition of outstanding debt and equity from the COMPUSTAT database, we compute the average fraction

[10] The preference for debt financed investment for pass-throughs arises from the fact that the tax rate paid by the borrower (pass-through owner) is higher than that of the lender (saver). The implications for the firm's cost of capital and incentive to invest are sensitive to assumptions about the underlying financial market equilibrium (Mackie, 2002).

of debt financing for each of the industry groups in our analysis (weighted by total assets across firms) and then normalize them to be consistent with the overall average for the economy. As expected, industries that rely more heavily on research and development and other intangible capital utilize less debt financing. For example, less than 30 percent of investment is debt financed for firms in the "software, information, and data process," "professional, scientific, and technical," or "chemical and pharmaceutical" industries.

TABLE 2. EFFECTIVE TAX RATES VARY BY INDUSTRY

Marginal effective tax rate on new investment by large, taxable firm

Industry	Asset Share	Debt Financing Ratio	Asset Mix				METRs	
			Equip.	Struc.	Inven.	IP	Constant D/E	Varying D/E
Wholesale and Retail Trade	12.8%	35%	18%	42%	38%	2%	31%	31%
Construction	1.8%	30%	49%	22%	28%	1%	27%	28%
Other Services	16.4%	40%	22%	73%	1%	4%	28%	27%
All Other	3.9%	32%	31%	37%	5%	28%	25%	26%
Finance, Insurance, and Real Estate	14.1%	49%	29%	66%	0%	5%	27%	26%
Nondurable Manufacturing	4.8%	32%	42%	29%	22%	7%	25%	25%
Durable Manufacturing	9.9%	32%	31%	26%	23%	20%	20%	21%
Transportation	5.3%	37%	39%	59%	1%	0%	21%	21%
Telecommunications	6.1%	34%	28%	61%	1%	10%	20%	21%
Software, Information, and Data Processing	1.5%	21%	21%	21%	3%	54%	18%	21%
Mining and Utilities	16.4%	37%	18%	80%	2%	0%	18%	18%
Professional, Scientific, and Technical	2.7%	28%	31%	30%	4%	35%	16%	18%
Chemical and Pharmaceutical	4.2%	26%	17%	16%	15%	52%	9%	11%
Total	**100.0%**	**37%**	**26%**	**54%**	**10%**	**10%**	**24%**	**24%**
Variation (s.d.) across industries							5.6%	5.0%

Source: Urban-Brookings Tax Policy Center Investment and Capital Model, version 1.0.

Holding the financing mix constant, METRs vary substantially across industries. Wholesale and retail trade faces the highest rate, more than 30 percent, because of their high reliance on structures and inventories. Chemical and pharmaceutical firms face the lowest rate, less than 10 percent, because of their high reliance on research and development, which can both be expensed and receive the R&E credit. Mining and utility companies face a relatively low rate because their structures are treated more like equipment (and, in the case of mining, much of the development costs are expensed).

Incorporating differences in the average mix of debt versus equity financing slightly reduces the variation in tax rates across industries. This reflects the fact that industries that rely more heavily on tangible investment in inventories and structures are able to finance more of their investment with debt, lowering the cost of capital and effective tax rates.

EFFECTIVE TAX RATES ON SMALL AND STARTUP BUSINESSES

The METRs in Table 2 reflect the tax policies that apply to all businesses, whether they are large or small, new or long-established. To understand how the tax code affects incentives to invest in new businesses, we now consider the effect of provisions specifically targeted to small and new businesses. Of particular importance is the fact that small businesses can expense investments up to a cap; this is known as section 179.

Expensing for small business investments reduces METRs by about 1.5 percentage points on average (Table 3). The effects vary across industries because of their differences in investment mix. Expensing is less valuable for chemical and pharmaceutical firms, for example, because they already have the ability to expense their primary investments in research and development. Expensing is more valuable for transportation firms, in contrast, because of their relatively high reliance on long-lived equipment, such as trucks.

Section 1202, which eliminates the capital gains tax on stock in qualifying C corporations held for five years or more, can also reduce the effective tax rate on new investment. If all equity in a new firm qualified, that provision would reduce the METR by about 4 percentage points, on average. Equity investments qualifying for Section 1202 turn out to be small, however. The Joint Committee on Taxation, for example, estimates the revenue loss from the provision at roughly $800 million a year, in contrast to more than $5 billion from small business expensing (JCT, 2014).

TABLE 3. TAX BREAKS LOWER EFFECTIVE TAX RATES ON SMALL BUSINESSES

Marginal effective tax rate on new investment by large and small taxable firms

Industry	Marginal Effective Tax Rates		
	Large	Change due to Section 179:	Small
Wholesale and Retail Trade	31%	-0.7%	31%
Construction	28%	-1.7%	26%
Other Services	27%	-0.8%	27%
All Other	26%	-2.1%	24%
Finance, Insurance, and Real Estate	26%	-1.2%	24%
Nondurable Manufacturing	25%	-1.4%	24%
Durable Manufacturing	21%	-1.1%	20%
Transportation	21%	-3.0%	18%
Telecommunications	21%	-2.5%	18%
Software, Information, and Data Processing	21%	-0.7%	20%
Mining and Utilities	18%	-2.9%	15%
Professional, Scientific, and Technical	18%	-1.1%	16%
Chemical and Pharmaceutical	11%	-0.6%	11%
Total	**24%**	**-1.5%**	**22%**
Variation (s.d.) across industries	5.0%		5.5%

Source: Urban-Brookings Tax Policy Center Investment and Capital Model, version 1.0.

TAX ADVANTAGES CAN BE OFFSET BY GREATER RELIANCE ON EQUITY

The benefit of tax incentives is real, but it is important to consider how use of those incentives may correlate with other factors that determine effective tax rates. Of particular importance is the form of financing. The tax system encourages loans, debt, and other business credit, whose interest costs are generally tax-deductible, over equity. To understand how the tax system affects the return to investment by new and innovative ventures, therefore, it is important to understand what types and mix of financing they use.

The Kauffman Firm Survey (KFS) provides unique insight on this question. The survey tracks a sample of almost 5,000 new ventures established in 2004; the last wave reports their performance and experience through 2011 (Robb and Farhat 2013). Researchers have recently used this survey to analyze the financing choices of new ventures. For our purposes, three findings are particularly relevant.

First, many new ventures rely on outside capital and, in particular, on outside credit. Cole and Sokolyk (2013) find, for example, that only one-quarter of new firms relied solely on equity financing in their early years, while three-quarters also relied on a combination of personal, business, and trade credit. Robb and Robinson (2012) find that "formal credit channels provide about 40 percent of a firm's initial startup capital." That figure is very close to the 37 percent we found for established firms. On average, therefore, there might not be a substantial difference between the debt-equity mix of startup and established firms.

Second, new ventures that raise outside equity—from angels, venture capitalists, corporations, and other sources—tend to have lower debt ratios than other startups. Robb and Robinson (2012) find, for example, that firms that take on external equity rely less on debt, with debt ratios of about 30 percent for firms funded by angels, VCs, and other sources, and 13 percent for ones funded by corporations. This is important because firms that tap outside equity are most likely to be fast-growing enterprises. In short, the typical startup may have a capital structure similar to those of established firms, but larger, fast-growing ones tend to rely more heavily on equity.

Third, firms are more likely to rely on credit if they invest in tangible assets (Cole and Sokolyk 2013) and more likely to rely on equity if they invest in intangible assets, particularly research and development (Robb and Seamans 2014). These findings are consistent with intuitions about risk and financing. Banks and other lenders are more willing to provide financing when business prospects are easier to foresee and when tangible assets can serve as collateral. Neither condition holds for research and development. In regression analyses, Robb and Seamans (2014) find that the debt-to-capital ratio of a startup that invests in R&D averages five percentage points lower than for one that does not. If a typical, non-R&D firm has a capital structure that's 40 percent debt and 60 percent equity, for example, an R&D startup would be capitalized with 35

percent debt and 65 percent equity. That could happen if, for example, R&D expenses are completely financed with equity and account for 10 percent of the firm's investment.

To give a sense of how greater reliance on equity financing affects taxes, Table 4 shows the effect of reducing the debt-to-capital ratio by five percentage points. We find that this difference offsets much of the tax advantage for startups, increasing the overall average tax rate by more than a percentage point. In fact, for R&D intensive industries—e.g., pharmaceuticals and professional, scientific, and technical services—that are least likely to be financed with debt, the tax rate on startups exceeds our baseline estimate for established firms.

TABLE 4. GREATER RELIANCE ON EQUITY FINANCING REDUCES THE TAX ADVANTAGE FOR STARTUPS AND R&D

Marginal effective tax rate on new investment by taxable firms, adjusting for outside-equity-backed startups greater reliance on equity financing

Industry	Marginal Effective Tax Rates		
	Established	Startup (unadjusted)	Startup (adjusted)
Wholesale and Retail Trade	31%	31%	32%
Construction	28%	26%	27%
Other Services	27%	26%	27%
All Other	26%	24%	25%
Finance, Insurance, and Real Estate	26%	23%	25%
Nondurable Manufacturing	25%	24%	26%
Durable Manufacturing	21%	20%	23%
Transportation	21%	18%	19%
Telecommunications	21%	18%	20%
Software, Information, and Data Processing	21%	21%	22%
Mining and Utilities	18%	15%	17%
Professional, Scientific, and Technical	18%	17%	19%
Chemical and Pharmaceutical	11%	11%	15%
Total	**24%**	**22%**	**23%**
Variation (s.d.) across industries	5.0%	5.4%	5.0%

Source: Urban-Brookings Tax Policy Center Investment and Capital Model, version 1.0.

THE IMPORTANCE OF LIMITS ON TAX LOSSES

Thus far our analysis has focused on profitable firms that face no limits on their ability to take advantage of depreciation allowances, expenses, and tax credits. Many startups and innovative firms do face such limits, however, which reduce the tax benefits they receive from investing and thus raise their cost of capital and their effective marginal tax rates.

Limits arise in two ways. First, if young firms report a net operating loss for tax purposes, they do not get a refund from the government. Instead, they can carry those losses forward to offset against taxable income up to twenty years in the future (section 172). (Firms can also carry losses back against profits in the prior two years, which helps established firms but not new or rapidly growing ones.) Such carry-forwards provide less value than immediate tax savings because of the time value of money, as well as the possibility that the firm will never report sufficient income to take advantage of them. Losses in pass-through businesses can be used to offset other sources of income, provided the owner is a "material participant" in the business. Passive investors, however, face limitations on the ability to use losses (section 469). Second, a firm's ability to use net operating losses is limited if it is acquired or receives capital investments that involve a material change in ownership (Allen, 2012) (section 382). In those cases, a firm may lose some or most of the tax savings to which it would otherwise be entitled.

Surveys suggest that new ventures will often be subject to these two limitations on using losses. Allen (2012) analyzed the net operating losses of a sample of venture-backed companies that filed for initial public offerings between 1996 and 2008. He found that more than three-quarters of those firms reported deferred tax assets reflecting the value of their unused net operating losses (NOL). Of those firms, about 80 percent reported that there was a significant probability that they would be unable to realize the NOL's value. He interprets this as evidence that many IPO firms believe there is a significant chance that they will lose most of the value of NOLs because of future acquisition or other qualifying changes in ownership. Ernst & Young (2013b) reviewed a sample of venture-backed companies in R&D-intensive industries between 2003 and 2012 and found that nearly two-thirds experienced financing or merger events that would likely trigger limits on NOLs. In addition, E&Y estimated that NOLs for research-intensive companies, both public and private, amounted to almost $12 billion from 2003 to 2012. Using the Kauffman Firm Survey, Robb and Farhat (2013) found that 55 percent of businesses founded in 2004—businesses of all kinds, not just venture-backed technology firms—had failed by 2011 (40 percent had failed by 2008 before the worst of the economic crisis). Failing firms are likely making losses, not profits, and are unlikely to take full advantage of tax savings.

These surveys suggest that NOL limitations are an important issue for both regular startups and successful, high-growth ones. Given the potential for persistent losses or outright failure, on the one hand, and limitations from acquisition and major financing rounds, on the other, NOLs can limit tax savings significantly.

We can model these limits by modifying the user cost of capital formula to account for the reduction in present value associated with being in a nontaxable status:

$$c = \frac{(r + \delta)(1 - (p_z Z\tau + p_k k))}{1 - p_c \tau} \qquad [1']$$

where p_z and p_k measure the fraction of the present value of depreciation allowances and tax credits, respectively, the firm expects to receive, and p_c measures the fraction of the present value of any positive cash flows that will be taxed. The first two adjustments reflect the delay or loss of tax savings from deductions or credits when the firm is nontaxable; they thus raise the cost of capital. The third term, p_c, reflects the delay in paying tax on positive cash flows from the investment; that lowers the cost of capital. If the firm is always taxable, there are no "haircuts" ($p_z = p_k = p_c = 1$), and the user cost of capital is given by the standard formula. If the firm is always nontaxable ($p_z = p_k = p_c = 0$), the user cost reduces to $r + \delta$, in which case taxes have no effect on the user cost of capital.

The equation for the firm's discount rate can similarly be modified to account for the potential reduction in present value of deducting any interest:

$$r = \gamma[i(1 - p_d \tau) - \pi] + (1 - \gamma)E \qquad [2']$$

where p_d measures the fraction of the present value of interest deductions that the firm can realize. Delayed or forfeited interest deductions raise the firm's cost of funds, increasing the METR.

These effects go in opposite directions—delaying taxation of cash flows reduces METRs, while delaying or losing deductions, expenses, and credits raises METRs—so their net impact on the user cost of capital is, in theory, ambiguous (Auerbach, 1983). Auerbach and Poterba (1987) and Cooper and Knittel (2010) find that asymmetric treatment of losses generally raises the cost of capital for equipment (where depreciation allowances are more generous than economic depreciation) and lowers the cost of capital for structures (where depreciation allowances are less generous than economic depreciation). Cooper and Knittel also point out that effective tax rate differentials can be particularly large if firms rely heavily on debt financing or utilize significant front-loaded tax incentives, such as investment tax credits and bonus depreciation. They conclude that younger firms are most likely to face higher user costs associated with delayed or unused tax losses.

In addition to having front-loaded tax incentives, investments in startups are also more likely to have their associated cash flows back-loaded—that is, more of the cash flows will materialize late in the life of the investment. In an extreme case, a startup firm that invests during a "pre-revenue" phase and then brings a product to market and realizes all of its revenue in the final year would incur the full cost of delayed credits and deductions, while facing the full statutory rate on its income. The reduced form modeling approach we adopt here is quite flexible in its ability to account for this scenario—specifically $p_c = 1$, and $p_z = p_k = p_d = 1/(1+r+\pi)^N$, where N is the number of years before the product is brought to market.

The practical importance of loss limitations will depend, of course, on the specific circumstances of a firm, including its pattern of revenues and expenses, applicable tax provisions, its likelihood of failure, and its likelihood of acquisition or other change of control that would trigger limitations. To get a sense of the importance of limitations, we consider three possible parameter combinations (Table 5).

The first scenario—$p_z = p_k = p_d = 0.8$ *and* $p_c = 0.9$—is consistent with a startup firm that will be non-taxable for the first several years. The new investment itself generates revenue, but other firm activities are losing money. This firm will thus be hurt by the delay in realizing the tax benefits from depreciation and credits on the new investment, but will be helped by the delay in taxing positive cash flows from the new investment. The larger 20 percent haircut that applies to interest and depreciation deductions and investment credits (roughly equivalent to a 5 year delay) reflects the fact that those tend to be front-loaded, while revenues are likely to be more evenly spread through the duration of the project.

The second scenario—$p_z = p_k = p_d = 0.8$ *and* $p_c = 1.0$—reflects a startup firm that must invest prior to generating any revenues, at which point it becomes taxable. Similar to the first scenario, the firm is unable to benefit from any of the associated deductions or credits from its activities while it is not taxable. It differs, however, from the first scenario in that the revenues from the new investment will be fully taxed. This could occur, for example, if the startup firm requires 5 years of investing before bringing the successful product to market.

The third scenario—$p_z = p_k = p_d = 0.6$ *and* $p_c = 1.0$—is similar to the second, except that it assumes a larger 40 percent reduction in the value of deductions and credits. This may reflect either a much longer lag before the product goes to market (e.g., a new pharmaceutical) or a much higher likelihood of forfeiting accumulated tax losses, either because the firm never generates sufficient future revenue or is acquired in a way that disqualifies accumulated tax losses (as often happens in high-tech industries).

These estimates demonstrate that loss limits can significantly increase the METRs on new startup investment. In the first scenario, in which the tax value of losses receives a 20 percent haircut and taxes on positive cash flows receive a 10 percent haircut, effective tax rates increase

TABLE 5. LIMITATIONS ON LOSSES INCREASE EFFECTIVE TAX RATES

Marginal effective tax rate on new investment by a startup, adjusting for non-taxable status

Industry	Marginal Effective Tax Rates			
		METRs by Non-taxable Status		
	Taxable	$p_z=p_k=p_d=0.8$ $p_c=0.9$	$p_z=p_k=p_d=0.8$ $p_c=1.0$	$p_z=p_k=p_d=0.6$ $p_c=1.0$
Wholesale and Retail Trade	32%	32%	36%	38%
Construction	27%	30%	36%	41%
Other Services	27%	30%	36%	42%
All Other	25%	29%	36%	43%
Finance, Insurance, and Real Estate	25%	30%	37%	44%
Nondurable Manufacturing	26%	29%	35%	40%
Durable Manufacturing	23%	28%	35%	41%
Transportation	19%	24%	31%	39%
Telecommunications	20%	25%	31%	39%
Software, Information, and Data Processing	22%	32%	41%	50%
Mining and Utilities	17%	22%	28%	37%
Professional, Scientific, and Technical	19%	28%	37%	47%
Chemical and Pharmaceutical	15%	22%	30%	38%
Total	**23%**	**28%**	**34%**	**40%**
Variation (s.d.) across industries	5.0%	3.6%	3.3%	3.0%

Source: Urban-Brookings Tax Policy Center Investment and Capital Model, version 1.0.

from 23 to 28 percent. The difference is most pronounced in R&D intensive industries, such as "software, information, and data process," "professional, scientific, and technical," and "chemical and pharmaceutical," because of the limits on the R&E credit and the value of expensing intellectual property investment.

We find similar results from the second and third scenarios, with effective tax rates increasing further as loss limits erode more of the tax benefits associated with new investment. In the second scenario, the average METR increases 11 percentage points to 34 percent. Again,

the impact is most pronounced in the R&D heavy industries, where tax rates roughly double. In the most extreme (yet still plausible) scenario with a 40 percent haircut on deductions and credits, the overall average tax rate nearly doubles from 23 to 40 percent.

Loss limits narrow the variation in effective tax rates across industries, reducing the standard deviation across industries from 5.0 percent to 3.6 in the first scenario (3.0 in the third scenario). Of course, that largely reflects the fact that loss limits undo much of the effect of tax incentives, especially on research and development and debt financed investment. As a consequence, this population of firms will be less responsive to policy efforts to stimulate investment and research.

These findings demonstrate that tax policy can have a substantial effect on investment incentives and that the effect varies greatly across situations. In this section, we explore how various options to reform the tax system would affect the size and pattern of METRs on business investment.

While there appears to be some consensus on the need to lower the statutory corporate rate and reform the system of international taxation, there remains considerable disagreement over the scope. In particular, most reform proposals seek to offset the revenue loss from lowering the corporate tax rate by reducing large corporate tax expenditures. Most notable from the standpoint of investment incentives is accelerated depreciation. For example, the Camp reform plan would repeal MACRS and replace it with a less generous system with longer recovery periods and straight-line depreciation similar to ADS. In addition, the plan proposes capitalizing and amortizing research and development expenditures. President Obama's framework does not outline any single proposal, but identifies potential revenue offsets for a lower corporate rate, including reducing accelerated depreciation and limiting interest deductibility.

We consider several stylized reform options that would lower the corporate tax rate and offset the revenue loss by reducing tax preferences that would narrow the tax treatment across forms of investment (Table 6). We measure the impact on two types of large established firms—corporate and pass-through—and two types of startup firms—one that is taxable (or otherwise able to fully use losses, deductions, and credits) and one that faces limits on its tax losses (using the parameters corresponding with scenario 2 in the previous section).

The first reform option would repeal the MACRS system of accelerated depreciation and require all assets to be depreciated under the slower, alternative depreciation system (ADS). Gravelle (2011) estimates that such a reform could generate steady-state tax revenue sufficient to offset a 3 percentage point cut in the corporate tax rate (e.g., from 35 percent to 32 percent). Such a reform would raise effective tax rates on all types of firms, as the benefit from the lower corporate rate would be outweighed by the reduced value of slower depreciation deductions. METRs on established pass-through firms would increase from 19 to 23 percent, slightly larger than the 3 percentage point increase on corporate firms (which benefit from the lower corporate rate). Taxable startups would see effective tax rates increase by a similar amount, from 23 to 26 percent. Loss limited startups, however, would see only a 1 percentage point increase, due to the fact that depreciation deductions are already delayed or reduced as a result of not being taxable.

The second reform option would repeal accelerated depreciation and limit the fraction of interest that firms can deduct by 25 percent. Ernst and Young (2013a) estimates that such a limit on interest deductibility could offset a corporate rate cut of 1.5 percentage points. This type of reform would further increase effective tax rates on all three types of taxable firms by 2

percentage points, because the lost interest deductions would more than offset the benefit of the lower corporate rate. Limiting interest deductibility would further narrow variation in effective tax rates, as measured by the standard deviation across industries and assets. This impact is most notable among established corporate firms, who face larger differences in tax rates on debt versus equity financed investments.

The third reform option—in addition to repealing accelerated depreciation and limiting interest deductibility—would require firms to amortize research and development spending over a five year period. A similar proposal in the Camp reform plan was estimated by the Joint Committee on Taxation to raise enough revenue to offset a corporate rate cut of roughly 2 percentage points. This type of reform would hit established pass-throughs the hardest, increasing the overall METR by about 1.5 percentage points. Established corporate and taxable startups would see little change in the overall rate, while startups in a loss position would face a modest reduction, due to the fact that loss limits already significantly limit the tax advantage of R&D investment and that they benefit modestly from the rate reduction (either because they are corporate or have a probability of incorporating in the future). Most notably, the variation in METRs across assets declines markedly, from the 9 percent range for taxable firms down to roughly 5 percent, resulting from eliminating much of the preferential tax treatment R&D receives in the current tax code. Of course, the desirability of such a reform depends on the sensitivity of the level of R&D to tax incentives and the social value of R&D more generally.

IMPLICATIONS

These results have three main implications for current tax reform discussions.

First, many reform proposals would lower the corporate tax rate while slowing depreciation allowances or reducing other tax preferences to broaden the tax base. As these results illustrate, doing so would raise the overall cost of capital for any plausible rate reductions. This doesn't necessarily mean a pure negative for welfare—there may be substantial gains from reducing inter-asset distortions—but traditional reform plans would discourage investment overall.[11]

Second, such reforms could adversely affect startups and entrepreneurs that are more likely to be organized as pass-throughs. Of course, such an effect might be desirable, to the extent that any current preference in the tax code toward pass-throughs is unwarranted.

Third, the impact on startups and entrepreneurs may be particularly sensitive to decisions about specialized provisions that subsidize R&D or affect the use of tax losses. While startups that face significant reductions in the value of tax preferences due to loss limits (resulting from either delay or forfeiture) are better insulated from negative effects of tax reform on METRs, our

[11] Bull, Dowd, and Moomau (2011) consider the macroeconomic effects of reducing the corporate tax rate offset by various forms of base broadening.

estimates highlight the importance of the value of losses to their overall level. Features of tax reform that make startups more susceptible to losing the value of investment related deductions and credits or make those losses larger could significantly raise METRs and depress investment among this subset of firms.[12]

TABLE 6. IMPACT OF REFORM OPTIONS ON EFFECTIVE TAX RATES

Marginal effective tax rate on new investment by type of firm

	Marginal Effective Tax Rates			
	Established		Startup	
	Corporate	Pass-through	Taxable	Non-taxable
Current Law				
METR	25%	19%	23%	34%
Variation (s.d.) across industries	4.8%	4.3%	5.0%	3.9%
Variation (s.d.) across assets	10.3%	9.8%	10.3%	4.2%
Reform Option #1: Reduce corporate rate to 32%; Replace MACRS with ADS				
METR	28%	23%	26%	35%
Variation (s.d.) across industries	4.0%	3.7%	3.8%	2.8%
Variation (s.d.) across assets	9.1%	9.7%	9.1%	4.0%
Reform Option #2: Reduce corporate rate to 30.5%; Replace MACRS with ADS and limit interest deductibility				
METR	30%	25%	28%	36%
Variation (s.d.) across industries	3.5%	3.6%	3.6%	2.7%
Variation (s.d.) across assets	8.4%	9.5%	8.8%	3.9%
Reform Option #3: Reduce corporate rate to 28.5%; Replace MACRS with ADS, limit interest deductibility, and capitalize R&D				
METR	30%	27%	28%	35%
Variation (s.d.) across industries	3.4%	2.7%	3.2%	2.9%
Variation (s.d.) across assets	4.6%	5.3%	5.1%	3.2%

Source: Urban-Brookings Tax Policy Center Investment and Capital Model, version 1.0.

[12] Cullen and Gordon (2006) similarly find that the impact of tax reform on entrepreneurial activity may be especially sensitive to choices about how business tax losses can be used.

CONCLUSION

Financing costs are an important factor influencing business investment decisions. To raise capital, whether from equity investors or lenders, a business needs to put forward a compelling case that the investment will return enough to provide those investors an adequate return. Tax policies have a significant effect on that hurdle rate. At the margin, tax policies can thus determine which investments get undertaken and which do not, whether firms finance investment through equity or debt, and whether firms structure themselves as corporations or as pass-throughs.

Our results are only illustrative. An individual firm or opportunity involves unique circumstances. Moreover, further work is needed to more precisely define important factors. For example, just how much do startups discount the value of tax credits and tax depreciation allowances? What fraction of equity funding comes from tax-favored sources? And what is the mix of investment types in specific industries?

Despite those limitations, our analysis provides new insight about important qualitative implications of the tax code. Today's tax system treats businesses differently. Both established and new retail businesses face relatively high tax rates on new investment, for example, while R&D intensive industries like pharmaceuticals and professional services face much lower rates. Corporations face higher tax rates than LLCs, partnerships, and other pass-throughs. Equity is taxed more heavily than debt.

In principle, startups and innovative firms benefit from targeted tax breaks, including the R&E tax credit, expensing of R&D, lower capital gains taxes, and more favorable depreciation rules. But those advantages are over-stated in traditional cost of capital analyses. First, greater reliance on equity financing eats away at the advantages offered to innovative firms and to startups. Second, and potentially more important, limits on the ability to use tax losses can significantly increase the cost of capital and marginal effective tax rates, relative to what they would be if new firms could take full advantage of preferences such as accelerated depreciation, expensing of research, and the research credit. Efforts to reform the tax code, especially those aimed at lowering the corporate tax rate and "leveling" the playing field among different types of investment should pay particular attention to these types of effects on startups and entrepreneurship.

REFERENCES

Allen, Eric J. 2012. "The Information Content of the Deferred Tax Valuation Allowance: Evidence from Venture Capital Backed IPO Firms," University of Southern California Leventhal School of Accounting, September 2012.

Auerbach, Alan J., 1983. "Corporate Taxation in the United States." *Brookings Papers on Economic Activity* 2, 451-513.

Auerbach, Alan J., 1987. "The Tax Reform Act of 1986 and the Cost of Capital." *The Journal of Economic Perspectives* 1 (1), 73-86.

Auerbach, Alan J. and James M. Poterba, 1987. "Tax Loss Carryforwards and Corporate Tax Incentives." In Feldstein, Martin (ed.), *The Effects of Taxation on Capital Accumulation*, 305-342. University of Chicago Press, Chicago IL.

Bull, Nicholas, Timothy A. Dowd, and Pamela Moomau, 2011. "Corporate Tax Reform: A Macroeconomic Perspective." *National Tax Journal* 64 (4), 923-41.

Cole, Rebel and Tatyana Sokolyk. 2013. "How Do Start-Up Firms Finance Their Assets? Evidence from the Kauffman Firm Surveys."

Congressional Budget Office, 2005. "Taxing Capital Income: Effective Rates and Approaches to Reform." Congressional Budget Office, Washington DC.

Congressional Budget Office, 2006. "Computing Effective Tax Rates on Capital Income." Congressional Budget Office, Washington DC.

Congressional Budget Office, 2014. "Taxing Capital Income: Effective Marginal Tax Rates Under 2014 Law and Selected Policy Options." Congressional Budget Office, Washington DC.

Cooper, Michael G. and Matthew J. Knittel, 2010. "The Implications of Tax Asymmetry for U.S. Corporations." *National Tax Journal* 63 (1), 33-62.

Cullen, Julie and Roger Gordon, 2006. "Tax Reform and Entrepreneurial Activity." In Poterba, James M. (ed.), *Tax Policy and the Economy*, *Volume 20*, 41-71. National Bureau of Economic Research, Cambridge, MA.

Ernst & Young. 2013a. "Macroeconomic analysis of a revenue-neutral reduction in the corporate income tax rate financed by an across-the-board limitation on corporate interest expenses." Prepared for the Build Coalition, July 2013.

Ernst & Young. 2013b. “Economic impact of tax proposals affecting research-intensive start-up businesses and qualified small business companies,” Prepared for the Coalition of Small Business Innovators (CSBI), July 2013.

Gale, William and Samuel Brown, 2013. “Small Business, Innovation, and Tax Policy: A Review.” *National Tax Journal* 66 (4), 871-892.

Gravelle, Jane G., 1994. *The Economic Effects of Taxing Capital Income*. The MIT Press, Cambridge, MA.

Gravelle, Jane G., 2011. “Reducing Depreciation Allowances to Finance a Lower Corporate Rate.” *National Tax Journal* 64 (4), 1039-53.

Hall, Bronwyn H., and Josh Lerner, 2010. “The Financing of R&D and Innovation.” In Hall, Bronwyn H. and Nathan Rosenberg (eds.), *Handbook of the Economics of Innovation*, *Volume 1*, 609-639.

Hall, Robert E. and Dale W. Jorgenson, 1967. “Tax Policy and Investment Behavior.” *American Economic Review* 57 (3): 391-414.

Hassett, Kevin A. and R. Glenn Hubbard, 2002. “Tax Policy and Business Investment.” In Auerbach, Alan J. and Martin Feldstein (eds.), *Handbook of Public Economics*, *Volume 3*, 1293-1343.

Joint Committee on Taxation, 2014. “Estimates of Federal Tax Expenditures for Fiscal Years 2014-2018.” JCX-97-14, Washington DC.

Mackie, James B. III, 2002. “Unfinished Business of the 1985 Tax Reform Act: An Effective Tax Rate Analysis of Current Issues in the Taxation of Capital Income.” *National Tax Journal* 55 (2), 293-337.

Marron, Donald B. 2014. “Tax Issues Facing Small Business.” Testimony before the Small Business Committee, United States House of Representatives.

Robb, Alicia M. and Joseph Farhat. 2013. "An Overview of the Kauffman Firm Survey: Results from 2011 Business Activities." Ewing Marion Kauffman Foundation, June 2013.

Robb, Alicia M. and David T. Robinson. 2012. "The Capital Structure Decisions of New Firms." The Review of Financial Studies 27 (1): 153-179.

Robb, Alicia M. and Robert Seamans. "The Role of R&D in Entrepreneurial Finance and Performance." Social Science Research Network, March 2014.

APPENDIX: THE URBAN-BROOKINGS TAX POLICY CENTER INVESTMENT AND CAPITAL MODEL

The Urban-Brookings Tax Policy Center's Investment and Capital Model (ICM) estimates the impact of tax policies on incentives to invest and save in the United States. The ICM combines detailed information about the personal and corporate income tax systems with disaggregated data on annual investment flows and the level of the capital stock from the Bureau of Economic Analysis (BEA), published tables from the Statistics of Income Division of the Internal Revenue Service (IRS), and aggregate financing and savings data from the Federal Reserve's Financial Accounts of the United States.

DATA SOURCES

Bureau of Economic Analysis: The BEA's fixed asset accounts include data on a) net stocks, b) investment, and c) rates of economic depreciation of the private nonresidential capital stock disaggregated into 62 detailed industry groups and 92 asset types (available at http://www.bea.gov/national/FA2004/Details/Index.html). BEA's 92 asset types are classified into 3 main categories: equipment, structures, and intellectual property products (including software, research and development, and entertainment and artistic originals). The BEA also provides similar (but less detailed) data on the residential capital stock and inventories.

Statistics of Income: IRS data are used to assign the capital stock by industry and asset type into entity type (C corporation, S corporation, partnership, sole proprietor) and add other information reported on tax returns (i.e., advertising, general business credits, etc.).

Federal Reserve: Financial Accounts data are used to estimate the distribution of marginal savings, based on economy-wide averages, by type of financial instrument (e.g., corporate debt, corporate equity, etc.).

CALCULATORS

A depreciation calculator maps BEA asset categories into MACRS and ADS classes based on IRS publication 946 (available at http://www.irs.gov/publications/p946/index.html) and calculates the time path and present discounted value of tax depreciation allowances.

The user cost of capital and marginal effective tax rate are then calculated for each industry and asset combination using formulas [1] – [4]. The user cost is calculated for inventories based on an assumed 50-50 split between last-in-first-out (LIFO) and first-if-first-out (FIFO) conventions. The METRs reported are weighted by BEA's estimates of net capital stocks in 2010.

MODEL PARAMETERS

The model for this paper abstracts from risk and assumes that nominal interest rates and after-tax returns to equity are equalized across firms and investment projects. The parameter values used in the baseline simulations are shown in Table A1.

TABLE A1. BASELINE PARAMETER VALUES

Parameter	Variable	Value
Tax rates on:		
Corporate income		35.0%
Pass-through income		30.0%
Interest income		27.5%
Equity income		20.0%
Nominal interest rate		6.0%
Required real rate of return to equity		6.5%
Inflation rate		2.0%
Fraction of income source subject to tax:		
Equity income		60%
Interest income (corporate)		60%
Interest income (pass-through)		80%
Fraction of investment financed by debt:		
Corporate sector		40%
Pass-through sector		30%

The Tax Policy Center is a joint venture of the
Urban Institute and Brookings Institution.

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