
Taxes, Incorporation, and Productivity

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Executive Summary

US 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, potential for public trading of shares, and ability to retain earnings. However, legal changes especially since the 1980s have improved the status of pass-throughs. The C-corporate form has typically been subject to a tax wedge, which has diminished since the 1960s. In our formal model, 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. A calibrated model, fit to observed total factor productivity (TFP) and C-corporate share of economic activity, implies that, for 1958–2013, the declining tax wedge and gap between C-corporate and pass-through productivity contributed 0.37% per year out of a total TFP growth rate of 1.09% per year. From 1994 to 2004, the TFP growth rate was unusually high at 2.00% per year, and the estimated contribution from the falling productivity gap between C-corporate and pass-through status was particularly large at 0.77% per year. The last channel lines up with legal changes related especially to limited liability companies.

I. Introduction

All US 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 net income. Alternatively, a business can choose to be a pass-through entity—notably 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 US 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. The research contained in our study (Barro and Wheaton 2019) builds on this analysis by observing that if C-corporate form typically confers productivity advantages relative to pass-through form, then systematic shifts in preferred legal form could affect overall productivity. The present paper describes the main findings in this research.

The tax wedge—that is, the difference between the C-corporate tax rate (including taxes on corporate profits and dividends) and the personal tax rate particularly on partnership income—is one factor that affects choices of business legal form. An individual business trades off this wedge against the productivity advantages 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 opportunity 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 Internal Revenue Service (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 formal model of the business-form decision faced by owners. This model provides the framework for regression evidence on the extent of business-form switching. We then use a calibrated version of the underlying model to infer effects on overall business productivity due to changes in tax wedges and to shifts in the productivity of C-corporate and pass-through forms of organization. Our estimate is that, for 1958–2013, the declining tax wedge and gap between C-corporate and pass-through productivity contributed 0.37% per year out of a total growth rate of total factor productivity (TFP) of 1.09% per year. This estimate reflects partly the movement toward C-corporate

form because of the sharp fall in the tax wedge. More important, however, especially since the early 1990s, are the improvements in the productivity of pass-through organizations due to legal changes that include the invention and refinement of the LLC.

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

A. 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 (i.e., 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 chooses corporate status if the after-tax income is higher in that form:

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

This expression can be rewritten as

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

where τ is the relevant tax wedge. If the τ is positive, a business has to enjoy at least the offsetting proportionate productivity advantage, $y(i)$, to prefer corporate form. If magnitudes of τ_c and τ_p are much less than 1, then $\tau \approx \tau_c - \tau_p$. 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, $y(i)$.¹ In the overall population of firms, the fraction opting to be corporate is 1 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 has occurred over the past several decades in the form of new and more flexible forms of pass-throughs and regulations

pertaining to them, then the fraction opting to be corporate falls for a given τ .

B. 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 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 than to average rates.

We sketch here the empirical construction of the tax wedge; details are in Barro and Wheaton (2019, part II). 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 rate on C-corporate profits. The use of the top rate ignores the graduation in the corporate tax schedule that applied from 1937 to 2017, but the average marginal tax rate (AMTR) on C-corporate income is close to the top rate in all years.

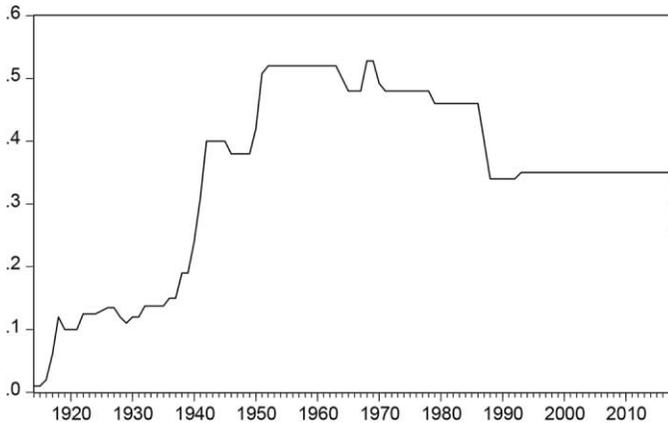


Fig. 1. Top federal tax rate on C-corporate profits. Data on the top federal marginal tax rate on C-corporate profits are in *Statistics of Income Bulletin* (Internal Revenue Service [IRS] 1983–2013, Fall 2003) and in recent issues of *Statistics of Income: Corporation Income Tax Returns* (IRS 1958–2013).

C-corporate income is double-taxed in the United States, with owners paying taxes on dividends and capital gains. We focus here on the federal taxation of dividends. The effective tax rate involves the tax status of shareholders with regard to dividend income. In this context, Rosenthal and Austin (2016, fig. I) document a large and increasing share of US corporate stock held by entities that have zero or low tax rates, including retirement plans, nonprofits, and foreigners (whom they treat as non-taxable). Using their analysis, along with that of Poterba (2004, table 1), we estimate the fraction of US corporate stock held in taxable form as the dotted line in figure 2.² This fraction declined from 88% in 1958 to 30% in 2015.

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 AMTR (see Barro and Sahasakul 1983; Barro and Redlick 2011). Before

Table 1
History of Major US Federal Tax Changes

Year	τ_{prof}	τ_{div}	τ_p	τ : Tax Wedge	Comments
1962	.52	.383	.368	.757	Tax wedge, τ , at high level, .757
1965	.48	.335	.340	.645	Kennedy-Johnson tax law: cuts in τ_{prof} and τ_{div} more than offset fall in τ_p to reduce τ
1968	.53	.364	.428	.645	Johnson: tax increases for Vietnam War; τ stable on net
1971	.48	.291	.372	.533	Nixon: cuts in τ_{prof} and τ_{div} more than offset fall in τ_p to reduce τ
1979	.46	.278	.406	.421	Carter: cut in τ_{prof} and rise in τ_p reduced τ
1983	.46	.189	.348	.398	First phase of Reagan tax cuts: fall in τ_{div} more than offset fall in τ_p to reduce τ
1988	.34	.139	.261	.263	Second phase of Reagan tax cuts: cuts in τ_{prof} and τ_{div} more than offset fall in τ_p to reduce τ
1993	.35	.140	.325	.189	Clinton: rise in τ_p reduced τ
2000	.35	.121	.348	.132	Clinton: cut in τ_{div} and rise in τ_p reduced τ
2003	.35	.045	.304	.114	Bush: cut in τ_{div} more than offset fall in τ_p to reduce τ
2012	.35	.037	.319	.085	Obama: cut in τ_{div} and rise in τ_p reduced τ
2018	.21	.041 ^a	.314 ^a	-.099 ^a	Trump: large cut in τ_{prof} sharply reduced τ

Note: τ_{prof} equals the top federal corporate-profits tax rate (fig. 1), τ_{div} equals the effective federal average marginal tax rate on dividends (solid line in fig. 2), and τ_p , the pass-through tax rate, equals the average marginal federal tax rate on Schedule E income (dotted line in fig. 3). The tax wedge, τ , for C-corporate versus pass-through legal status is calculated from eq. (2) as $\log(1 - \tau_p) - \log(1 - \tau_{\text{prof}}) - \log(1 - \tau_{\text{div}})$.

^aEstimated value.

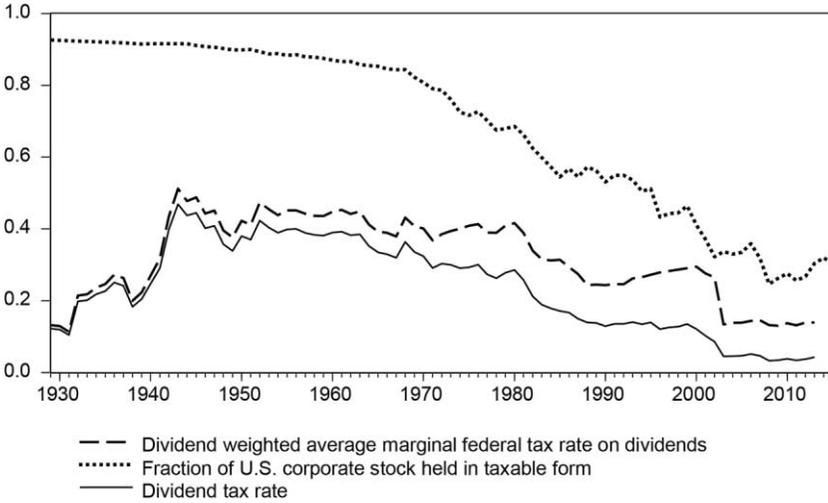


Fig. 2. Federal tax rates on dividends. The dividend-income-weighted average marginal federal dividend tax rate in the dashed line was provided for 1960–2012 by Dan Feenberg, using the TAXSIM program of the NBER. (Qualified dividends are used since 2003.) The value for 2013 was unavailable and was assumed to equal that for 2012. Values before 1960 are estimates based on issues of Internal Revenue Service (IRS 1929–59). The fraction of US corporate stock held in taxable form in the dotted line is based on Rosenthal and Austin (2016, fig. I) and Poterba (2004, table 1). We measure the dividend tax rate, τ_{div} (solid line), as the product of the values in the dashed and dotted lines.

the sharp cut in the qualified-dividend tax rate in 2003, the dividend AMTR, available up to 2012 and shown by the dashed line in figure 2, is higher than the labor-income-weighted AMTR, which appears in figure 3 (dashed line).³

To measure the dividend tax rate, τ_{div} , we multiplied the fraction of corporate stock held in taxable form (dotted line in fig. 2) by the dividend AMTR (dashed line) to get the solid line. In 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 solid line from figure 2.

For the pass-through tax rate, τ_{pr} we focus on S-corporations and partnerships, whose incomes are reported on IRS Form 1040, Schedule E. As discussed in Barro and Wheaton (2019, Sec. II.B), we were able to measure the Schedule E income-weighted average marginal tax rate (Schedule E AMTR) from 1962 to 2012. The resulting series is shown as the dotted line in figure 3.

Figure 3 also shows two series that serve as comparisons for the Schedule E AMTR. The dashed line is the federal AMTR used in earlier

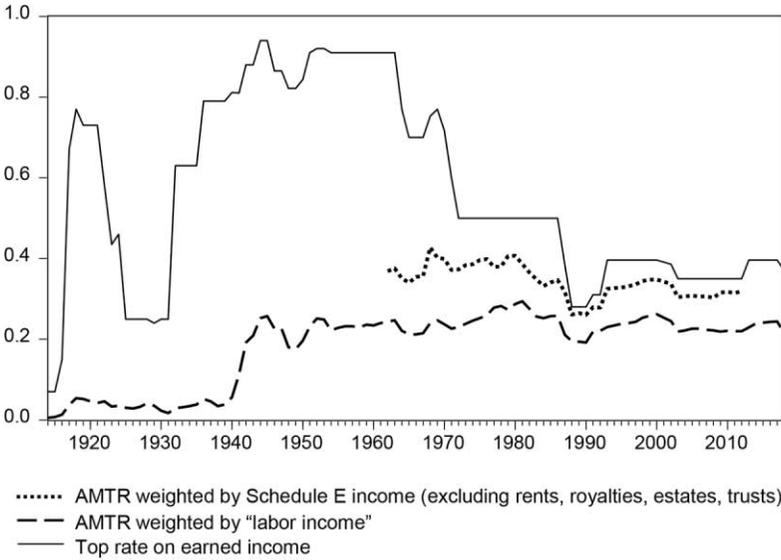


Fig. 3. Federal average marginal individual income tax rates. The dotted line is the income-weighted federal average marginal tax rate (AMTR) based on Schedule E income (exclusive of rents, royalties, estates, and trusts). The dashed line is the corresponding federal AMTR based on a broad concept of labor income. The solid line is the top federal marginal rate on earned income (distinguished from ordinary income for 1971–81). 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 NBER. The AMTR weighted by labor income is from Barro and Sahasakul (1983), Barro and Redlick (2011), and the Tax Policy Center.

research, based on labor income. This series comes from Barro and Sahasakul (1983), Barro and Redlick (2011), and the Tax Policy Center. The solid line is the top marginal federal tax rate on earned income.

The overall tax wedge is $\tau = -\log(1 - \tau_c) + \log(1 - \tau_p) = -\log(1 - \tau_{prof}) - \log(1 - \tau_{div}) + \log(1 - \tau_p)$. The series for τ and its components are shown in figure 4.

From 1962 to 2012, for which all of the tax-rate data are available, the main trend has been a downward movement of the tax wedge, τ . Table 1 shows how the changes in the overall wedge and its underlying parts, τ_{prof} , τ_{div} , and τ_p , relate to the various US presidential administrations. Overall, τ fell sharply from 0.757 in 1962 to 0.085 in 2012. The change from 1962 to 2012 featured a substantial cut in τ_{prof} from 0.52 to 0.35, a dramatic cut in τ_{div} from 0.38 to 0.04, and a comparatively small decline in τ_p from 0.37 to 0.32.

The 2017 tax reform, taking effect in 2018, included a sharp reduction in τ_{prof} from 0.35 to 0.21. This change likely moved the tax wedge,

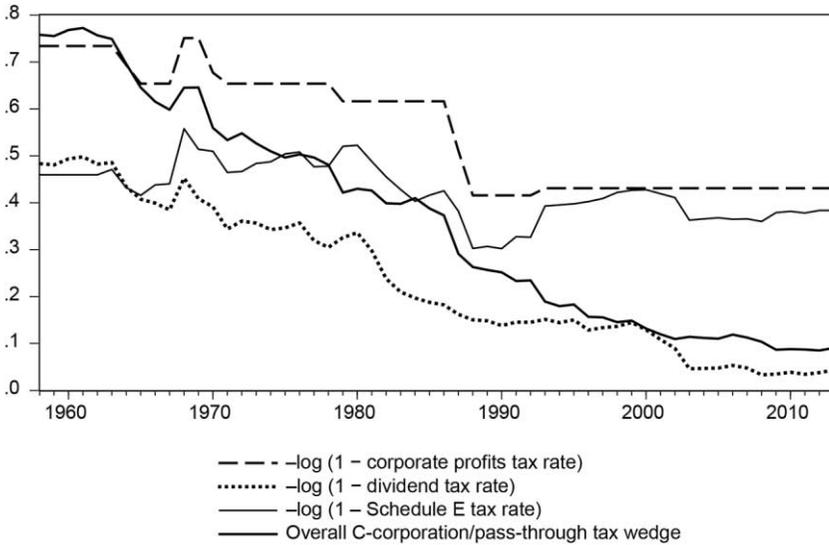


Fig. 4. Federal income-tax wedge. The top federal tax rate on C-corporate profits is from figure 1, the federal dividend tax rate is from figure 2 (thin solid line), and the federal average marginal tax rate (AMTR) for Schedule E income is from figure 3 (dashed line). (For the Schedule E AMTR, the values for 1958–61 are assumed to equal those for 1962. 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 dashed line plus the dotted line minus the thin solid line.

τ , into negative territory for the first time—roughly to -0.10 , as shown in table 1. That is, the federal tax system shifted in 2018 to favoring C-corporations over pass-through forms.

III. C-Corporate Shares of Economic Activity

We have several empirical measures of the C-corporate share of businesses' economic activity, based on publicly available IRS data and mostly covering the period 1958–2013.⁴ 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 (Mackie-Mason and Gordon 1997; Clarke and Kopczuk 2017; Prisinzano and Pearce 2018) uses information on business net income. However, a serious problem with these data, noted by Prisinzano and Pearce (2018, Sec. 2.1), is double counting—arising especially because partnerships are owned partly by corporations and other partnerships. The share numbers based on positive net income are also

highly volatile because of strong sensitivity of the various forms of income to the business cycle. The volatility is even more pronounced when businesses with losses are included. These difficulties cause us to discount empirical results based on net income. 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 currently available for corporate tax returns) of *Statistics of Income, Business Income Tax Returns* (IRS 1958–76), *Statistics of Income, Partnership Returns* (IRS 1977–82), *Statistics of Income, Corporation Income Tax Returns* (IRS 1958–2013), *Statistics of Income Bulletin: Partnership Returns* (IRS 1983–2013), *Statistics of Income: Sole Proprietorship Returns* (IRS 1977–81), and *Statistics of Income Bulletin: Sole Proprietorship Returns* (IRS 1982–2013). Clarke and Kopczuk (2017, Sec. III) discuss these data sources, including their beginnings in the 1950s. The data that we use are 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 2 years from 1959 to 75 and annually for 1977–82 and 1988–2013.

Figure 5 shows the C-corporate shares of net capital stocks.⁵ The C-corporate share was 0.95 in 1958 and trended downward to 0.53 in

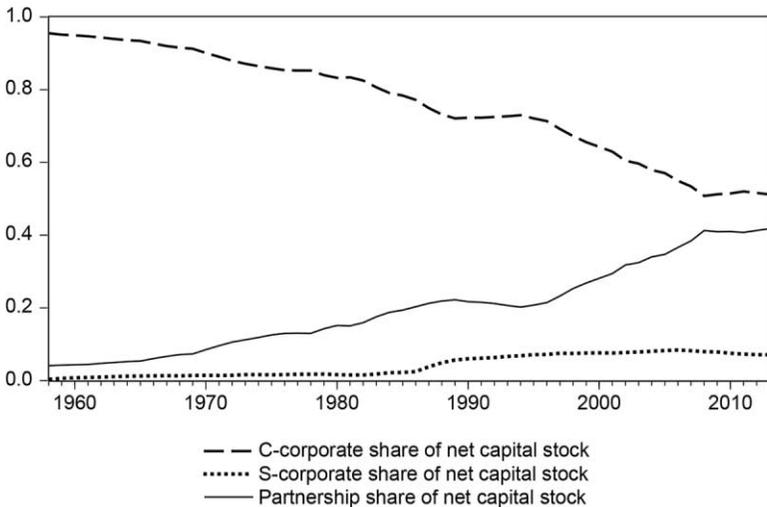


Fig. 5. Shares of business net capital stock. The underlying data on business capital stocks net of depreciation are from various Internal Revenue Service sources, noted in the references. The partnership numbers are interpolated based on data available every 2 years from 1959 to 75 and annually for 1977–82 and 1988–2013.

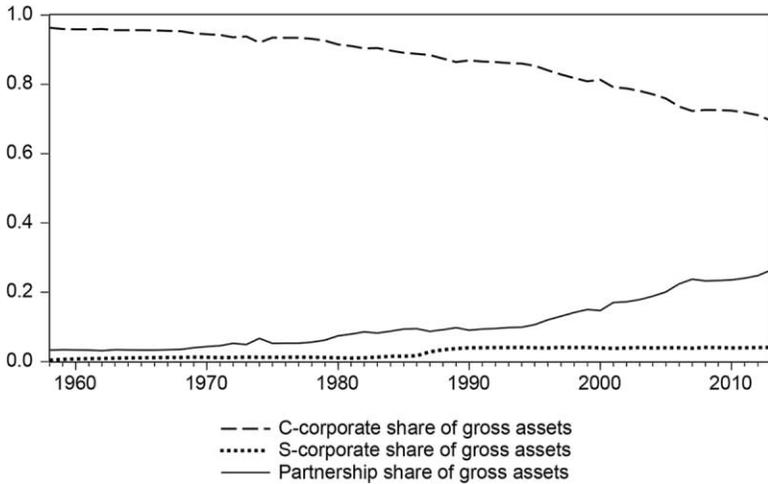


Fig. 6. Shares of business gross assets. The underlying data on business gross assets are from various Internal Revenue Service sources, noted in the references.

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 6 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 with 0.037 in 1990.

IV. A Formal Model of Choice of Business Legal Form

In Barro and Wheaton (2019, part IV), we work out a formal model that includes the frequency distribution of the corporate productivity advantage, $y \equiv \log(Y_c/Y_p)$, which appears in equation (2). This analysis applies for a given legal or regulatory framework for C-corporations and pass-through alternatives. Over time, legal changes 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 of y . For example, corporate form may be more useful in some types of businesses, such as those with larger-scale benefits or greater dependence on credit markets, than in others.

The model developed in Barro and Wheaton (2019, part IV) 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 at the cut-off τ , and the fraction corporate is 1 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 depend on the five parameters μ_c , σ_c , μ_p , σ_p , and ρ . We calibrate the model by specifying values of these parameters. One reason for carrying out this calibration is to construct reasonable ranges of values for coefficients that arise in the regression analysis. More importantly, the calibrated model allows inferences on how productivity responds to changes in τ or to shifts in the underlying parameters—especially μ_c and μ_p , which reflect the average productivity associated with the two legal forms. The difference $\mu_c - \mu_p$ represents the typical advantage for corporate form. We think that the main legal changes in recent decades have reduced this advantage.

Barro and Wheaton (2019, part IV) describe how we chose reasonable parameter values to calibrate the model. A key point is that the values of μ_c and μ_p were set for each year so that the model matched, first, the year's C-corporate share of net capital stock and, second, the year's overall level of business TFP, as given by Fernald's (2019) data. These calculations took account of each year's tax wedge, τ .

Figure 7 shows the time series for TFP as the dashed line. The estimated values of μ_c and μ_p are given, respectively, by the dotted and solid lines in the figure. Loosely speaking, the gap between μ_c and μ_p was set to match the C-corporate share of business net capital stock (dashed line in fig. 5), given the tax wedge, τ (thick solid line in fig. 4). The overall levels of μ_c and μ_p were chosen to generate the observed TFP level, given again the value of τ . Note that the estimated gap between μ_c and μ_p has fallen in most years since 1958. This gap closed especially rapidly between 1994 and 2004, likely reflecting the spread of LLCs. By 2009, the gap was nearly closed and thereafter has remained roughly constant.

Figures 8–10 each have two graphs, one corresponding to 1978 (the start date of our regression sample) and the other to 2013 (the final date

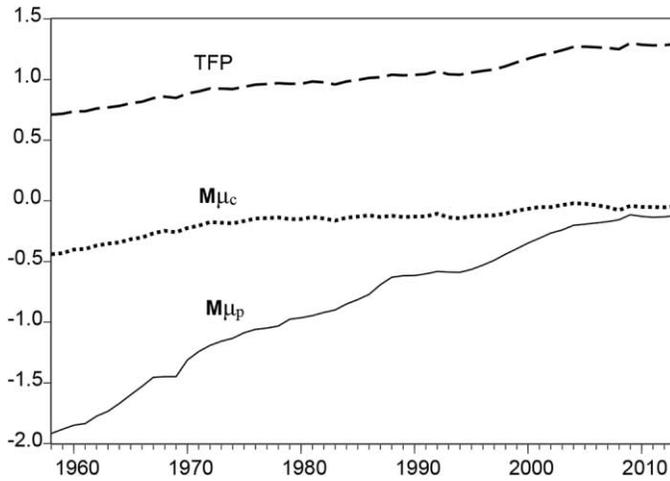


Fig. 7. Total factor productivity (TFP) and calibrated productivity parameters. The TFP series comes from the utilization-adjusted quarterly data on TFP described in Fernald (2019). The parameters μ_c and μ_p refer in the underlying model to the means of the logs of productivity under corporate and noncorporate ownership, respectively. The values of μ_c and μ_p for each year are backed out from the model, given the observed values of TFP; the tax wedge, τ , from the thick solid line in figure 4; and the C-corporate share of net capital stock from the dashed line in figure 5 (used to gauge the corporate share of output in the model). The other distributional parameters in the model are set at $\sigma_c = \sigma_p = 0.5$ and $\rho = 0.25$. See Barro and Wheaton (2019, part IV) for details.

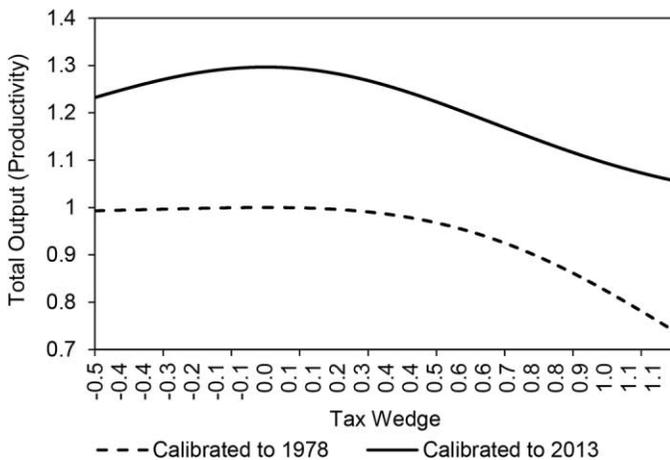


Fig. 8. Total output (productivity) as function of tax wedge, τ . Total output (productivity) peaks at a tax wedge, τ , of 0. This peak value is normalized to equal 1.0 for 1978. Total output falls with τ when $\tau > 0$ and rises with τ when $\tau < 0$. The curves for 1978 and 2013 use the respective values of the mean parameters μ_c and μ_p from figure 7.

of the sample). The graphs show the calibrated model’s predicted effect of a change in τ on a designated variable while holding constant the parameters μ_c and μ_p that apply for each year (see fig. 7).

Figure 8 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 values of μ_c and μ_p are higher in 2013. We focus, for each curve, on a range of τ between 0.1 and 0.5; this range applies in figure 4 to our 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 (productivity). 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 9 shows the relation of the corporate share of output to the tax wedge, τ . Note that the overall level of the curve is much lower in 2013 than in 1978 because of the lower estimated gap, $\mu_c - \mu_p$, in 2013. For each curve, a higher τ implies a lower corporate share. These results can be matched quantitatively with data, already described, on the C-corporate share of business economic activity.

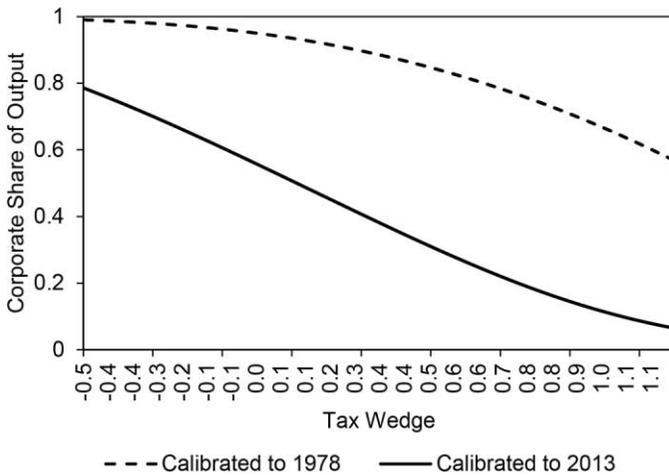


Fig. 9. Corporate share of output as function of tax wedge, τ . See the notes to figure 8. The corporate share of output declines monotonically with the tax wedge, τ . This share approaches 1 as τ approaches $-\infty$ and approaches 0 as τ approaches ∞ .

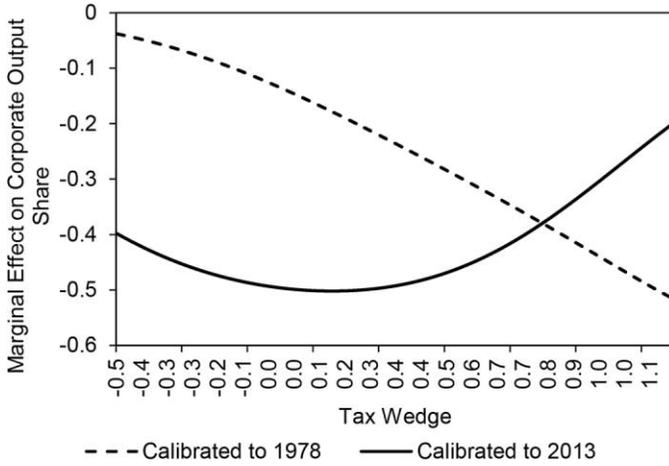


Fig. 10. Marginal effect of τ on corporate output share. See the notes to figure 8. The marginal effect of the tax wedge, τ , on the corporate output share is negative throughout.

Figure 10 shows the marginal effect of the tax wedge, τ , on the corporate share of output. Consistent with figure 9, 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.

V. Regressions

A. 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, $\log(1 - \tau_c) = \log(1 - \tau_{\text{prof}}) + \log(1 - \tau_{\text{div}})$. The pass-through part, $\log(1 - \tau_p)$, is determined by 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 nonstationarity 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 because the C-corporate share data start in 1958.

In principle, we would like to isolate time-varying influences, such as changes in the legal or 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 during our sample 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 1978 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 (FIRE), manufacturing, mining, services, trade, and transportation. However, as discussed in Barro and Wheaton (2019, part V), we have found that a compositional change variable constructed from these sectoral data lacks explanatory power for changes in C-corporate shares of economic activity.⁶

B. Regression Results

Table 2 has regression results where the dependent variable is the 20-year difference of the C-corporate share of net capital stocks (col. 1) or gross assets (col. 2). The sample period with annual data is 1978–2013 (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, part V).

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.

Table 2
Regressions for C-Corporate Shares of Economic Activity, 1978–2013

	Dependent Variable	
	C-Corp. Share Net Capital Stock (1)	C-Corp. Share Gross Assets (2)
Independent variables:		
Constant (trend), 1978–88	-.0103*** (.0008)	-.0064*** (.0006)
Constant (trend), 1989–96	-.0101*** (.0006)	-.0071*** (.0007)
Constant (trend), 1997–2013	-.0128*** (.0004)	-.0094*** (.0005)
C-corp. federal tax rate, $\log(1 - \tau_c)$.238*** (.049)	.238*** (.034)
Pass-through federal tax rate, $\log(1 - \tau_p)$	-.481*** (.093)	-.343*** (.029)
Number of observations	36	36
R^2	.84	.92
Standard error of regression	.0158	.0112

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 (fig. 5) and col. 2: C-corporate share of business gross assets (fig. 6). The shares are calculated relative to business totals that comprise C-corporations, S-corporations, and partnerships (including limited liability companies [LLCs]). The top federal tax rate on C-corporate profits, τ_{prof} , and the federal average marginal tax rate (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 and trusts) and is in fig. 3. The tax-rate variables enter, as in eq. (2), as $\log(1 - \tau_c) = \log(1 - \tau_{\text{prof}}) + \log(1 - \tau_{\text{div}})$ and $\log(1 - \tau_p)$. The constants correspond to 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 Sec. I).

*** $p < .01$.

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 (cols. 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 (col. 1) and 0.34 (col. 2).

The sizes of the estimated tax-rate coefficients are in the ballpark of those predicted by the model described in Section IV. As noted before, the marginal tax-wedge effects in figure 7 range between -0.2 and -0.5

when τ ranges between 0.1 and 0.5 that applies to the regression sample, 1978–2013.

The results in table 2 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 (fig. 3). This result suggests that the high top individual tax rates that prevailed before 1987 did not materially affect choices between C-corporate and pass-through legal forms. This finding makes sense because the large gap between the top tax rate and the Schedule E AMTR in this period (fig. 3) indicates that little pass-through income actually faced these high marginal tax rates.

The intercept terms apply in table 2 to the periods 1978–88, 1989–96, 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 these results as reflecting the increased 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 (fig. 4). Thus, this tax effect goes against the estimated trend coefficients (intercepts), which imply declining C-corporate shares of economic activity, consistent with figures 6 and 7. On their own, the tax changes from 1958 to 2013 should have increased C-corporate shares of economic activity.

VI. 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 productivity of C-corporate and pass-through forms of legal organization. Second, legal or other changes that affect C-corporate and pass-through forms of organization—that is, changes in μ_c and μ_p —impact productivity directly and also indirectly by influencing choices of legal status. We focus particularly on the idea that legal

changes that improved the status of LLCs lowered the gap $\mu_c - \mu_p$ by raising μ_p for given μ_c .

We use the calibrated model to compute three counterfactual time series, as detailed in Barro and Wheaton (2019, part VI). The first scenario, corresponding to the dotted line in figure 11, gives the estimated log of TFP (relative to that in 1958) that would have arisen if, instead of mostly falling over time, the gap $\mu_c - \mu_p$ had remained fixed at its value in 1958

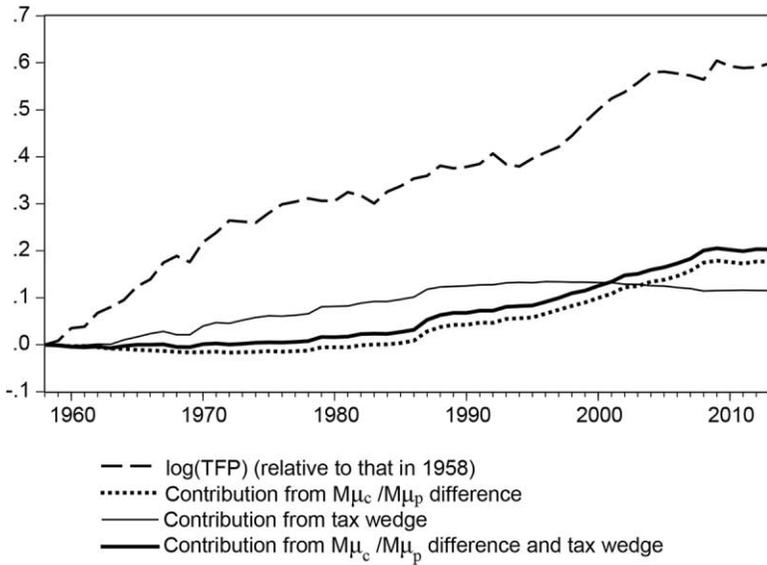


Fig. 11. Contributions to total factor productivity (TFP) growth. The dashed line is $\log(\text{TFP}) - \log(\text{TFP}_{1958})$, where TFP is from figure 7. The other graphs are calculations from the model sketched in Section IV and described in Barro and Wheaton (2019, parts IV and VI). The results depend on the estimated values of the parameters μ_c and μ_p shown in figure 7. For the contribution from $\mu_c - \mu_p$, the model is used to estimate the output, \hat{y} , that would have arisen each year if $\mu_c - \mu_p$ were kept at its 1958 value, 1.478 (see fig. 7). Each year's tax wedge, τ , is kept at that shown by the thick solid line in figure 4; μ_c is kept at the value shown in figure 7; and μ_p is set to $\mu_c - 1.478$. The dotted line shows $\log(\text{TFP}) - \log(\hat{y})$ —the contribution to $\log(\text{TFP})$ from the change in $\mu_c - \mu_p$ compared with its value in 1958. For the tax-wedge calculation, the model is used to estimate the output, \hat{y} , that would have arisen each year if τ were kept at its 1958 value, 0.7580 (thick solid line in fig. 4). Each year's μ_c and μ_p are kept at those shown in figure 7. The thin solid line shows $\log(\text{TFP}) - \log(\hat{y})$ —the contribution to $\log(\text{TFP})$ from the change in τ compared with its value in 1958. For the calculation for the joint contribution from the changes in $\mu_c - \mu_p$ and τ , the model is used to estimate the output, \hat{y} , that would have arisen each year if $\mu_c - \mu_p$ and τ were kept at their 1958 values of 1.478 and 0.7580, respectively. Each year's μ_c is kept at that shown in figure 7, and μ_p is set to $\mu_c - 1.478$. The thick solid line shows $\log(\text{TFP}) - \log(\hat{y})$ —the contribution to each year's $\log(\text{TFP})$ from the changes in τ and $\mu_c - \mu_p$ compared with their values in 1958.

(see fig. 7). The second scenario, corresponding to the thin solid line in figure 11, computes the estimated log of TFP that would have arisen if the tax wedge, τ , instead of mostly declining over time, had remained constant at its value in 1958 (fig. 4). The third scenario, given by the thick solid line in figure 11, assumes that $\mu_c - \mu_p$ and τ are both kept fixed at their respective values in 1958.

The dotted line in figure 11 implies that, from 1958 to 2013, the effect of the fall in $\mu_c - \mu_p$ is a rise in TFP by 0.33% per year, compared with the total of 1.09% per year. However, the effects are very different in the early and late parts of the sample. From 1958 to the mid-1980s, the substantial rise in μ_p (fig. 7) did not contribute to rising TFP. The reason is the tax penalty, τ , for being corporate (fig. 4), which creates a distortion in the sense that the public return from being corporate rather than pass-through exceeds the private return. In the years up to 1986, when τ is very high—between 0.37 and 0.77—this distortion turns out to be large enough so that overall output falls slightly or rises only slightly when μ_p increases for given μ_c and τ (despite the direct positive impact of a rise in μ_p on productivity). By 1987, τ had fallen enough (below 0.30), so that increases in μ_p contribute to higher TFP. The effect from the shrinking gap between μ_c and μ_p is particularly large from 1994 to 2004, when the growth rate of TFP is unusually high at 2.00% per year. In this period, the estimated contribution from the falling $\mu_c - \mu_p$ is 0.77% per year. This effect lines up reasonably well with the legal changes that made LLCs attractive alternatives to C- or S-corporations or to existing forms of partnerships. That is, the results suggest that the invention of the LLC was an important form of technical progress.

The thin solid line in figure 11 gives the results from the mostly falling tax wedge, τ . In this case, the contribution to TFP growth is most important in the early period, when τ and the gap $\mu_c - \mu_p$ are particularly high. From 1958 to 1987, the average TFP growth rate was 1.24% per year, and the contribution from the mostly declining τ was 0.41% per year. Over the full period from 1958 to 2013, the contribution from the reductions in τ was 0.21% per year compared with the total of 1.09% per year.

The thick solid line in figure 11 shows the estimated combined contribution from the declines in $\mu_c - \mu_p$ and τ . From 1958 to 2013, the combined contribution to TFP growth was 0.37% per year compared with the total of 1.09% per year. (The estimated effects from the changes in $\mu_c - \mu_p$ and τ are not additive because of important interactions between the two components.)

VII. Concluding Observations

We dealt theoretically and empirically with the relation between tax rates and the composition of US business economic activity between C-corporate and pass-through forms. The main federal tax wedge, τ , that we measured since 1958 involves the tax rate on C-corporate profits, the effective tax rate on dividends, and the pass-through tax rate, gauged by the AMTR on Schedule E income. Our regression estimates imply that the mostly declining tax wedge from 1958 to 2013 raised the C-corporate share of economic activity.

Despite the overall decline in the tax wedge, the 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 enhanced the productivity of pass-through forms, notably through the development of LLCs. We gauged these effects in our regression estimates by aligning trend terms (intercepts) with the dates of the principal changes that affected the legal status of the LLC form of business.

The calibrated theoretical model provides estimates of the contribution to the growth rate of business TFP from the mostly falling gap between C-corporate and pass-through productivity and from the mostly declining tax wedge. The estimated combined contribution to TFP growth from 1958 to 2013 was 0.37% per year compared with the total growth rate of 1.09% per year. The contribution from the declining gap between C-corporate and pass-through productivity was negligible up to the mid-1980s but became important thereafter. The growth contribution was especially large at 0.77% per year in the period from 1994 to 2004 when the observed TFP growth rate was unusually high at 2.00% per year.

Endnotes

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1. More generally, the distribution of the $\tau(i)$ also matters. However, as discussed in Barro and Wheaton (2019), bringing in this consideration does not change the main results.

2. This construction assumes that the tax rate on foreign holdings is the same as that on domestic holdings.

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 Kleineberg, using issues of *Statistics of Income, Individual Income Tax Returns* (IRS). A similar measure of the dividend AMTR (but including state income taxes) appears in Poterba (2004, table 1).

4. These data do not include economic activity by governments, nonprofits, real estate investment trusts, and regulated investment companies.

5. These shares are measured relative to the total for C-corporations, partnerships, and S-corporations. Data on sole proprietorships are unavailable for net capital stocks and gross assets.

6. The main changes in shares of gross assets were toward FIRE and away from manufacturing and transportation. However, because these sectors were all relatively high in C-corporate shares of gross assets, the sectoral changes had little impact on the aggregate C-corporate share.

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