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Taxes and the macro economy*

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Abstract

My research with Furman (2018) assessed the 2017 U.S. tax reform and concluded that economic growth would be boosted by about 1 percent per year for 2018-19 and to a lesser extent for the following eight years. This forecast accorded well with realizations through the first quarter of 2019, but subsequent growth is slower, likely due to adverse effects from the ongoing trade war. Extensions from the previous research consider effects from businesses' choices of legal form between corporate and pass-through status. Corporate form conveys benefits from perpetual legal identity, limited liability, potential for public trading of shares, and ability to retain earnings. However, legal changes have enhanced pass-through alternatives, for example, through the invention of the S-corporation in 1958 and the improved legal status of LLCs (limited liability companies) at the end of the 1980s. Corporate form is subject to a time varying tax wedge, which offsets the productivity benefits. In a theoretical framework, with a distribution of firms' productivities associated with corporate and pass-through status, the tax wedge determines the fraction of firms that opt for corporate status, the level of economy-wide output (productivity), and the share of output generated by corporations. This framework underlies the empirical analysis of corporate shares of business economic activity. Long-difference regressions for 1968-2013 show that a higher tax wedge reduces the corporate share of gross assets. The corporate share also exhibits downward trends, likely reflecting underlying legal changes.

Key words: *corporate tax, corporation, partnership, LLC, productivity*

JEL classification: *H25, E60, L16*

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1. Introduction

Barro and Furman (2018), henceforth BF, assessed the effects of the 2017 U.S. tax reform on economic growth. The present paper reviews these findings and applies them more broadly to the macroeconomic effects of taxation. A focus of the analysis in this paper is the impact of the 2017 law and previous tax changes on businesses' decision to choose C-corporate versus pass-through legal status and how these changes in form impact productivity.

BF considered effects from changes in business and individual taxation. The bottom-line forecast was a boost to the growth rate of real GDP by 1.1 percentage point per year over 2018 19, the two years following the enactment of the tax law. Hence, with a baseline growth forecast of 2 percent per year in the absence of the tax reform, the projected growth rate for 2018-19 was 3.1 percent per year. Over the longer term, say from 2020-2028, the estimated growth effect was an increase by about 0.2 percentage point per year. Thus, with a baseline of 2.0 percent per year, the projected growth rate was around 2.2 percent per year.

The bulk of the predicted short-run growth response—say 2018-19—reflected the cuts in individual marginal income-tax rates. These effects were temporary for the growth rate but permanent for the level of real GDP. The comparatively small predicted rise in the long-run growth rate came from the cuts in business taxes, particularly those applying to C-corporations. These responses implied a gradual positive effect on the level of real GDP extending over 10 years and beyond.

After introduction, section 2 briefly discusses previous contributions. Section 3 deals with the methodology of which basis on BF paper. Section 4 provides results of empirical analysis which are more extensively discussed in section 5. Section 6 provides conclusions of the research.

2. Literature review

The main BF approach for gauging effects on businesses—C-corporations and pass-through enterprises (S-corporations, partnerships, sole proprietorships)—involved effects of the tax reform on the user cost of various types of capital. The analysis used the projected changes in user costs within a simple, calibrated neoclassical framework to gauge the long-run impacts of the tax changes on capital-labor ratios, output per worker, and the real wage rate. The underlying concept of user costs goes back at least to Keynes (1936, Ch. 11) and has since been employed in public and corporate finance by many economists, including Hall and Jorgenson (1967), who did not use the explicit term. The BF approach to user cost relied particularly on the conceptual framework of King and Fullerton (1984, Ch. 2). Other work that BF used includes Summers (1987) and Auerbach and Hassett (1992).

Given the projected long-run responses, the estimated shorter-run effects came from empirically estimated rates of convergence from the empirical literature on economic growth. Thus, for example, the analysis projected how capital and output per worker for C-corporations and pass-through businesses would evolve over a 10-year horizon starting in 2018.

A complementary empirical analysis used data on corporate-profits tax rates for about 80 countries in the context of cross-country growth regressions. The results from this approach turn out to be in the same ballpark as those derived from the analysis that derives long-run effects from a simple calibrated model and then derives short-run effects from estimated convergence rates. Thus, the regression results enhance the confidence in the estimates derived from a calibrated model.

BF assessed effects of the changes in individual income-tax rates on GDP growth by using empirical estimates from existing reduced-form time-series regression models. References here include Barro and Redlick (2011), Mertens and Ravn (2013), and Mertens and Montiel Olea (2018). According to the Tax Policy Center, the cut in the labor-income weighted average marginal income-tax rate contained in the 2017 law was substantial, 3.2 percentage points. BF lowered this estimate to 2.3 percentage points by factoring in the drastically reduced deductibility of state & local income taxes in the 2017 reform. This cut by 2.3 percentage points is substantially below the 4.5 points in the Reagan 1986 tax reform and 3.6 points in the Kennedy-Johnson tax cut of 1964 but is similar to the 2.1 point cut in the Bush 2003 tax package.

As noted in Barro (2019a), the BF forecast of U.S. real GDP growth at 3.1% per year for 2018 19 matched up very well with actual performance from the beginning of 2018 through the first quarter of 2019. Subsequently, however, the growth rate seems to have diminished, likely coming in at about 2% per year for the 2nd and 3rd quarters of 2019. As discussed in Barro (2019b), the likely reason for this slowdown is the trade war initiated by the Trump administration.

3. Methodology

3.1. C-Corporate and Pass-through Business Taxes

For C-corporations, the main effects of the 2017 tax reform on user costs—and, hence, on business investment—come from the cut in the tax rate, τ, on corporate net income (profits) and the increase in the degree of expensing, λ, used to calculated this taxable income. Public-finance economists seem to agree that, at least in a first-best situation, permanent 100% expensing is efficient because it matches the deductions from taxable income with the actual cash flows for buying equipment and structures and other forms of business capital. The 2017 law represents a partial movement toward this setup.

I focus the discussion here on the scenario in BF where the changes in the corporate tax law as of 2018 were unanticipated and permanent. In practice, some of these changes may be temporary; in fact, some elements of the changes had sunset provisions in the law as written. More generally, the path of future corporate and individual taxation depends on what future Congresses and Presidents decide on.

An argument for focusing on the law assuming that all of its provisions are maintained over time is that this approach best corresponds to "current policy," in the sense of the tax code currently in existence (say as of 2019). Further, for many provisions in the tax code, the assumption that current policy would be continued—even when sunset provisions were included in the law—has been an accurate predictor of future practice. As examples, the R&D tax credit was routinely extended on a "temporary" basis for more than three decades before being made "permanent" in 2015, and the alternative minimum tax was routinely patched and extended for many years until these fixes were made "permanent" in 2013. Moreover, about 80 percent of the Bush tax cuts of 2003 were made "permanent" under a Democratic President with a Democratic Senate in early 2013. This "provisions-permanent" assumption in BF corresponded to that used by the Tax Foundation (2017) but differed from the approaches of the Penn-Wharton Budget Model (2017) and the model of the Tax Policy Center (Page, et al., 2017). BF also considered an alternative scenario in which the tax changes were temporary, exactly as specified in the "law as written."

BF began by analyzing the impacts on the C-corporate user cost of capital for various forms of capital under the assumption that the provisions in effect in 2018 would continue forever. A simple calibrated neoclassical model was then used to derive long-run effects on capital-labor ratios, *K/L*, output per worker, *Y/L*, and the real wage rate, *w*. A parallel analysis applied to pass-through businesses and to the overall economy.

The baseline model assumes a Cobb-Douglas form of the production function:

$$Y_t = AK_t^{\alpha} L_t^{1-\alpha},$$

where Y_t is a firm's expected output, Kt is capital input, Lt is labor input, and the exponent satisfies $0<\alpha<1$. The parameter α corresponds to the capital share of income. The empirical application assumes five types of capital: equipment, structures, residential rental property, R&D intellectual property, and other intellectual property. Each form of capital enters with an exponent that gives its share of income. The analysis can also readily be extended to allow for a more general constant-elasticity-of-substitution production function.

Corporate cash flow is Y_t less wages, $w_t L_t$, less gross investment, $(K_t - K_{t-1} + \delta K_{t-1})$, less taxes, T_t, where δ is the true depreciation rate on capital. Taxes are the fraction τ

of taxable earnings, computed as Y_t less $w_t L_t$ less the fraction λ of gross investment. A flat-rate tax is a good approximation to U.S. corporate-profits taxation; that is, the graduation in the schedule for τ is not important.

Businesses chose inputs to maximize the expected present value of profit. The discount rate used for the present-value calculation is *rk*, the required expected real rate of return on capital (computed after corporate taxes but before individual taxes). This rate *rk* is set at a high value—empirically around 8 percent per year—to accord with the high observed average real rate of return on equity.

The analysis uses the same *rk* for all components of corporate cash flow. The risk characteristics of this overall net cash flow—for example, the correlation with overall business conditions—dictates which discount rate applies.

The formula for determining the long-run capital-labor ratio, *K/L*, comes from the equation of the marginal product of capital, MPK_t to the user cost, Ω:

$$MPK_t = \Omega = \frac{(1-\tau\lambda)}{(1-\tau)} \cdot \left(r_t^k + \delta\right), \tag{1}$$

where τ, λ, and δ are assumed constant. (The analysis in BF allows also for R&D tax credits and for tax deductibility of interest payments on corporate bonds.) The formula in equation (1) corresponds to equations worked out in King and Fullerton (1984, Ch. 2).

Given the form of the Cobb-Douglas production function in equation (1), the expression for capital's marginal product, *MPK*, is:

$$MPK_t = \alpha A \left(\frac{K_t}{L_t}\right)^{-(1-\alpha)}. \tag{2}$$

This approach neglects adjustment costs for investment and is likely to work well for a long-run analysis of the determination of K/L. More generally, the left side of equation (1) would be the marginal rate of return on investment, factoring in adjustment costs.

4. Empirical data and analysis

The key part of the analysis is the formula for the user cost, Ω, given on the right side of equation (1). This user cost is proportional to $r_t^k + \delta r_t^k + \delta$ and depends otherwise on the characteristics of the tax system. In particular, key aspects of the tax effects that work through Ω are:

$\lambda = 1$ (full expensing): no effect of τ on Ω.

$\lambda = 0$ gives the familiar formula $(1 - \tau)MPK_t = r_t^k + \delta$.

$\tau < 1$: Ω falls with λ.

$\lambda < 1$: Ω rises with τ.

$\lambda > 1$: Ω falls with τ. (That is, with more than full expensing, τ has a negative effect on user cost.)

The main calibration assumes *rk*=8% per year. This value is the average real rate of return on equity for a group of 11 OECD countries, including the United States, that have long-term data. (The data are an updated version of the information contained in Barro and Ursua [2008]). This observed rk is roughly stable over long periods.

The analysis treats rk as given even when corporate taxes change. This invariance property holds for real interest rates in the steady state of the standard neoclassical growth model (when the structure of individual income taxation is fixed) because of given time preference and intertemporal substitution. (See, for example, Barro and Sala-i-Martin [2004, Ch. 2]). That is, the long-run supply of capital is horizontal in this workhorse model.

Other models, such as the finite-horizon framework of Blanchard (1985), have an upward-sloping long-run supply of capital. In this case, a tax change that induces a long-term rise in *K/L* also implies an increase in the long run in rk. However, this pattern can go the opposite way if the time-preference rate falls when *K/L* rises; that is, if people are more patient when they are richer. The long-run constancy of rk (which seems roughly in accord with the data) is probably a good approximation.

The effective expensing rate, λ, is computed as the present value of applicable depreciation allowances and expensing, using *rk*=8% as the discount rate. The biggest change for expensing in the 2017 law is the introduction of full expensing for equipment. This provision applies to C-corporations and pass-through businesses. The analysis treats this change as permanent, although there are phase-outs specified in the law as written.

For structures, the biggest change in the 2017 law is the large cut in the C-corporate tax rate. Smaller cuts in individual tax rates apply for pass-through businesses. The analysis treats all of these changes as permanent, as in the law as written.

Table 1 (based on BF, Table 5) gives the C-corporate user costs for five types of capital in the baseline (pre-2018) tax system and in the system as of 2018. The C-corporate tax rate is 38% in the baseline and 26% in the new system. (These numbers factor in the federal tax rate on corporate profits along with estimates of average state-level tax rates on corporate profits.) The C-corporate user cost, Ω, falls by 10% for equipment (because of the move to 100% expensing) and by 11% for structures and residential rental property (because of the cut in the tax rate). The user cost for R&D intellectual property rises slightly (because of the reduced value of the bond interest exemption) and that for other intellectual property falls by 3%. On average (with each type of capital weighted by its income share), the user cost falls by 8%. The implied average increase in long-run *K/L* is by 13% (using capital-income share parameters, α, applicable to each type of capital). This expansion of *K/L* implies a rise in long-run output per worker, *Y/L*, by 5%.

Table 1: C-Corporate Responses to 2017 Tax Reform

	Baseline	New System
C-Corporate tax rate	0.38	0.26
	C-Corporate User Costs	
Equipment	0.19	0.17 (-10%)
Structures	0.14	0.12 (-11%)
Residential rental property	0.15	0.13 (-11%)
R&D intellectual property	0.18	0.18 (+1%)
Other intellectual property	0.30	0.29 (-3%)
Average (share weighted)		-8%
	C-Corporate capital stock & output	
K/L (share weighted)		+13%
Y/L		+5%

Note: These results are based on Barro and Furman (2018, Table 5).

Table 2 (based on BF, Table 9) has estimates for pass-through businesses. In this case, the baseline pass-through tax rate is estimated to be 35%, and the rate in the new system is 31%. The treatment of expensing/depreciation allowances is the same as for C-corporations. The result is that the legislation is predicted to raise the long-run average *K/L* by 8% and output per worker, *Y/L*, by 3%.

Table 2: Pass-Through & Overall Responses to 2017 Tax Reform

	Baseline	New System
	Pass-through business	
Pass-through tax rate	0.35	0.31
User costs (average, share-weighted)		-5%
K/L (share weighted)		+8%
Y/L		+3%
	Economy-wide responses	
Y/L		+3%
Y/L, allowing for shift toward C-corporations		+4%

Note: These results are based on Barro and Furman (2018, Tables 9 and 10).

Table 2 also has predictions for the overall economy. These results (related to BF, Table 10) are based on a breakdown of value added in the baseline setting of 39% for C-corporations, 36% for pass-through businesses, and 25% for a residual sector of government, households (exclusive of sole proprietorships), and non-profit institutions. For the purpose of incentives for investment, the last sector is assumed to be unaffected by the 2017 tax changes.

The result—when weighing the change in each sector's *Y/L* by its share of value-added—is that economy-wide output per worker, *Y/L*, is estimated to rise in the long run by 3%. In the underlying neoclassical framework, this rise in *Y/L* associates with an increase in the real wage rate, w, of the same magnitude, 3%. BF also worked through an alternative scenario that allowed for shifts in business legal structure from pass-through to C-corporate because of the change in the tax system, which favors C-corporate form. This analysis also allowed for a level difference in productivity associated with C-corporate legal structure. (This advantage is what implicitly motivates enterprises to adopt the C-corporate form, rather than a pass-through designation, despite the typical tax disadvantage.) With a 10% level difference in productivity, the predicted effect on long-run economy-wide *Y/L* became an increase by 4%.

Given the projected long-run (or steady-state response), the dynamics of real per capita GDP depends on the economy's rate of convergence toward its new steady-state position. Hence, BF based its dynamic projection on estimated convergence rates present in the growth literature (see Barro [2015]). Empirical cross-country research estimated that convergence took place at a rate around 2% per year, a value that has been dubbed the "iron law of convergence." However, this slow rate of convergence applies economy-wide to adjustments of capital broadly defined to include human capital and, perhaps, aspects of political institutions. In contrast,

the 2017 tax reform directly affected business physical capital. In this context, the rate of convergence should be faster. For example, with a physical capital share of income of 40%, the convergence rate predicted by a simple neoclassical model (as in Barro and Sala-i-Martin [2004, Ch. 1]) is around 5% per year. This rate of convergence implies that the level of per capita GDP would be up about 2% after 10 years. This response implies that the growth rate of per capita GDP would be increased over a 10-year period by 0.2 percentage points per year.

5. Results and discussion

5.1. Individual Income Taxes

As mentioned before, the Tax Policy Center estimates that the 2017 law lowered the labor-income-weighted average marginal income-tax rate for 2018 by 3.2 percentage points. This number was scaled down to 2.3 percentage points because of the reduced tax deductibility of state & local income taxes.

The results in Barro and Redlick (2011) (henceforth BR) and Mertens and Montiel-Olea (2018) (MM) were used to translate the change in the average marginal income-tax rate, AMTR, into effects on economic growth. The time-series regression results in BR (Table 2, cols. 1 and 4) imply that a permanent (unanticipated) cut in the AMTR by 0.01 raises the level of per capita GDP by 0.5% after 2 years. Thus, with the AMTR down by 0.023 for 2018, real GDP is projected to be up by 1.15% over two years, implying that the growth rate is higher by 0.6 percentage points per year for 2018-19. This effect is temporary on the GDP growth rate but permanent on the level of GDP.

The analysis in Mertens/Montiel and Olea (2018, especially Fig. 5) uses a structural vector auto-regression with instrumental variables (SVAR-IV). In this case, a cut in the AMTR by 0.01 is estimated to raise the level of real GDP by 1% after 2 years; that is, by twice as much as that estimated by BR.[2] The projections in BF averaged the MM results with those of BR to get a predicted boost to the GDP growth rate by 0.9 percentage points per year for 2018-19.

To summarize, BF estimated that the cut in business taxes would raise the GDP growth rate by 0.2 percentage points per year over 10 years, whereas the cut in the average marginal income-tax rate on individuals would boost the GDP growth

[2] However, in MM, the tax-rate effects on the level of GDP tend to be partly temporary because the tax changes themselves are estimated to be partly temporary. For example, the Reagan 1986 cuts in marginal income-tax rates were partially reversed by future tax-law changes and bracket creep. This dynamic effect was not considered by BF, which modeled the changes in the AMTR as permanent and unanticipated.

rate by 0.9 percentage points per year over 2 years and have no growth effect thereafter. Combining these results implies that the 2017 tax package would raise the GDP growth rate by 1.1 percentage points per year for 2018-2019 and by 0.2 percentage points per year for 2020-2028. The main two-year effect (0.9 points) comes from the cut in the marginal income-tax rate for individuals, with the remainder coming from the business tax cuts, especially those applying to C-corporations. Over the next 8 years, the projected rise in the GDP growth rate by 0.2 percentage points per year reflects solely the tax cuts for businesses (working through the expansionary effects on long-run levels of capital and output per worker).

5.2. Research on Business Legal Form and Productivity

Barro and Furman (2018) suggested potentially important effects from tax-induced changes in business legal form. In particular, the 2017 tax law motivated shifts from pass-through to C-corporate status because of the cut in C-corporate relative to pass-through tax rates. This section summarizes ongoing preliminary research with Brian Wheaton on tax effects on choices of C-corporate versus pass-through form of organization. A central part of the project is to assess the implications of the changing choices of legal form for economy-wide productivity.

Previous research on choices of corporate versus pass-through status includes Mackie-Mason and Gordon (1997) (henceforth MG), Goolsbee (1998), and Prisinzano and Pearce (2017). Following MG, suppose that firm i has productivity $A_c(i) > 0$ in corporate (meaning C-corporate) form and $A_n(i) > 0$ in non-corporate (pass-through) form. Firm i then opts for corporate form if

$$(1 - \tau_c)A_c(i) > (1 - \tau_n)A_n(i). \quad (3)$$

The proportionate productivity advantage (positive or negative) of corporate form for firm i is

$$a(i) \equiv [A_c(i) - A_n(i)]/A_n(i). \quad (4)$$

The condition for choosing corporate form in (3) can then be expressed as:

$$(\tau_c - \tau_n)/(1 - \tau_c) \equiv \tau \equiv \text{tax wedge}. \quad (5)$$

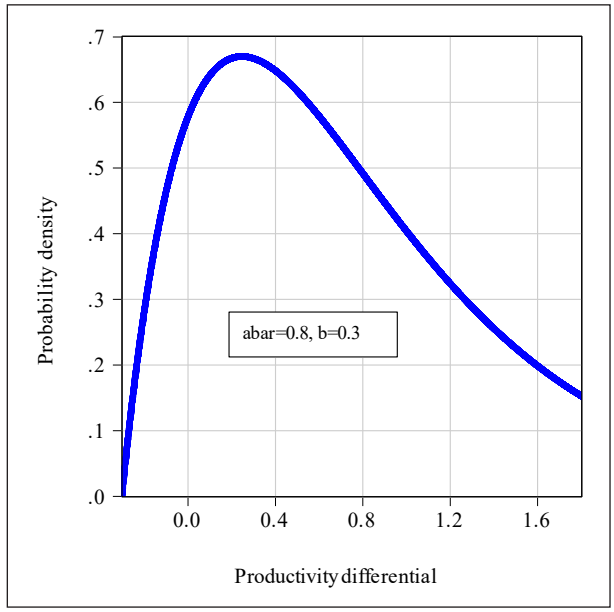
If tax rates are the same for all firms, the key matter for choices of legal form is the frequency distribution of the proportionate productivity advantage, a(i). (The analysis can readily be extended to allow also for a distribution of tax rates.) In the overall population of firms, the fraction opting to be corporate is one minus the cumulative density of a(i) evaluated at the cutoff τ.

A tractable representation for the distribution of a(i) is the first-order gamma, which is part of the family of exponential distributions. The specification is

$$f[a(i)+b] = \left\{\frac{4[a(i)+b]}{(\bar{a}+b)^2}\right\} \cdot exp\left\{\frac{-2[a(i)+b]}{(\bar{a}+b)}\right\}. \quad (6)$$

The parameter b (set at 0.3 in the main analysis) allows for negative values of a(i); that is, for the presence of some firms that have a productivity advantage in non-corporate form. The parameter $\bar{a}$ is the average value of a(i). To match the observation that many firms opt for C-corporate form despite high tax wedges, $\bar{a}$ has to be large—taken to be 0.8 in the main analysis. Figure 1 shows the graph of the probability density for a(i) with the assumed parameter values.

Figure 1: Probability Density for Gamma Distribution

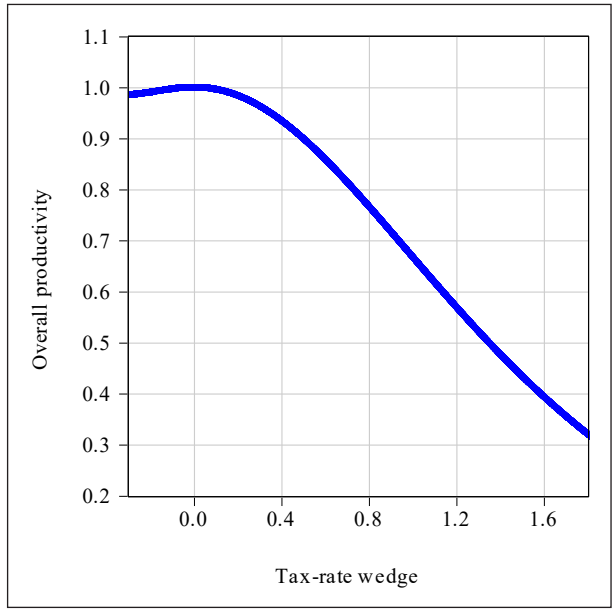


Note: The first-order gamma distribution is $f[a(i)+b] = \left\{\frac{4[a(i)+b]}{(\bar{a}+b)^2}\right\} \cdot exp\left\{\frac{-2[a(i)+b]}{(\bar{a}+b)}\right\}$.

The variable a(i) for firm i (positive or negative) is the proportionate productivity advantage of corporate over pass-through form. The parameter b (set at 0.3) is the maximum productivity advantage for pass-through form (corresponding to a(i)=-0.3). $\bar{a}$, set at 0.8, is the average of a(i); that is, the average productivity advantage for corporate form.

Figure 2 shows the implied relation of average output or productivity of firms as a function of the tax wedge, τ, as defined in equation (5).[3] Note that peak output (normalized to equal 1.0) corresponds to a zero tax wedge—that is, to neither a tax nor a subsidy on the form of legal organization. Beyond τ=0, output falls with τ.

Figure 2: Tax-Rate Wedge and Productivity

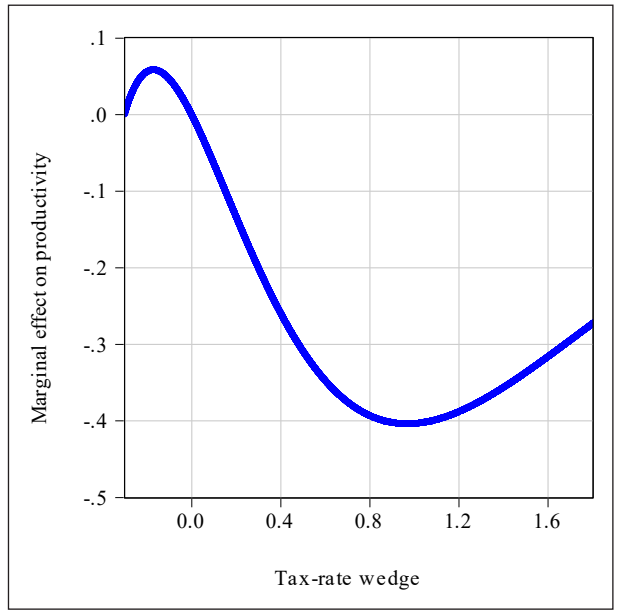


Note: The peak productivity level is normalized to 1.0. This peak occurs at τ=0 (not τ=-0.3).

[3] These calculations assume that the productivity increment, $a(i)$, is distributed independently of the baseline level of non-corporate productivity, $A_n(i)$. These results can be generalized; for example, to treat $A_c(i)$ and $A_n(i)$ as bivariate log-normal with a non-zero correlation.

Figure 3 gives the slope implied by Figure 2; that is, the marginal effect of τ on output or productivity (corresponding to the marginal excess burden from taxation). This marginal effect is negative for τ>0.

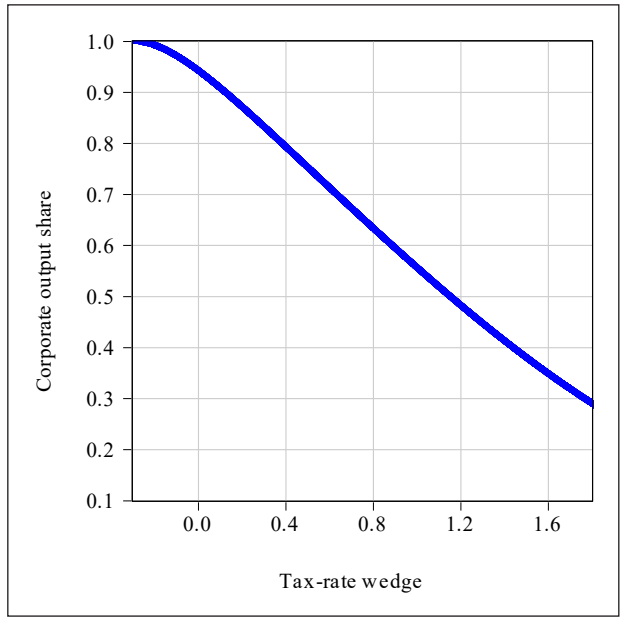
Figure 3: Marginal Effect of Tax Wedge on Productivity



Note: The graph shows the marginal excess burden associated with the tax wedge.

Figure 4 shows the implied share of output provided by the corporate sector. These values—which depend on the underlying parameters assumed in Figure 1—can be matched up with data relating to the share of economic activity originating in the corporate sector. Note that for values of τ in a realistic range—such as 0.1 to 0.6—the model's calculated corporate output share is between 70% and 90%, which accords well with some empirical measures used below.

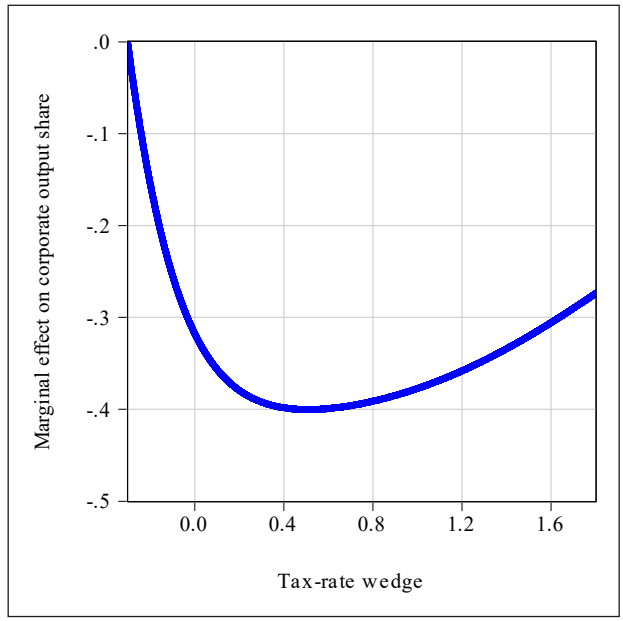
Figure 4: Corporate Share of Output



Note: This corporate share of output in the model can be matched up with data on corporate shares of economic activity. In the realistic range of tax wedges, from 0.1 to 0.6, the corporate share is between 0.7 and 0.9, roughly in accord with data.

Figure 5 corresponds to the slope implied by Figure 4. This marginal effect of τ on the corporate output share is roughly constant for realistic values of τ, say between 0.1 and 0.6. In this range (and given the underlying parameters assumed in Figure 1), this marginal effect turns out to be close to -0.4. The implication is that the coefficient in a regression of corporate share of economic activity on the tax wedge should be roughly constant—that is, a linear specification should be satisfactory—with a value around -0.4. Results discussed later accord roughly with this prediction.

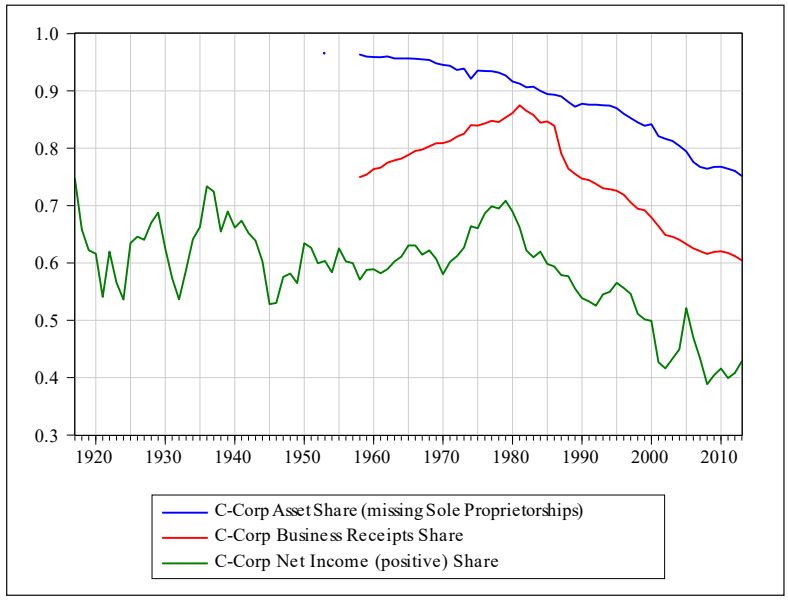
Figure 5: Marginal Effect of Tax Wedge on Corporate Output Share



Note: This marginal effect in the model should correspond to a regression coefficient in the relation between corporate share and the tax wedge. In the relevant range of tax wedges, roughly 0.1 to 0.6, the marginal effect is nearly constant at around -0.4.

Figure 6 shows available empirical measures for the United States of the C-corporate share of business activity. These data, available up to 2013, come from IRS Statistics of Income.

Figure 6: C-Corporate Shares of Economic Activity



Note: Data are from IRS *Statistics of Income*.

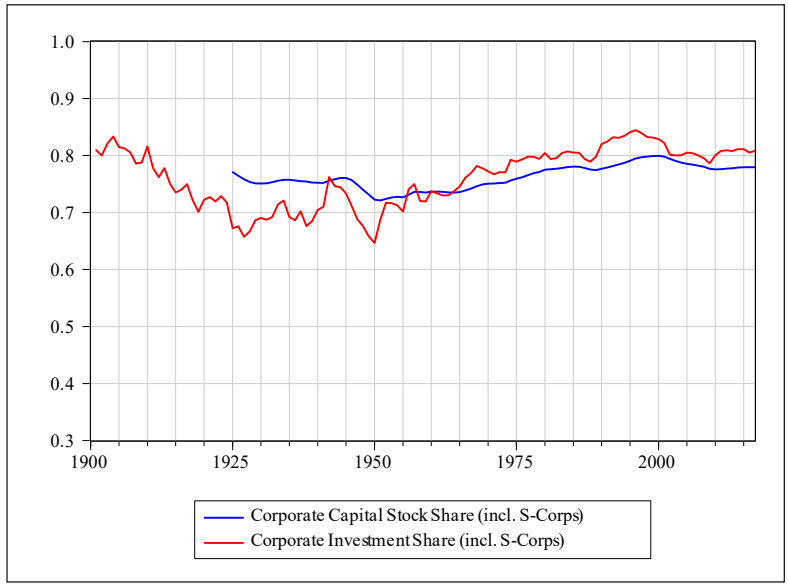
The upper graph in Figure 6 is the C-corporate gross asset share, measured out of a universe that includes S-corporations and partnerships (but excludes sole proprietorships, for which the IRS lacks asset data). Note that assets are a gross concept, since they are mostly matched by liabilities on the opposite side of businesses' ledgers. These data are available for 1953 and for 1958-2013. The C-corporate asset share is over 90% from the mid 1950s through 1984, then falls fairly steadily to 75% in 2013. This asset-share concept was used in the empirical analysis by Mackie-Mason and Gordon (1997).

The middle graph in Figure 6 is the C-corporate share of business receipts. This concept of economic activity, available for 1958-2013, is also gross in the sense of not netting out purchases of intermediate goods and materials from other businesses. This measure of C-corporate share shows a rise from 75% in 1958 to 87% in 1981, followed by a decline to 60% in 2013. The downward trend since the late 1980s is similar to that shown for assets.

The lower graph in Figure 6 is the C-corporate share of positive net income. This measure, available for 1917-2013, is highly volatile because of the strong sensitivity of the various forms of business net income to the business cycle. The C-corporate share of overall net income is even more volatile because of the extreme sensitivity of negative net income to business conditions. The share of positive net income shown in the figure has no clear trend through the mid 1980s, but then falls from 62% in 1984 to 43% in 2013. The net income share concept was used in the empirical analysis of Mackie-Mason and Gordon (1997) and Prisinzano and Pearce (2017).

Figure 7 shows data from the U.S. Commerce Department (BEA) on the corporate share of business gross investment and capital stock. The investment data, available from 1901 to 2017, are based on a concept of corporations that combines pass-through S-corporations (originating in 1958) with C-corporations. The corporate share of gross investment shows no clear trend, especially since the mid 1970s. This share varies only between 79% and 84% from 1974 to 2017. The BEA also reports the corporate share of capital stock, based on a perpetual-inventory method. However, these data are problematic because they do not pick up, in a timely way, the effects on business ownership of stocks of capital that arise from changes in ownership; for example, when a business shifts status from C-corporation to partnership (likely LLC) or vice versa. In the data, these ownership changes do not show up contemporaneously as shifts in ownership of capital stocks—that get reflected only over time when investment outlays are associated with the new form of ownership.

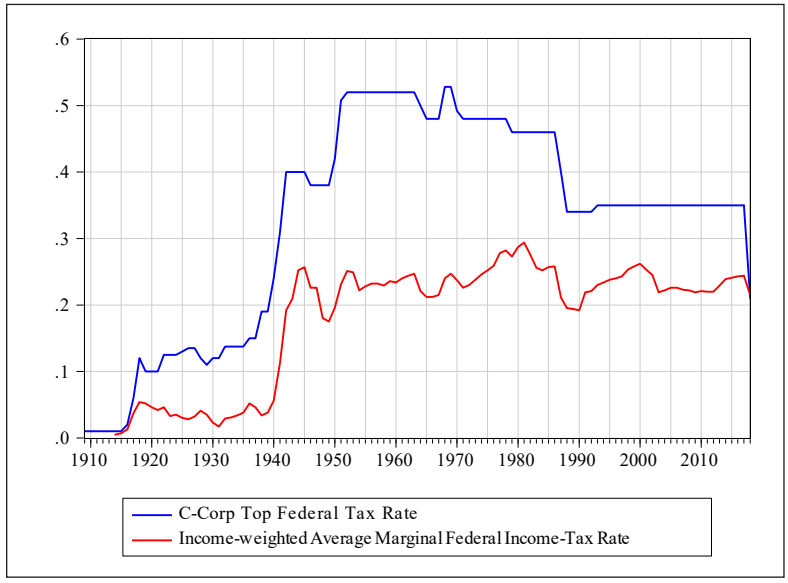
Figure 7: Corporate Shares of Business Investment and Capital Stock



Note: Data are from Bureau of Economic Analysis (BEA).

Figure 8 has two important components of the tax wedge, τ, between C-corporate and pass-through ownership. The upper graph is the top federal tax rate on C-corporate profits. The lower graph is the labor-income weighted average marginal tax rate in the individual federal income tax.

Figure 8: Federal C-Corporate & Individual Tax Rates



Note: Data on top federal rate on C-corporate profits are from IRS, *Statistics of Income Bulletin*, Fall 2003. Recent data are from IRS.gov. Data on average marginal federal income-tax rates are from Barro and Redlick (2011) and Tax Policy Center.

For measuring the C-corporate tax rate, τc, the main omission in the upper graph of Figure 8 concerns taxes levied on dividends and capital gains. However, because of retention of earnings, there tend to be long gaps between accrual of corporate net income and realization of dividend payouts. Also, owners of dividend-paying corporate stock tend to be selected for low tax rates on dividends. Capital gains can reflect cumulations of retained earnings within a corporation, but realizations of these gains tend to be deferred substantially by individuals, thereby implying low effective rates of taxation.

The pass-through tax rate, τn, corresponds to marginal income-tax rates applicable to high-income individuals who are potentially owners of pass-through businesses. The labor-income weighted average marginal individual federal tax rate in the lower graph of Figure 8 is an approximation to this measure.

Table 3 has regressions for the C-corporate share of business assets. The sample period is 1968-2013, and the dependent variable is the 10-year difference in the C-corporate asset share (see the data in the upper graph of Figure 6).[4] The only regressors in the first regressions are a constant (which corresponds to a trend in the C-corporate share) and the 10-year changes in the tax-rate variables: the top federal tax rate on C-corporate profits and the AMTR for the federal individual income tax (see Figure 8). A year variable is added subsequently to allow for a quadratic trend. Newey-West standard errors are calculated to allow for the serial dependence created by the overlapping 10-year differences of the dependent variable.

Table 3: Regressions for C-Corporate Share of Business Assets, 1968-2013

	(1)	(2)	(3)	(4)
	Specification 1		Specification 2	
Independent variable				
Constant (trend)	-0.0521*** (0.0063)	-0.0231*** (0.0057)	-0.0508*** (0.0063)	-0.0225*** (0.0048)
C-corporate top federal tax rate	-0.164*** (0.048)	-0.080** (0.038)	-0.319*** (0.106)	-0.171** (0.067)
AMTR federal individual income tax	0.220*** (0.050)	0.108** (0.050)	0.387*** (0.087)	0.205*** (0.074)
Years since 1968 (quadratic trend)	--	-0.00103*** (0.00020)	--	-0.00105*** (0.00018)
p-value for equal magnitude of tax coefficients	0.0001	0.071	0.10	0.21
R-squared	0.47	0.79	0.45	0.81
s.e. of regression	0.0155	0.0099	0.0158	0.0095

***Significant at 1%, **significant at 5%, *significant at 10%.

Note: Dependent variable is C-corporate share of business assets (upper graph in Figure 6). C-corporate top federal tax rate, τ_c, and AMTR for federal individual income tax, τ_n, are in Figure 8. Variables are 10-year differences. Standard errors, shown in parentheses, are calculated from Newey-West method with 10-year bandwidth. Specification 1 uses $\tau_c /(1 - \tau_c)$ and $\tau_n /(1 - \tau_n)$ as the tax variables. Specification 2 uses τ_c and τ_n.

In specification 1 of Table 3, the tax wedge is computed from equation (5) as $\tau = (\tau_c - \tau_n) /(1 - \tau_c)$. The two parts of $\tau - \tau_c /(1 - \tau_c)$ and $\tau_n /(1 - \tau_c)$ – are entered separately into the regressions, thereby allowing for tests of equality of the

[4] Goolsbee (1998) says that he used these BEA data on corporate share of capital stock. However, he actually used, apparently because of confusion with the BEA table headings, the data on corporate share of gross investment. Thus, inadvertently, Goolsbee avoided the conceptual problem associated with the BEA measure of ownership of capital stock.

magnitudes of the coefficients. Specification 2 uses the simpler tax-wedge expression, $\tau = \tau_c - \tau_n$.

In Table 3, the estimated coefficients in specification 1 (column 2) are -0.164 (s.e.=0.048) on the variable based on the C-corporate tax rate and 0.220 (0.050) on that based on the individual AMTR. In specification 2 (column 3), the estimated coefficients are -0.32 (0.11) on the C-corporate tax rate and 0.39 (0.09) on the AMTR. The fits of the two specifications are similar. Note that the signs of the estimated coefficients are correct—negative on the corporate tax rate and positive on the individual AMTR. The magnitudes of the coefficients should be equal, and they are close. At a 5% critical level, the hypothesis of equality is rejected in the first specification (p=0.0001) and accepted in the second (p=0.10).

The coefficient magnitudes, estimated at around 0.2 in specification 1 and 0.35 in specification 2, should correspond to the model-based marginal effect shown in Figure 5. That magnitude is 0.36-0.40 in the relevant range of τ (given the parameters assumed in Figure 1). Therefore, the regression results are in the ballpark of the results generated from the calibrated model. However, in this context, specification 2 works better than specification 1.

The estimated trend in the C-corporate asset share in Table 3 is significantly negative, as reflected in the constant terms in columns 1 and 3. These findings accord with the clearly visible trend in the upper graph in Figure 6. The trend could pick up shifts of the economy out of sectors, including manufacturing, in which the C-corporate legal form has the highest productivity advantage. The trend could also reflect the gradually improved legal status of pass-through alternatives. For example, S-corporations with limited liability began in 1958, although this ownership form is heavily restricted with respect to numbers and types of shareholders. Master limited partnerships, which began in 1981, allow limited liability and public trading of shares for limited partners, but only for enterprises operating in specified activities related to energy (though Blackstone managed to qualify as an MLP). Attractive forms of partnerships with limited liability—LLCs—became widespread after their tax status (partnership treatment) was clarified by the IRS in 1988. However, explanations of the trends based on changes in the economy-wide composition of output or in legal changes for pass-throughs may not work because the trends in corporate shares look different with alternative measures of corporate share of economic activity—for example, there is little trend in the corporate share of gross investment in Figure 7.

Columns 2 and 4 of Table 3 add a year variable, which allows for a quadratic trend (as in the specifications of Mackie-Mason and Gordon [1997]). This year variable is significantly negative, meaning that the negative trend in the C-corporate asset share intensified over time since 1968. This pattern can be discerned in the upper graph of Figure 6, but the underlying source of this quadratic trend is unclear.

Reassuringly, even with the quadratic trend, the pattern of estimated coefficients on the tax-rate variables is similar to before, although the magnitudes of the estimated coefficients are smaller. The hypothesis of equal magnitude coefficients related to the C-corporate and individual tax rate variables are now accepted in each specification at the 5% critical level. These results suggest that the effects of tax rates may be well identified even though the source of the underlying trends has not yet been related to changes in economic and legal fundamentals.

The main estimated historical effects of tax rates on the C-corporate share of economic activity can be summarized by considering the major tax changes that have occurred since 1960. In Table 4, τ_c corresponds to the federal tax rate on C-corporate profits and τ_n to the average marginal tax rate from the federal individual income tax—see Figure 8. These values imply a tax wedge, $\tau=(\tau_c - \tau_n)/(1 - \tau_c)$, from equation (5). The values shown for economy-wide productivity are those given by the calibrated model in Figure 2.

Table 4: Estimated Productivity Effects from Major Historical U.S. Tax Changes

• 1960, $\tau_c = 0.52$, $\tau_n = 0.234$, $\tau = 0.60$, productivity = 0.861;
• 1986, $\tau_c = 0.46$, $\tau_n = 0.258$, $\tau = 0.37$, productivity = 0.943, up 9.5%;
• 1988, $\tau_c = 0.34$, $\tau_n = 0.195$, $\tau = 0.22$, productivity = 0.981, up 4.0%;
• 2017, $\tau_c = 0.35$, $\tau_n = 0.244$, $\tau = 0.16$, productivity = 0.990, up 0.9%;
• 2018, $\tau_c = 0.21$, $\tau_n = 0.215$, $\tau = -0.01$, productivity = 1.000, up 1.0%.

Note: τ_c equals the top federal corporate tax rate and τ_n equals the federal average marginal income-tax rate for individuals—see Figure 8. The tax wedge, τ, is calculated from equation (5). The correspondence between τ and the economy's overall productivity comes from Figure 2.

In 1960, the C-corporate tax rate, $\tau_c = 0.52$, was well above the pass-through rate, $\tau_n = 0.23$, so that the tax wedge, τ, was very high, 0.60. Correspondingly, estimated productivity, based on the underlying model, was 86% of its potential peak, corresponding to $\tau = 0$. Then, up to 1986, τ_c fell to 0.46, while τ_n rose to 0.26—both changes contributed to a fall in the tax wedge, τ, which reached 0.37. The model implies a cumulative tax-induced rise in productivity by a substantial 10%; that is, by 0.4 percentage points per year from 1960 to 1986.

The Reagan 1986 tax reform, applying between 1986 and 1988, is well-known to have lowered individual marginal income-tax rates. However, the fall in the corporate rate, to $\tau_c = 0.34$, more than offset the fall in τ_n to 0.20, so that the tax wedge, τ, fell further, to 0.22. The model implies another expansion of productivity, in this case by 4%.

From 1988 to 2017, τ_c was virtually unchanged, but τ_n rose back to 0.24, as the Reagan tax changes were substantially undone. Therefore, the tax wedge, τ, fell further, to 0.16. The model implies an additional expansion of productivity, by 1%.

Finally, in 2018, the large cut in τ_c, to 0.21, more than offset the fall in τ_n, which reached 0.22. Consequently, the tax wedge, τ, became negative, -0.01, for the first time. However, because τ was already comparatively low, 0.16, by 2017, the further boost to productivity was only another 1%.

6. Conclusions

The Tax Cuts and Jobs Act enacted in the United States in 2017 cut tax rates for C corporations, expanded expensing for business equipment, and cut marginal tax rates in the individual income tax. When the provisions in place for 2018 are treated as permanent, the calibration of a neoclassical model implies that output per worker rises in the long run by around 5 percent for C-corporations, 3 percent for pass-through businesses, and 4 percent for the overall economy. Over 10 years, the estimated increase in the growth rate of per capita GDP is about 0.2 percentage points per year. The cut in individual marginal income-tax rates has a larger estimated short-run effect on economic growth, 0.9 percentage points per year over 2018–2019. Hence, the main short-run growth response involves the individual income tax, and the main long-run response involves business taxes.

The estimates take into account tax-induced shifting of business legal form between C corporate and pass-through status. Since 1960, there has been a large drop in a measure of the tax wedge between the C corporate form and the pass-through form—which has fallen from 60% in 1960 to 37% in 1986, 22% in 1988, 16% in 2017, and 0% in 2018. At the same time, there has been a marked negative trend in the C-corporate share of economic activity, likely reflecting legal changes that made pass-throughs (notably LLCs) more attractive.

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Porezi i makroekonomija

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Sažetak

Zajedno s Furmanom (2018.) proveli smo istraživanje američke porezne reforme za 2017. godinu i zaključili da će se gospodarski rast povećati za oko 1 posto godišnje tijekom 2018. i 19. godine, a u manjem opsegu za sljedećih osam godina. Ova je prognoza bila u skladu s realizacijama tijekom prvog tromjesečja 2019. godine, ali kasniji je rast sporiji, vjerojatno zbog štetnih učinaka tekućeg trgovinskog rata. Prethodno istraživanje je prošireno i proučava učinke poslovnih izbora zakonske forme između korporativnog i prolaznog statusa. Korporativni oblik donosi koristi od trajnog pravnog identiteta, ograničene odgovornosti, potencijala za javno trgovanje dionicama i mogućnosti zadržavanja zarade. Međutim, zakonske promjene omogućuju prolazne alternative, na primjer, izumom S-korporacije 1958. godine i poboljšanim pravnim statusom LLC-a (društva s ograničenom odgovornošću) krajem 1980-ih. Korporativni oblik podložan je vremenskom pomaku poreznog opterećenja koje se podmiruje iz ostvarene dobiti. U teoretskom okviru, s raspodjelom produktivnosti poduzeća povezanih s korporativnim i prolaznim statusom, porezni klin određuje udio poduzeća koja se odlučuju za korporativni status, razinu proizvodnje (produktivnosti) u cjelokupnom gospodarstvu i udio proizvodnje koji generiraju korporacije. Taj se okvir temelji na empirijskoj analizi korporativnih udjela u gospodarskoj djelatnosti. Regresija u vremenskim serijama za period od 1968.-2013.godine pokazuje da veći porezni klin smanjuje udio u bruto aktivi. Korporativni udio također pokazuje trendove smanjenja, što vjerojatno odražava temeljne zakonske promjene.

Ključne riječi: *porez na dobit, korporacija, partnerstvo, društvo s ograničenom odgovornošću- LLC, produktivnost*

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