Taxes, Incorporation, and Productivity[1]

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Abstract

U.S. businesses can be C-corporations or pass-throughs in the forms of S-corporations and partnerships. C-corporate form confers benefits from perpetual existence, limited liability, public trading of shares, and the ability to retain earnings. However, this form is typically subject to a tax wedge, which has diminished since the 1960s. In our formal model, firms' productivities under C-corporate and pass-through form are distributed as bivariate log-normal, and the tax wedge determines the fraction of firms opting for C-corporate form, the level of output (business productivity), and the C-corporate share of output. This framework underlies our empirical analysis, wherein long-difference regressions for 1978-2013 show that a higher tax wedge reduces the C-corporate share of net capital stock and gross assets. The quantitative model implies productivity growth due to changing legal form of 0.46% per year from 1968 to 2013. This result reflects partly tax-induced changes in legal status and partly exogenous improvements in the "quality" of pass-through organization. The last channel involves legal changes that include the invention and refinement of the S-corporation and, especially, the limited liability company (LLC).

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1. Introduction

All U.S. businesses face a key decision: to incorporate or not to incorporate. That is, a business can choose to be a C-corporation, which exists as a separate legal entity from its owners and pays corporate taxes on business income. Alternatively, a business can choose to be a pass-through entity—an S-corporation or a partnership—which passes its earnings through to its individual owners, who then pay personal taxes on that income.

In a recent analysis of the 2017 U.S. tax reform, Barro and Furman (2018) focus on its productivity implications, considering the incentives of businesses to invest in capital within a given legal form of organization. That analysis also considered in a preliminary way the effects of tax changes on chosen legal form and, thereby, on productivity. We build on this analysis by observing that, if C-corporate form typically confers productivity advantages relative to pass-through form, then systematic shifts in the preferred legal form could have substantial effects on overall productivity.

The tax wedge—the difference between the C-corporate tax rate (including taxes on corporate profits and dividends) and the personal tax rate—is one factor that affects choices of business legal forms. An individual business trades off this wedge against the productivity advantages typically conferred by C-corporate form. These benefits include a distinct and perpetual legal status, which prevents fractionalization of capital over long horizons; the option for public trading of shares; limited liability of owners; and the allowance for retention of earnings. However, legal changes have substantially changed the benefits associated with pass-through status—notable here are the inventions of the S-corporation in 1958 and the limited liability company (LLC) in 1977. Probably most important are the IRS ruling in 1988 that allowed LLCs to be taxed as partnerships and the enactment of laws permitting LLCs in all 50

states from 1988 to 1996. For a discussion of the history of LLCs, see Hamill (2005).

We use these ideas on the tax wedge and the benefits of C-corporate versus pass-through status in a model of the business-form decision faced by owners. We use this model as the framework for obtaining regression evidence on the extent of business-form switching. We then use the quantitative model to infer effects on productivity related to choices of legal form of organization. Our estimate is that the changing form of business organization accounts for growth in business productivity of 0.46% per year from 1968 to 2013. This estimate reflects partly the movement toward C-corporate form because of the sharp fall in the tax wedge. More important, however, are the exogenous improvements in the "quality" of pass-through organization, likely due to legal changes that include the invention and refinement of the S-corporation and the LLC. These changes account for the strong shift away from C-corporate and toward pass-through status, especially in the form of LLCs.

2. The Tax Wedge and Choices of Legal Form of Organization

2.1 Basic Framework

The seminal work studying the choice between C-corporate and pass-through form is Mackie-Mason and Gordon (1997), who studied empirically the determinants of the C-corporate shares of gross assets and net income. Prisinzano and Pearce (2018) update this type of research and provide an overview of the field.

The basic framework, following Mackie-Mason and Gordon (1997), is simple and intuitive. Let $Y_c(i) > 0$ and $Y_p(i) > 0$ denote output (or productivity) in corporate (that is, C-corporate) and pass-through form, respectively. Let $\tau_c < 1$ and $\tau_p < 1$ denote the respective tax rates, treated here as proportional to output. A firm will choose corporate status if the after-tax income is higher in that form:

(1) $$(1-\tau_c)Y_c(i) \geq (1-\tau_p)Y_p(i).$$

With simple algebra, this expression can be re-written as

(2) $$y(i) \equiv \log\left(\frac{Y_c(i)}{Y_p(i)}\right) \geq \log\left(\frac{1-\tau_p}{1-\tau_c}\right) \equiv \tau,$$

where τ is the relevant tax wedge. In other words, if the wedge τ is positive, a business has to enjoy at least the offsetting proportionate productivity advantage, *y(i),* in order to prefer corporate form. If the magnitudes of τ_c and τ_p are much less than one, then $\tau \approx \tau_c$-τ_p. More generally, τ rises with τ_c and falls with τ_p.

If the tax rates are the same for all firms, the key determinant of choices of legal form is the frequency distribution of the proportionate productivity advantage, *y(i).*[2] In the overall population of firms, the fraction opting to be corporate is one minus the cumulative density of *y(i)* evaluated at the cutoff τ. At a point in time, when the frequency distribution of the *y(i)* is fixed, a higher τ translates into a smaller fraction of firms opting for corporate status. However, if the legal treatment of pass-throughs improves (as is important in the U.S. history), then the fraction opting to be corporate falls for a given τ.

2.2 Data on the Tax Wedge

Before laying out and calibrating our model of the productivity consequences of the tax wedge or estimating the related regressions, we first require data on the tax wedge. Although the business-form choice involves a discrete amount of income accruing in one form or another, the income in each case is "marginal" with respect to other forms of income that business owners have. For example, C-corporate shareholders and partners in a partnership are likely to have

[2]More generally, the distribution of the *τ(i)* also matters. However, as discussed in Barro and Wheaton (2019), bringing in this consideration does not change the main results.

labor income and other types of asset income. For this reason, the relevant tax rates τ_c and τ_p correspond more closely to marginal rates than average rates.

Starting with τ_c, we consider two key aspects of C-corporate taxation at the federal level: the corporate-profits tax and the dividend tax. Figure 1 shows τ_{prof}, the top federal tax on C-corporate profits. The use of the top rate ignores the graduation in the corporate tax schedule from 1937 to 2017, but the average marginal tax rate (AMTR) on C-corporate income turns out to be close to the top rate in all years.

C-corporate income is double-taxed in the United States, with owners paying taxes on dividends and capital gains. Dividend payouts and hence dividend taxes can be deferred by corporate retention of earnings. This retention leads to increased stock prices, which result in capital-gains taxes if owners choose to realize their gains. However, in a reasonable baseline setting, retained earnings affect the timing of dividends but not their present value. Or, to put it alternatively, the present value of capital gains and losses created by retentions equals zero. In this context, we can neglect capital-gains taxes as an approximation.

Another well-known point is that double-taxation of C-corporate income can be mitigated by replacing dividends with stock repurchases. Despite this option, C-corporations typically pay dividends, and the tax rate on these payments should enter into the overall C-corporate tax rate. This calculation involves the tax status of shareholders with regard to dividend income. In this context, Rosenthal and Austin (2016, Figure I) document a large and increasing share of U.S. corporate stock held by entities that have zero or low tax rates, including retirement plans, non-profits, and foreigners (whom they treat as non-taxable). Our analysis assumes that the fraction of foreign holdings held in taxable form equals that of domestic holdings. In that case (when we also use data from Poterba [2004, Table 1]), we get the series for the estimated fraction of U.S.

corporate stock held in taxable form as the red graph in Figure 2. This fraction declined from 88% in 1958 to 30% in 2015. We assume that this share for ownership of corporate stock applies to the share of dividends accruing to taxable entities.

We constructed a dividend-income-weighted average marginal federal income-tax rate on dividends (or dividend AMTR), a concept that parallels one used in previous research for the labor-income-weighted average marginal tax rate (described in Barro and Sahasakul [1983] and Barro and Redlick [2011]). Before the sharp cut in the qualified-dividend tax rate in 2003, the dividend AMTR, shown by the blue graph in Figure 2,[3] is higher than the labor-income-weighted AMTR, which appears in Figure 3 (red graph).

To measure the dividend tax rate, τ_{div}, we multiplied the fraction of corporate stock held in taxable form (red graph in Figure 2) by the dividend AMTR (blue graph) to get the green graph.[4] In the theory, the contribution of C-corporate taxation to the tax wedge, τ, in equation (2) should enter as $\log(1-\tau_c) = \log(1-\tau_{prof}) + \log(1-\tau_{div})$, where τ_{prof} is from Figure 1 and τ_{div} is the green graph from Figure 2.

Turning now to the pass-through tax rate, τ_p, we focus on S-corporations and partnerships. We thereby exclude sole proprietorships, for which data on measures of economic activity are less available. S-corporate and partnership incomes are reported on IRS Form 1040, Schedule E. By using information provided by Dan Feenberg from the National Bureau of Economic Research's TAXSIM program, we were able to measure the Schedule E income-weighted average marginal tax rate (AMTR) on Schedule E income from 1962 to 2012. This calculation

[3]The data for 1960-2012 were provided by Dan Feenberg, based on the National Bureau of Economic Research's TAXSIM program. The value for 2013 was unavailable and was assumed to equal that for 2012. Values before 1960 were estimated by Tatjana Kleinberg, using issues of IRS, *Statistics of Income, Individual Income Tax Returns*. A similar measure of the dividend AMTR (but including state income taxes) appears in Poterba (2004, Table 1).
[4]The assumption here is that taxable foreign stock holdings face the same marginal tax rate on dividends as that on domestic holdings.

first computes the additional federal tax on a sampled return generated by a small hypothetical increment to Schedule E income, holding constant other income and deductions.[5] The individual marginal tax rates are then averaged using Schedule E income as weights. This income excludes portfolio income passed through to partners. To get close to the incomes derived from ownership of S corporations and partnerships, we excluded amounts reported on Schedule E for rents, royalties, and estates & trusts. The resulting Schedule E AMTR is shown as the blue graph in Figure 3.

Figure 3 also shows two series that serve as comparisons for the Schedule E AMTR. The red graph is the federal AMTR used in earlier research, based on labor income. This series comes from Barro and Sahasakul (1983), Barro and Redlick (2011), and the Tax Policy Center. The green graph is the top marginal federal rate on earned income, which is distinguished from ordinary income for 1971-1981.

Finally, Figure 4 combines the corporate and pass-through data, computing the series for the overall tax wedge. This wedge is given by $\tau = -\log(1-\tau_c) + \log(1-\tau_p)$.

3. A Formal Model of Choice of Business Legal Form

In Barro and Wheaton (2019), we work out a formal model that includes the frequency distribution of the corporate productivity advantage, $y \equiv \log(\frac{Y_c}{Y_p})$, which appears in equation (2). This analysis applies at a point in time, which features a given legal/regulatory framework applying to C-corporations and pass-through alternatives. Over time, changes in laws and regulations can shift the entire distribution of y. Implicitly, we are also holding constant the structure of production across sectors. Changes in this composition can affect the distribution

[5]The assumption is that the additional amount is "earned income," which matters for the top income-tax rate from 1971 to 1981. The additional tax includes self-employment tax.

of y. For example, corporate form may be more useful in some types of business—such as those with larger scale benefits or greater dependence on credit markets—than in others.

The model assumes that $log(Y_c)$ and $log(Y_p)$ are distributed bivariate normal with respective means and standard deviations of μ_c, σ_c, μ_p, and σ_p and a correlation coefficient between the two random variables of ρ. The fraction of firms that opt to be pass-through is the cumulative normal value for y corresponding to the cutoff τ, and the fraction corporate is one minus this cumulative normal value. The challenging part of the model is to derive the impact of τ on overall output (productivity) and the fraction of this output generated by the corporate sector.

The quantitative results involve the five parameters μ_c, σ_c, μ_p, σ_p, and ρ. We calibrate the model by specifying values for these parameters.[6] This calibration is informed by observations about the distribution of productivity across businesses and on data, discussed below, on the C-corporate share of economic activity at various points in time. One reason for carrying out this calibration is to construct hypotheses concerning reasonable ranges for estimated regression coefficients. Another reason is that the calibrated model allows us to make inferences about how overall productivity responds to changes in τ or to shifts in the underlying parameters, especially μ_p, which reflects the attractiveness of pass-through status.

Figures 5-7 depict some of the model's results for specified parameter values. In each case, the graphs show the effects from a change in τ while holding constant these parameters. Two graphs are displayed in each case, one corresponding to 1978 (the start date of our regression sample) and the other to 2013 (the final date of the sample). The difference in the two cases is only the assumed value of the parameter μ_p, related to the average productivity of pass-

[6]One parameter can be eliminated through a normalization. We select values that deliver a level of output of 1.0 when τ=0 in a selected year, which we took to be 1978.

through status. This parameter is chosen for each year so that the model matches the observed share of the C-corporate sector in overall business activity in that year. (We use here the share data, described below, for net capital stock.) Because the observed share of the C-corporate sector is much lower in 2013 than in 1978 (after holding constant the effects from differences in τ), the assumed value of the parameter μ_p is much higher in 2013. We view this change in μ_p as reflecting legal changes that enhanced the benefits of pass-through form of legal organization.

Figure 5 shows the relation of overall output (business productivity) to the tax wedge, τ. Note that the curve for 2013 is uniformly above that for 1978—because the associated value of μ_p is higher in 2013. We focus, for each curve, on a range for τ between 0.1 and 0.5—this range applies in Figure 4 to our main regression sample, from 1978 to 2013. Because the only distortion in the model is this tax wedge, the maximum of output occurs for both curves at $\tau=0$. When $\tau>0$, output falls as τ rises. Note that we are implicitly using the revealed preference of business owners to infer the effects of τ on output. Specifically, when $\tau>0$, a firm opts to be corporate only if the productivity advantage associated with this legal form is sufficient to justify the tax penalty. Moreover, a firm at the margin must have a productivity advantage that exactly compensates for the tax penalty.

Figure 6 shows the relation of the corporate share of output to the tax wedge, τ. A higher τ implies a lower corporate share. These results can be matched quantitatively with data, described below, on the C-corporate share of business economic activity.

Figure 7 shows the marginal effect of the tax wedge, τ, on the corporate share of output. Consistent with Figure 6, this marginal effect is negative throughout. Quantitatively, the marginal effect is between -0.2 and -0.5 when τ is between 0.1 and 0.5. These marginal effects should correspond to regression coefficients in a linear relation between the C-corporate share of

economic activity and τ. The magnitudes of regression coefficients found empirically turn out to accord reasonably well with those generated by the calibrated model.

4. C-Corporate Shares of Economic Activity

We have several empirical measures of the C-corporate share of businesses' economic activity, based on IRS data and mostly covering the period 1958 to 2013.[7] We discuss here results with two concepts of economic activity, net capital stocks and gross assets. The assets measure was emphasized by Mackie-Mason and Gordon (1997). Other research, including Mackie-Mason and Gordon (1997), Prisinzano and Pearce (2018), and Clarke and Kopczuk (2017), uses information on business net income. However, C-corporate shares based on net income are highly volatile—we argue in Barro and Wheaton (2019) that results using this concept are not so informative. Results based on equity (book value) are similar to those based on net capital stocks and gross assets.

Data on C-corporate shares come from issues from 1958 to 2013 (the latest year available for corporate tax returns) of IRS *Statistics of Income, Business Income Tax Returns*; *Statistics of Income, Partnership Returns*; and *Statistics of Income, Corporation Income Tax Returns*. Clarke and Kopczuk (2017, section III) discuss these data sources, including their beginnings in the 1950s. The data that we use are publicly available on the IRS website in PDF format, and we have digitized them into a usable format for data analysis. The partnership numbers on net capital stocks were interpolated for part of the sample, based on data available from the IRS every two years from 1959 to 1975 and annually for 1977-1982 and 1988-2013.

Figure 8 shows the C-corporate shares of net capital stocks (in the total of business that includes C-corporations, S-corporations, and partnerships). The C-corporate share was 0.95 in

[7]These data do not include economic activity by governments, non-profits, real estate investment trusts (REITs), and regulated investment companies (RICs).

1958 and trended downward to 0.53 in 2013. The main offsetting increase, shown in the figure, was in the partnership share, which went from 0.04 in 1958 to 0.40 in 2013. Legal changes noted before, especially for LLCs, likely explain much of this trend. The share for S-corporations was 0.004 in 1958 (the first year of existence), rose to 0.025 in 1986, then jumped upward to 0.074 by 1999. This share then fell to 0.067 in 2013, probably because of increased competition from LLCs.

Figure 9 has shares for business gross assets, the concept used by Mackie-Mason and Gordon (1997). The trends in gross assets are similar to those for net capital stocks, but the C-corporate share of gross assets has not declined as much—the share in 2013 was 0.75, whereas that for partnerships was 0.22. The S-corporate share of gross assets in 2013 was 0.033, compared to 0.037 in 1990.

5. Regressions

5.1 Econometric Framework

The regression analysis relates the C-corporate shares of economic activity to the two components of the tax wedge, $\tau = -\log(1-\tau_c) + \log(1-\tau_p)$. As discussed before, the C-corporate part depends on the federal tax rates on C-corporate profits and dividends, $\log(1-\tau_c)=\log(1-\tau_{prof})+\log(1-\tau_{div})$. The pass-through part, $\log(1-\tau_p)$, depends on the AMTR on Schedule-E income. The tax-rate series are displayed in Figures 1-4.

We rely on long-difference estimation, as there are substantial concerns with other econometric techniques. Level regressions, such as those implemented in Mackie-Mason and Gordon (1997), are problematic due to strong persistence and potential non-stationarity of the C-corporate shares. This problem was noted by Prisinzano and Pearce (2018), who utilized first-difference regressions. However, this specification is likely to be heavily influenced by

measurement error, as the timing between changes in the tax system and changes in business legal form is not well-determined. We therefore emphasize results from long-difference estimation; specifically, with 20-year differences in C-corporate shares and tax-rate variables. The 20-year differencing dictates a sample that runs from 1978 through 2013, as the C-corporate share data start in 1958.

In principle, we would like to isolate time-varying influences, such as changes in the legal/regulatory environment and shifts in the composition of production, that influence the relative attractiveness of C-corporate and pass-through forms. With regard to important legal changes, the one in 1958 that created S-corporations predates the start of our sample. We think that the most significant changes involve LLCs, notably the IRS ruling in late 1988 that allowed LLCs to be taxed as partnerships and the adoption of LLC laws in all 50 states by 1996. To account for these changes, we estimate one trend (intercept) coefficient from 1973 to 1988, another from 1989 to 1996, and a third from 1997 to 2013.

We have data on the division of C-corporate and pass-through gross assets into eight sectors: agriculture, construction, finance/insurance/real estate or FIRE, manufacturing, mining, services, trade, and transportation. However, as discussed in Barro and Wheaton (2019), we have found that a compositional-change variable constructed from these data lacks explanatory power for changes in C-corporate shares of economic activity.

5.2 Results

Table 1 has regression results where the dependent variable is the 20-year difference of the C-corporate share of net capital stocks (column 1) or gross assets (column 2). The sample period with annual data is 1978 to 2013 (dictated by the availability of data beginning in 1958). These regressions have the three intercept terms noted before (which pick up trends in levels) and the

20-year changes in the two tax-rate variables, $log(1-\tau_c)$ and $log(1-\tau_p)$. Details on the regression results are in Barro and Wheaton (2019).

The estimated coefficients on $log(1-\tau_c)$ are positive, as predicted; that is, the estimated effects of τ_c on the C-corporate shares are negative. These estimated coefficients are statistically significantly different from zero at less than the 5% level. The point estimates are 0.24, by coincidence the same in the two cases (columns 1 and 2).

The estimated coefficients on $log(1-\tau_p)$ are negative, as predicted; that is, the estimated effects of τ_p on the C-corporate shares are positive. These estimated coefficients are again statistically significantly different from zero at less than the 5% level. The magnitudes of these estimated coefficients are 0.48 (column 1) and 0.34 (column 2).

The magnitudes of the estimated tax-rate coefficients are in the ballpark of those predicted by the model. As noted before, the marginal tax-wedge effects in Figure 7 range between -0.2 and -0.5 when τ is in the range from 0.1 to 0.5 that applies to the regression sample, 1978 to 2013.

The results in Table 1 gauge the pass-through tax rate, τ_p, by the AMTR on Schedule E income. However, as is clear from Figure 3, this tax-rate variable is positively correlated with a more standard AMTR based on labor income. If we measure τ_p by the standard AMTR, the fits of the regressions deteriorate but the qualitative results remain.

The regression fits deteriorate more sharply if we measure τ_p by the top individual tax rate on earned income (Figure 3). This result suggests that the high top individual tax rates that prevailed pre-1987 did not influence choices between C-corporate and pass-through legal form. This finding makes sense because the large gap between the top tax rate and the Schedule E AMTR in this period (Figure 3) indicates that little pass-through income actually faced these

high marginal tax rates.

The intercept terms apply in Table 1 to the periods 1978-1988, 1989-1996, and 1997-2013. The estimated coefficients on these intercepts are significantly negative at the 1% level, and the magnitude of the coefficient is significantly higher for the last period, 1997-2013, than for the previous two. We interpret this result as reflecting the broad availability of the LLC legal form, which was recognized in all 50 states by 1996.

The tax changes from 1958 to 2013 imply a substantial overall drop in the tax wedge, τ (Figure 4). Thus, this tax effect goes against the estimated trend coefficients (intercepts), which imply declining C-corporate shares of economic activity, consistent with Figures 8 and 9. On their own, the tax changes from 1958 to 2013 should have increased C-corporate shares of economic activity.

6. Historical Productivity Effects

The calibrated model can be used to gauge two types of effects on productivity associated with changes in the legal form of business organization. First, changes in the tax wedge, τ, affect choices of C-corporate versus pass-through status and, thereby, affect productivity. This effect operates for given underlying parameters; specifically, for given mean values μ_c and μ_p associated with the benefits from C-corporate and pass-through legal organization. Second, legal or other changes that affect the attractiveness of C-corporate and pass-through organizations impact productivity directly and also indirectly by influencing choices of legal status. These effects can be represented in the model by changes in the parameters μ_c and μ_p, for given τ. In practice, we focus on the legal changes that we view as raising μ_p over time.

6.1 Productivity effects from reduced tax wedges

Table 2 considers the first channel of effects; that is, the implications for productivity

from the sizable cut in the C-corporate versus pass-through tax wedge, τ, that occurred over recent decades. The table highlights the main historical tax changes that affected τ since 1968. We gauge the effects of the changes in τ on overall output (productivity) from the results shown in Figure 6 for the graph calibrated to 1978 (the starting year of the regression sample). That is, these results hold fixed the underlying parameter values, including μ_p, at the values applying in 1978. Hence, this exercise does not factor in changes in productivity corresponding to the trends (intercept terms) that were estimated in the regressions in Table 1. Note also that the tax effects on productivity shown in Table 2 reflect only the induced changes in legal form of organization—this analysis does not deal with tax effects on capital accumulation (the focus of Barro and Furman [2018]) or labor supply.

In 1968, τ was very high, 0.65, and the calibrated model's associated level of productivity is 0.939 (relative to the value 1.0, which corresponds, as a normalization, to τ=0 in 1978). The changes in τ after 1968 reflect shifts in the underlying federal tax components—the corporate profits tax rate, τ_{prof}, the effective dividend tax rate, τ_{div}, and the pass-through tax rate, τ_p, gauged by the AMTR on Schedule E income. Note that τ depends positively on τ_{prof} and τ_{div} and negatively on τ_p. The net impact on the wedge, τ, turns out to be negative for all the tax changes highlighted in the table. This pattern is surprising because the Republican Presidents cut tax rates overall (Nixon, Reagan, Bush, and Trump), while the Democrats raised them (Carter, Clinton, and Obama),

By 1971, the Nixon era cut in τ_{prof} from 53% to 48% and the decrease in τ_{div} from 36% to 29% more than offset the fall in τ_p from 43% to 37% to produce a decline in τ from 0.65 to 0.53. The model's estimated productivity level of 0.962 in 1971 implies a rise by 2.4% compared to that in 1968.

By 1979, the Carter period decrease in τ_{prof} from 48% to 46% and the rise in τ_p from 37% to 41% reduced τ further to 0.42. Estimated productivity thereby rose to 0.979 or by 1.8% compared to that in 1971.

By 1983, after the first phase of the Reagan tax cuts, τ_{div} fell from 28% to 19% and τ_p from 41% to 35% to generate a net fall in τ to 0.40. This change raised estimated productivity to 0.976 or by 0.3% compared to that in 1979.

The changes in 1988 reflect the second phase of the Reagan tax cuts. In this case, τ_{div} and τ_p each fell sharply, from 19% to 14% and from 35% to 26%, respectively, while τ_{prof} fell even more in percentage points, from 46% to 34%. On net, the tax wedge, τ, declined from 0.40 in 1983 to 0.26 in 1988. This change raised estimated productivity to 0.993 or by 1.1% compared to that in 1983.

For 1993, the main change is the Clinton tax increase, which raised τ_p from 26% to 32%, while τ_{prof} and τ_{div} changed little. The wedge, τ, therefore fell further, in this case from 0.26 in 1988 to 0.19 in 1993. The productivity level rose accordingly by 0.4% compared to that in 1988. From there until 2000, the main effect is the continuing rise in τ_p, to 35%. Since this change *lowered* the wedge, τ, the result is a further increase in productivity, by 0.2%.

The tax rate on dividends, τ_{div}, fell gradually since 1968 because of the decreasing fraction of stocks held by tax-paying entities (Figure 2). Then the Bush tax cut in 2003 included a reduction in the top tax rate on (qualified) dividends to 15%. This change sharply lowered τ_{div}, from 0.086 in 2002 to 0.045 in 2003. Hence, the tax wedge, τ, decreased from 0.13 in 2000 to 0.11 in 2003. This change resulted in a further rise in productivity, by 0.04%.

Up to 2013, during the Obama administration, the main effect came from the rise in τ_p, to 32%. The further fall in the tax wedge, τ, from 0.11 in 2003 to 0.09 in 2013 raised productivity

by another 0.05%.

Finally, Trump's 2017 tax reform implied that τ_{prof} fell sharply, from 35% in 2013 to 21% in 2018. The decline in τ_p from 32% to 29% partly offset this change, but τ fell overall from 0.09 in 2013 to -0.06 in 2018. That is, the tax wedge, τ, fell by 15 percentage points to reach a negative number for the first time—the federal tax system had shifted to favoring C-corporations over pass-throughs. This change raised estimated productivity, but only from 0.9994 in 2013 to 0.9998 in 2018, or by 0.04%. One reason for the small response is that the tax wedge, τ=0.09, in 2013 was already low, and the sensitivity of productivity to the tax wedge is small in this range (Figures 6 and 7). Moreover, because peak productivity in the model corresponds to τ=0, the movement of τ into negative territory led to a small decrease in estimated productivity.

In terms of cumulative effects, the full cut in the tax wedge, τ, from 0.65 in 1968 to -0.06 in 2018 raised estimated productivity from 0.939 to 0.9998; that is, by 6.5% or 0.13% per year over 50 years. The results are similar from 1968 to the end of the regression sample in 2013. In that case, estimated productivity rose from 0.939 to 0.9994; that is, by 6.4% or 0.14% per year over 45 years. These cumulative effects—reflecting only tax-induced changes in legal form of business organization—are substantial. Moreover, in the model, these changes correspond to reduced distortions and, hence, to gains in efficiency. They also correspond to pure changes in productivity, applying for given quantities of factor inputs.

6.2 Productivity effects from enhanced legal status of pass-through organizations

We can also assess the productivity effects associated with the trend (intercept) terms in the regressions shown in Table 1. Within the model, we interpret these effects as reflecting changes in the mean pass-through productivity parameter, μ_p; specifically, μ_p varies while the corresponding parameter associated with corporate status, μ_c, and the other parameters are

assumed to remain fixed. We can then determine the value of μ_p needed at each date to generate the observed C-corporate share of economic activity within the calibrated model. (In this exercise, we identify the C-corporate share with the observed share of net capital stock.) The calibrated model dictates these values of μ_p, taking account of the tax wedge, τ, that applied at each date. For example, the μ_p for 1968 associated with the C-corporate share of 0.915 and $\tau=0.645$ turns out to be -1.34, whereas that for 2013 associated with the share of 0.512 and $\tau=0.090$ is -0.21. The rise in μ_p from -1.34 in 1968 to -0.21 in 2013 is an overall productivity shock in the sense of the estimated improvement in the average "quality" of pass-through legal status. (Note that μ_c is held fixed over time at a value that turned out to be -0.14.)

Given the estimated μ_p parameter for each date, we can use the calibrated model to determine the level of output (business productivity) at that date for any specified value of τ. For example, if we keep τ fixed at 0.645, its value in 1968, then estimated output turns out to be 0.958 in 1968 and 1.080 in 2013. Therefore, if τ had (counter-factually) stayed constant from 1968 to 2013, output would have risen by 12.7% or by 0.27% per year over 45 years. This number represents the estimated productivity effect from the improvements in the legal status of pass-throughs, for given tax rates.

We can also look at the combined effects on business productivity from the changes in τ and μ_p. For example, the calibrated model yields an estimated level of output (productivity) of 1.180 for 2013 when τ is set at its value for 2013 of 0.090. Thus, the full change in estimated productivity from 1968 to 2013 (from 0.958 to 1.180) is by 23.2% or 0.46% per year over the 45 years. This result gives our full estimate of productivity effects from changing legal form of business organization—due partly to tax-induced changes and partly to exogenous improvements in the quality of pass-through organization. These quality improvements, likely stemming

mainly from legal changes such as the invention and refinement of S-corporations and LLCs, are effectively forms of technological progress.

The estimated productivity growth rate from changing form of business legal organization—0.46% per year—is large when considered in relation to estimates of the overall growth rate of total factor productivity (TFP). However, to compare with overall TFP growth, we first have to adjust our estimated growth rate of business productivity to allow for the portion of GDP that accrues outside of businesses—that is, through general government and households plus non-profit institutions. The share of business in economy-wide value-added from 1968 to 2013 was highly stable and averaged 76%.[8] If we assume that productivity growth outside of business sectors is zero, then the calibrated model accounts for overall productivity growth of 0.35% per year (0.76 times 0.46% per year). By comparison, the Federal Reserve Bank of San Francisco (2019) reports that the growth rate of TFP from 1968 to 2013 (utilization adjusted with quarterly data) averaged 0.92% per year. That is, the estimated legal-form channel accounts for 38% of overall TFP growth.

The model's estimated effects on business productivity do not match the oft-mentioned slowdown of productivity growth for the post-2000 period compared with the 1990s. The calibrated model yields estimated growth rates of economy-wide productivity of 0.40% per year from 1990 to 2000 and 0.62% per year from 2000 to 2013. That is, the model predicts a rise in the productivity growth rate, corresponding to a more rapid observed rate of decline in the C-corporate share. In contrast, according to the San Francisco Fed, the growth rate of TFP (utilization adjusted) averaged 0.99% per year from 1990 to 1999 and 0.89% per year from 2000 to 2013. Thus, the model predicts higher productivity growth post-2000 compared to the 1990s,

[8]Bureau of Economic Analysis, *National Income & Product Accounts*, Table 1.3.5, accessed at bea.gov.

whereas the TFP data show a modest decline.

7. Concluding Observations

We dealt theoretically and empirically with the relation between tax rates and the composition of U.S. business economic activity between C-corporate and pass-through forms. The main federal tax wedge, τ, that we measured since 1968 involves the tax rate on C-corporate profits, the effective tax rate on dividends, and the pass-through tax rate, gauged by the average marginal tax rate on Schedule E income. Our estimates imply that the declining tax wedge from 1968 to 2013 raised the C-corporate share of economic activity. And we further estimated, based on the revealed preference of owners with respect to choices of business legal form, that the cumulative effect from this reduced tax wedge raised business productivity by about 6% or 0.14% per year over the 45 years.

Despite the overall decline in the tax wedge, our measures of C-corporate share of economic activity exhibit downward trends at least since the 1970s. We attributed these trends particularly to legal changes that favored pass-through forms, notably LLCs. We gauged these effects by aligning empirical intercept terms with the dates of the principal changes that affected the legal status of the LLC form of business. In the calibrated model, the productivity effects from the enhanced attractiveness of pass-through organization are substantial. When combined with the effects from a lower tax wedge, the model accounts for an expansion of business productivity from 1968 to 2013 by 23% or 0.46% per year over the 45 years.

We are currently extending the empirical research internationally. We are collecting data on the tax code and measures of business activity by legal form for a variety of high-income countries. The resulting panel data set will allow us to replicate and further develop the empirical results in this paper.

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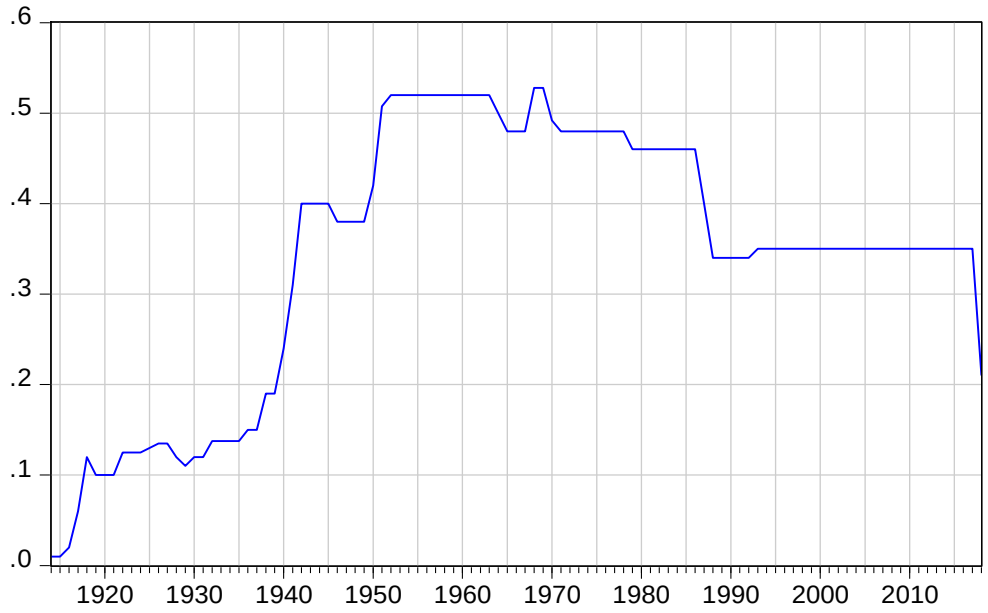
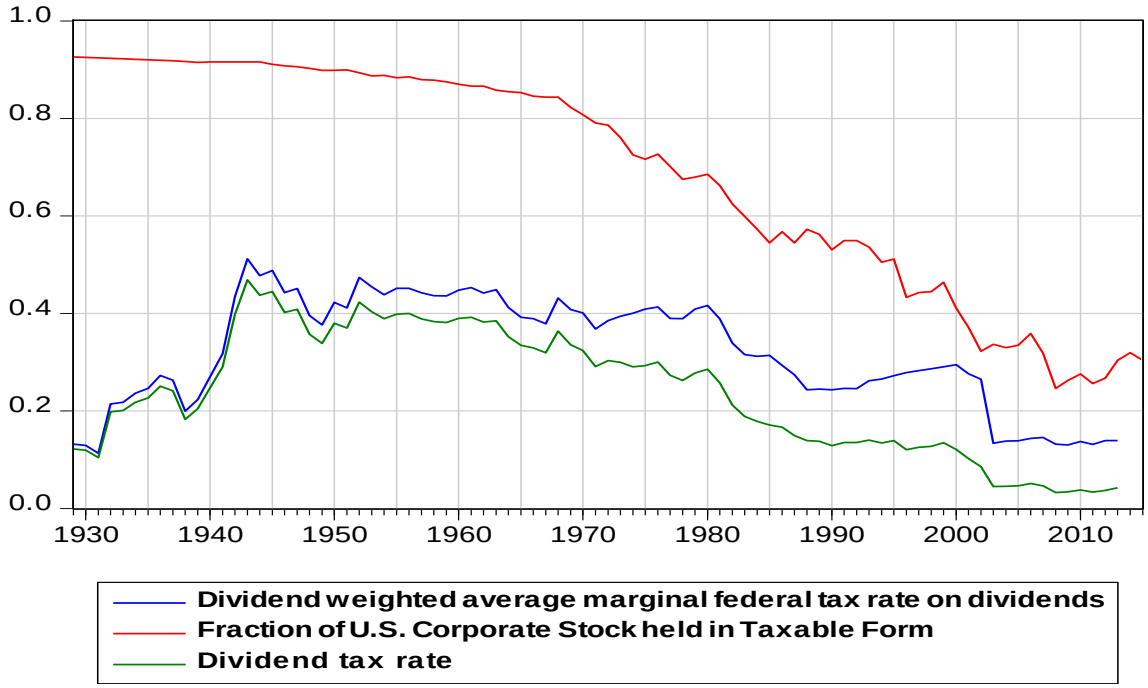
Tables and Figures

Figure 1 Top Federal Tax Rate on C-Corporate Profits



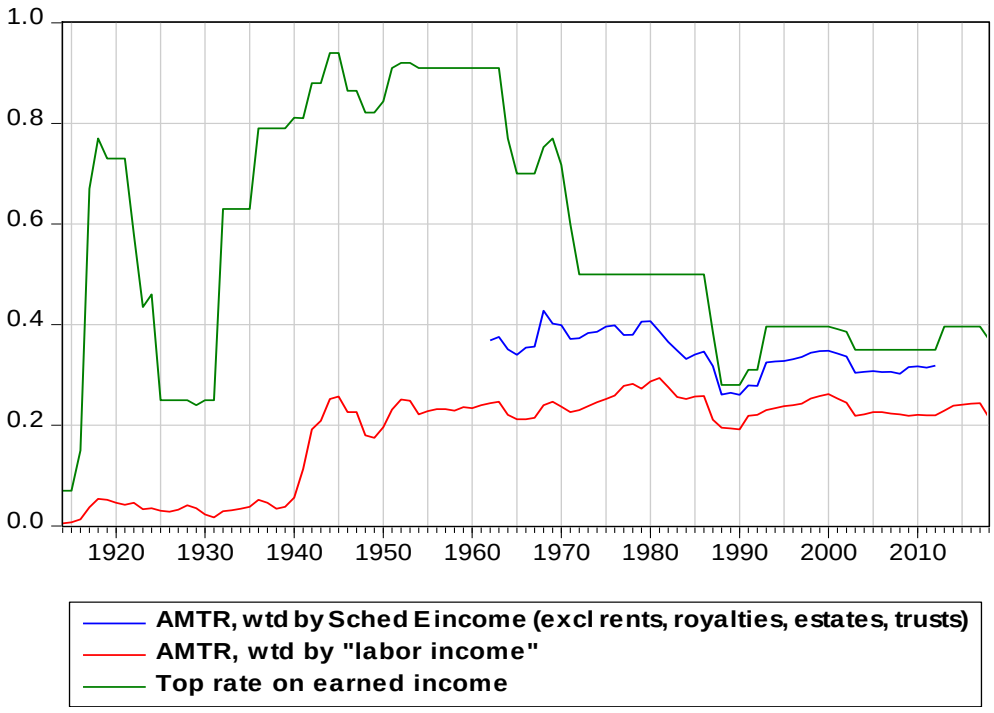
Note: Data on the top federal marginal tax rate on C-corporate profits are in IRS, *Statistics of Income Bulletin*, Fall 2003, and in recent issues of IRS *Statistics of Income: Corporation Income Tax Returns*.

Figure 2 Federal Tax Rates on Dividends



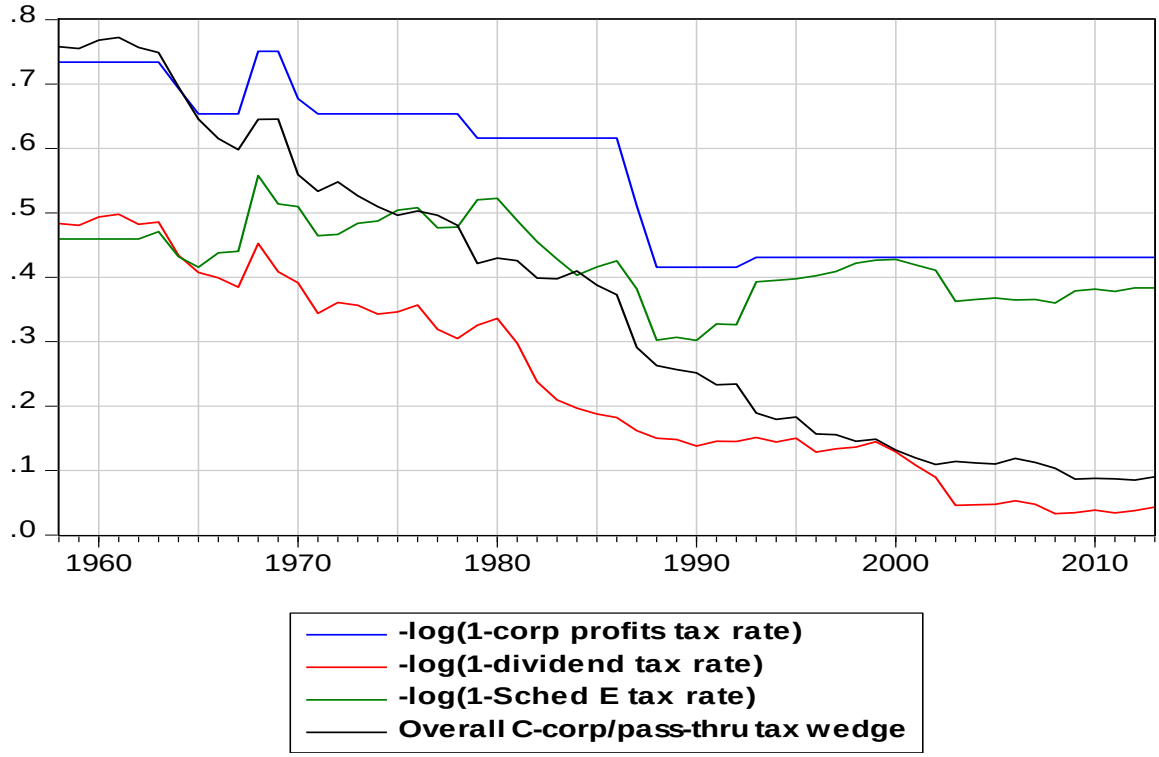
Note: The dividend-income weighted average marginal federal dividend tax rate in the blue graph was provided for 1960-2012 by Dan Feenberg, using the TAXSIM program of the National Bureau of Economic Research. (Qualified dividends are used since 2003.) The value for 2013 was unavailable and was assumed to equal that for 2012. Values before 1960 are estimates based on issues of IRS, *Statistics of Income, Individual Income Tax Returns*. The fraction of U.S. corporate stock held in taxable form in the red graph is from Rosenthal and Austin (2016, Figure I) and Poterba (2004, Table 1). We measure the dividend tax rate, τ_{div}, (green graph) as the product of the values in the blue and red graphs.

Figure 3 Federal Average Marginal Individual Income-Tax Rates



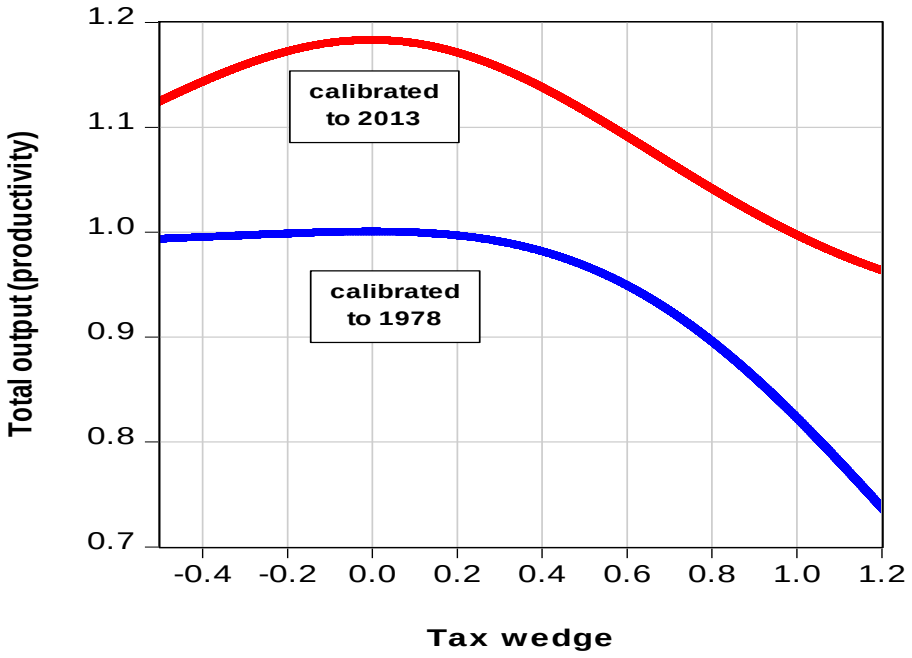
Note: The blue graph is the income-weighted federal average marginal tax rate based on Schedule E income (exclusive of rents, royalties, estates, trusts). The red graph is the corresponding federal AMTR based on a broad concept of labor income. The green graph is the top federal marginal rate on earned income (distinguished from ordinary income for 1971-1981). The data for calculating the Schedule E-income weighted average marginal federal tax rate were provided for 1962-2012 by Dan Feenberg, using the TAXSIM program of the National Bureau of Economic Research. The AMTR weighted by labor income is from Barro and Sahasakul (1983), Barro and Redlick (2011), and the Tax Policy Center.

Figure 4 Federal Income-Tax Wedge



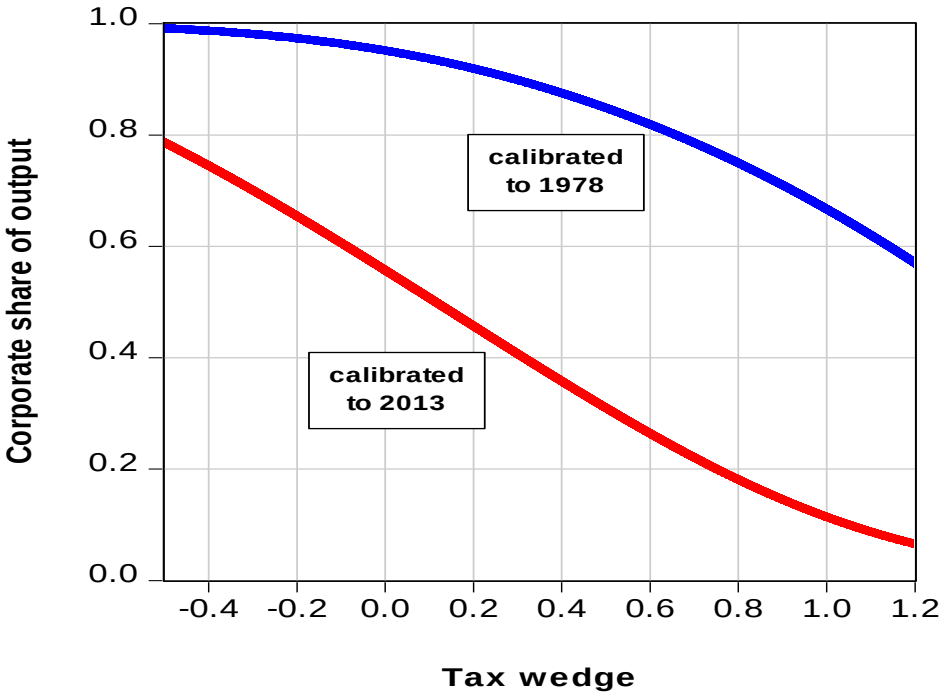
Note: The top federal tax rate on C-corporate profits is from Figure 1, the federal dividend tax rate is from Figure 2 (green graph), and the federal average marginal tax rate for Schedule E income is from Figure 3 (blue graph). (For the Schedule E AMTR, the values for 1958-1961 are assumed to equal that for 1962 and the value for 2013 is assumed to equal that for 2012.) The overall federal tax wedge for C-corporate versus pass-through status equals the blue graph plus the red graph minus the green graph.

Figure 5 Total Output (Productivity) as Function of Tax Wedge, τ



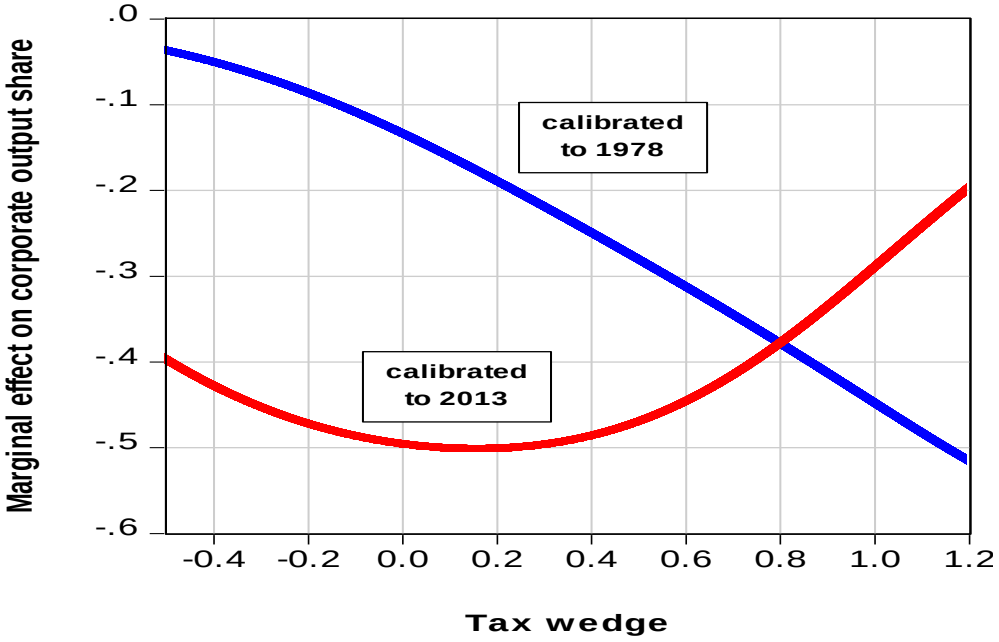
Note: This graph uses the parameter values $\sigma_c = \sigma_p = 0.5$ and $\rho = 0.25$. The value $\mu_c = -0.137$ is used for both graphs; that is, the corporate productivity parameter is assumed to be the same in 1978 and 2013. The values of μ_p are *-1.035* for 1978 and *-0.213* for 2013. The values for μ_c and μ_p were selected to generate a peak level of output (productivity) of 1.0 (a normalization) in 1978 and to match the observed C-corporate shares of net capital stock in 1978 and 2013 (0.852 and 0.512, respectively). Total output (productivity) peaks at a tax wedge, τ, of 0. Total output falls with τ when $\tau > 0$ and rises with τ when $\tau < 0$.

Figure 6 Corporate Share of Output as Function of Tax Wedge, τ



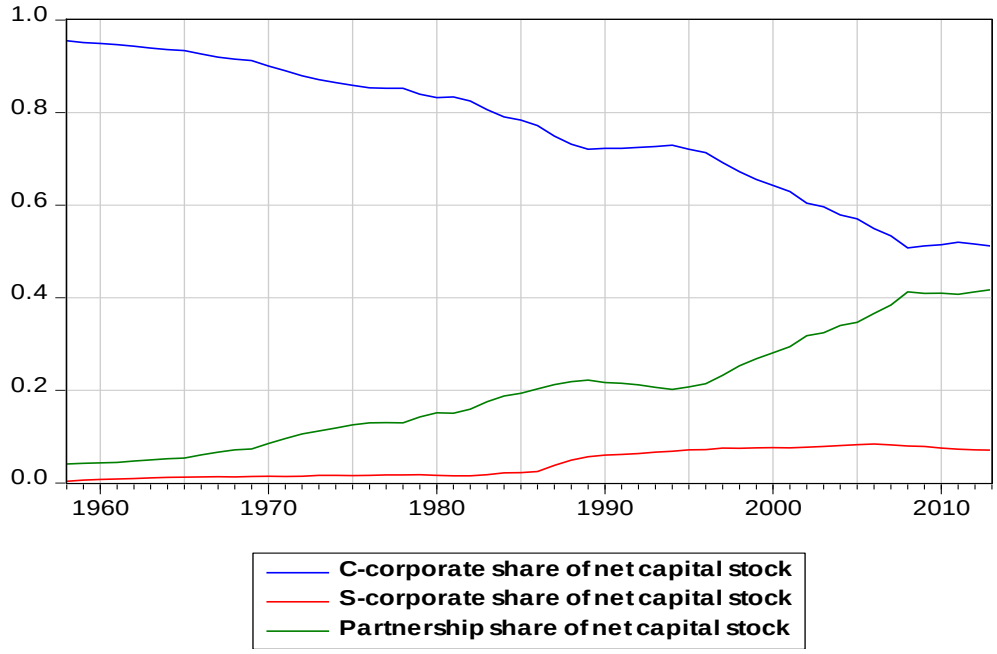
Note: See the note to Figure 5. The corporate share of output declines monotonically with the tax wedge, τ. This share approaches 1 as τ approaches $-\infty$ and approaches 0 as τ approaches ∞.

Figure 7 Marginal Effect of Tax Wedge, τ, on Corporate Output Share



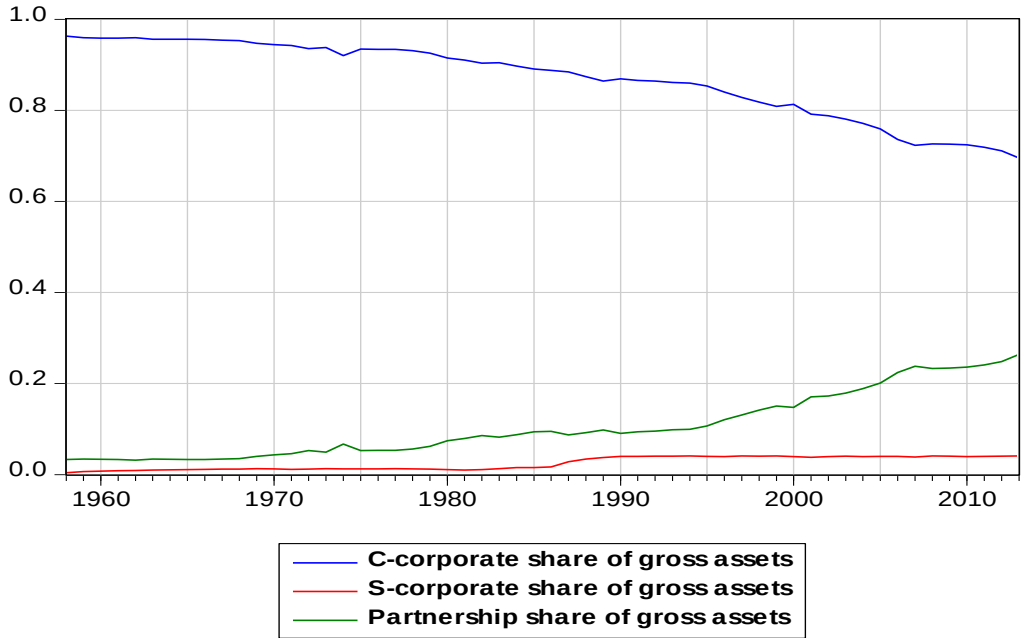
Note: See the notes to Figures 5 and 6. The marginal effect of the tax wedge, τ, on the corporate output share is negative throughout.

Figure 8 Shares of Business Net Capital Stock



Note: The underlying data on business capital stocks net of depreciation are from various IRS sources, noted in the references. Data for sole proprietorships are unavailable. The partnership numbers are interpolated based on data available every two years from 1959 to 1975 and annually for 1977-1982 and 1988-2013.

Figure 9 Shares of Business Gross Assets



Note: The underlying data on business gross assets are from various IRS sources, noted in the references. Data for sole proprietorships are unavailable.

Table 1

Regressions for C-Corporate Shares of Economic Activity, 1978-2013

	(1)	(2)
Dependent variable:	**C-Corp share net capital stock**	**C-Corp share gross assets**
Independent variables:		
Constant (trend), 1978-1988	-0.0103*** (0.0008)	-0.0064*** (0.0006)
Constant (trend), 1989-1996	-0.0101*** (0.0006)	-0.0071*** (0.0007)
Constant (trend), 1997-2013	-0.0128*** (0.0004)	-0.0094*** (0.0005)
C-Corp federal tax rate, log(1-τ_c)	0.238*** (0.049)	0.238*** (0.034)
Pass-through federal tax rate, log(1-τ_p)	-0.481*** (0.093)	-0.343*** (0.029)
Number of observations	36	36
R-squared	0.84	0.92
s.e. of regression	0.0158	0.0112

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

Note: Variables in the regressions are 20-year differences. The annual sample periods are 1978-2013. Standard errors, shown in parentheses, are calculated from the Newey-West method with 20-year bandwidths. Dependent variables are Col. 1: C-corporate share of business net capital stocks (Figure 8) and Col. 2: C-corporate share of business gross assets (Figure 9). The shares are calculated relative to business totals that comprise C-corporations, S-corporations, and partnerships (including LLCs). The top federal tax rate on C-corporate profits, τ_{prof}, and the federal AMTR for dividends, τ_{div}, are in Figures 1 and 2. The pass-through federal tax rate, τ_p, is gauged by the federal AMTR for Schedule E income (exclusive of rents, royalties, and estates & trusts) and is in Figure 3. The tax-rate variables enter, as in equation (2), as $log(1\text{-}\tau_c) = log(1\text{-}\tau_{prof}) + log(1\text{-}\tau_{div})$ and $log(1\text{-}\tau_p)$. The constants indicate trend rates of change per year. The break points of 1989 and 1997 correspond to key historical legal events involving the role of LLCs (see the text).

Table 2

Estimated Productivity Effects from Major U.S. Federal Tax Changes

Year	τ_{prof}	τ_{div}	τ_p	τ: tax wedge	Estimated productivity	Change in productivity	Comments
1968	0.53	0.364	0.428	0.645	0.939	--	Tax wedge, τ, at high level, 0.645. Estimated productivity at 0.939, compared to peak normalized to 1.0 when τ=0 in 1978.
1971	0.48	0.291	0.372	0.533	0.962	+2.4%	Nixon: Cuts in τ_{prof} and τ_{div} more than offset fall in τ_p to reduce τ.
1979	0.46	0.278	0.406	0.421	0.979	+1.8%	Carter: Cut in τ_{prof} and rise in τ_p reduced τ.
1983	0.46	0.189	0.348	0.398	0.982	+0.31%	First phase of Reagan tax cuts—fall in τ_{div} more than offset fall in τ_p to reduce τ.
1988	0.34	0.139	0.261	0.263	0.9932	+1.1%	Second phase of Reagan tax cuts—cuts in τ_{prof} and τ_{div} more than offset fall in τ_p to reduce τ.
1993	0.35	0.140	0.325	0.189	0.9968	+0.36%	Clinton: rise in τ_p reduced τ.
2000	0.35	0.121	0.348	0.132	0.9985	+0.17%	Clinton: cut in τ_{div} and rise in τ_p reduced τ.
2003	0.35	0.045	0.304	0.114	0.9989	+0.04%	Bush: cut in τ_{div} more than offset fall in τ_p to reduce τ.
2013	0.35	0.042	0.319	0.090	0.9994	+0.05%	Obama: cut in τ_{div} and rise in τ_p reduced τ.
2018	0.21	0.042	0.29	-0.06	0.9998	+0.04%	Trump: cut in τ_{prof} more than offset cut in τ_p to reduce τ.

Note: τ_{prof} equals the top federal corporate-profits tax rate (Figure 1), τ_{div} equals the effective federal average marginal tax rate on dividends (Figure 2), and τ_p, the pass-through tax rate, equals the average marginal federal tax rate on Schedule E income (Figure 3). The tax wedge, τ, for C-corporate versus pass-through legal status is calculated from equation (2) as $\log(1-\tau_p) - \log(1-\tau_{prof}) - \log(1-\tau_{div})$. Values of τ_{div} and τ_p for 2018 are estimates—but errors here would have a minor effect on the calculated τ. The estimated productivity, normalized to 1.0 at the peak, comes from the model calibrated to 1978 and shown in Figure 6. These estimates consider only effects from tax-induced changes in the share of economic activity represented by C-corporations rather than pass-throughs.