CRS Report for Congress

Corporate Tax Reform:
Issues for Congress

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Summary

H.R. 3970, introduced by Chairman Charles B. Rangel of the House Committee on Ways and Means, includes corporate tax revisions, trading a lower rate for a broader tax base as part of the revenue neutral reform package. Some participants at a recent Treasury conference, and some discussions by economists in opinion pieces, suggest there is an urgent need to lower the corporate tax rate, but not necessarily to broaden the tax base.

Arguments for lowering the corporate tax rate include the traditional concerns about economic distortions arising from the corporate tax and newer concerns arising from the increasingly global nature of the economy. Some claims have been made that lowering the corporate tax rate would raise revenue because of the behavioral responses, an effect that is linked to an open economy. Although the corporate tax has generally been viewed as contributing to a more progressive tax system because the burden falls on capital income and thus on higher income individuals, claims have also been made that the burden falls not on owners of capital, but on labor income — an effect also linked to an open economy.

The analysis in this report suggests that many of the concerns expressed about the corporate tax are not supported by empirical data. Claims that behavioral responses could cause revenues to rise if rates were cut do not hold up on either a theoretical basis or an empirical basis. Studies that purport to show a revenue maximizing corporate tax rate of 30% (a rate lower than the current statutory tax rate) contain econometric errors that lead to biased and inconsistent results; when those problems are corrected the results disappear. Cross-country studies to provide direct evidence showing that the burden of the corporate tax actually falls on labor yield unreasonable results and prove to suffer from econometric flaws that also lead to a disappearance of the results when corrected, in those cases where data were obtained and the results replicated. Similarly, claims that high U.S. tax rates will create problems for the United States in a global economy suffer from a misrepresentation of the U.S. tax rate compared to other countries and are less important when capital is imperfectly mobile, as it appears to be.

While these new arguments appear to rely on questionable methods, the traditional concerns about the corporate tax appear valid. While an argument may be made that the tax is still needed as a backstop to individual tax collections, it does result in some economic distortions. These economic distortions, however, have declined substantially over time as corporate rates and shares of output have fallen. Moreover, it is difficult to lower the corporate tax without creating a way of sheltering individual income given the low rates of tax on dividends and capital gains.

A number of revenue-neutral changes are available that could reduce these distortions, allow for a lower corporate statutory tax rate, and lead to a more efficient corporate tax system. These changes include base broadening, reducing the benefits of debt finance through inflation indexing, and reducing the tax at the firm level offset by an increase at the individual level. This report will not be updated.

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On October 25, 2007, Ways and Means Committee Chairman Charles B. Rangel introduced H.R. 3970, a tax reform plan that included revisions in the corporate tax to lower the rate and broaden the base. This proposal would cut the corporate tax rate and, in a roughly revenue-neutral sub-section of the proposal, broaden the tax base.

Interest in corporate rate cuts and other corporate revisions has been developing for some time. In November 2005, President George W. Bush's Advisory Panel on Tax Reform reported on a variety of proposals for major reform of the tax system, including those for corporate and business income taxes.[1] Hearings were held on these proposals in 2006, but no further action occurred. On July 16, 2007, *The Wall Street Journal* published an opinion article by Treasury Secretary Henry M. Paulson addressing concerns that the U.S. corporate tax rate is high relative to other countries and announcing a conference to be held July 26 that would examine the U.S. business tax system and its effects on the economy.[2]

On July 23, the Treasury Department released a background paper (hereafter, the Treasury Study) that addressed several issues associated with the corporate tax: (1) special tax provisions that narrow the corporate tax base; (2) the efficiency effects of the tax (distortions in the size and allocation of investment); (3) the size of the unincorporated sector; and (4) a comparison of corporate taxes in the United States with other countries.[3] The paper, however, did not discuss important justifications for a corporate tax, such as its role in the progressivity of federal taxes assuming the burden of the tax falls on capital, and the need for a corporate tax to avoid the use of the corporate form as a tax shelter by high income individuals.

While the Treasury Study focused largely on efficiency issues and international comparisons, on the day of the conference, R. Glenn Hubbard, President Bush's first chairman of the Council of Economic Advisors, also published an opinion article in *The Wall Street Journal* referring to the conference.[4] His article echoed some arguments that have been made in recent months that are based partly, or largely, on empirical studies of differences across countries. He addressed the distributional

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[1] *Simple, Fair, and Pro-Growth: Proposals to Fix America's Tax System*, November 2005, which can be found at [http://www.taxreformpanel.gov/].

[2] Henry M. Paulson, Jr., "Our Broken Corporate Tax Code," *The Wall Street Journal*, July 19, 2007.

[3] United States Department of the Treasury, "Treasury Tax Conference on Business Taxation and Global Competitiveness: Background Paper," July 30, 2007, at [http://www.ustreas.gov/press/releases/hp500.htm].

[4] R. Glenn Hubbard, "The Corporate Tax Myth," *The Wall Street Journal*, July 26, 2007.

issue, but referred to some evidence that the burden of the corporate tax falls on labor. In addition to theoretical arguments, he cited an empirical paper by Kevin Hassett and Aparna Mathur of the American Enterprise Institute.[5] His article also discussed empirical evidence suggesting that the U.S. might raise revenue by cutting corporate tax rates because of large behavioral responses.[6] Hubbard concludes by suggesting that cutting the corporate tax rate would reduce a tax that is largely, or even fully, borne by labor and that behavioral responses would offset much of the static revenue cost.

During the conference, discussions included whether business representatives would trade tax preferences for lower rates, whether reform should take the form of lower rates or write-offs of investments, and methods of avoiding the corporate tax by income shifting in a global economy. Some participants complained that the corporate tax is outdated, too complex, distorts decisions, and undermines the ability of firms to complete in a global economy. Echoing some issues raised in Hubbard's article, Kevin Hassett indicated that the corporate tax was not an effective way to raise revenues and suggested that lowering the rate would raise revenues.[7]

Prior to the 2007 conference, Congress held hearings in 2006 on the Advisory Panel's proposals, with a general hearing followed by one concentrating on business tax issues. In the 110th Congress, attention to capital income taxes has been targeted to narrower issues such as the tax gap and offshore tax havens.[8] At the time of the Treasury conference, Chairman Charles B. Rangel of the House Ways and Means Committee released a statement inviting the Bush Administration to discuss such issues as tax reform, especially the Alternative Minimum Tax (AMT), addressing tax havens, and increasing equity and fairness in the tax structure.[9]

H.R. 3970 includes some of the base broadeners included in the Treasury Study and others that were not. The rate reduction, from 35% to 30.5% was not as large as

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[5] Kevin A. Hassett and Aparna Mathur, *Taxes and Wages*, American Enterprise Institute, working paper, March 6, 2006, presented at a conference of the American Enterprise Institute on May 2, 2006.

[6] Hubbard's article cites Michael Devereux, and apparently refers to a paper also presented at the American Enterprise Institute Symposium.

[7] This summary and other references to the issues discussed at the conference are based on two detailed media accounts of the conference; although the conference was televised, there is no transcript at this time. The articles are Heidi Glenn, "Business Leaders would Give Up Tax Breaks for Lower Rates," *Tax Notes,* July 30, 2007, pp. 324-327, and Joanne M. Weiner, "U.S. Corporate Tax Reform: All Talk, No Action," *Tax Notes*, August 27, 2007, pp. 716-728.

[8] Hearings were held by the Senate Finance Committee on August 3, 2006, with a follow-up focused on business tax issues on September 20, 2006. The committee also held hearings on May 3, 2007 on tax havens.

[9] Statement released by the Honorable Charles B. Rangel, Chairman, Ways and Means Committee, July 26, 2007.

that discussed in the Treasury Study, 27%. Base broadeners in H.R. 3970 have already been criticized by some business groups.[10]

The corporate tax debate continues to be in the news. In May 2008, N. Gregory Mankiw published an article suggesting that most of the burden of the tax falls on labor, and cites research suggesting the corporate tax is borne by labor and that revenue losses may be fully or largely offset by behavioral responses.[11]

This report provides an overview of corporate tax issues and discusses potential reforms in the context of these issues, with particular attention to some of the recent research concerning large behavioral responses and their implications for revenue and distribution. The first section reviews the size and history of the corporate income tax, and discusses an important issue that has been given little attention by those who propose deep cuts in the corporate tax: its role in preventing the use of the corporate form as a tax shelter by wealthy business owners. This section also discusses the potential effect of behavioral responses on corporate tax revenues. The second section examines the role of the corporate tax in contributing to a progressive tax system and discusses claims that the burden falls on workers. The third section reviews arguments relating to efficiency and revenue yield, and traditional criticisms of the corporate tax as one that causes important behavioral distortions. One aspect of this discussion is the question of how the tax might be viewed differently in a more global economy. The final section examines options for reform.

The Corporate Tax as a Revenue Source

The corporate tax is the third largest source of federal revenue, but its importance as a revenue source has diminished considerably over time.

Magnitude and Historical Pattern

Despite concerns expressed about the size of the corporate tax rate, current corporate taxes are extremely low by historical standards, whether measured as a share of output or a based on the effective tax rate on income.[12] In 1953, the

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[10] See Jeffrey H. Birnbaum, "Democrat Overhall of Taxes: Rangel Would Annul AMT, Shift Burden," *Washington Post*, October 26, 2007, p. D1.

[11] N. Gregory Mankiw, "The Problem with the Corporate Tax," *New York Times*, June 2, 2008. For empirical evidence on incidence he cites an empirical study by Wiji Aralampalam, Michael P. Devereux, and Giorgia Maffini, *The Direct Incidence of Corporate Income Tax on Wages*, Oxford University Center for Business Taxation, May, 2008. For empirical evidence on the feedback effects on revenue, he cites Alex Brill and Kevin Hassett, *Revenue Maximizing Corporate Income Taxes*, AEI working paper # 137, American Enterprise Institute, July 31, 2007.

[12] The data discussed in this paragraph are taken from Jane G. Gravelle, "The Corporate Tax: Where Has it Been and Where is it Going?," *National Tax Journal,* vol. 57 (December 2004), pp. 903 — 923; U.S. Congressional Budget Office, Historical Data,[http://cbo.gov/budget/historical.shtml] and The Budget and Economic Outlook, Fiscal years 2008-2017

corporate tax accounted for 5.6% of GDP and 30% of federal tax revenues. In recent years the tax has fluctuated round 2% of GDP and 10% of revenues, reaching a low of 1.2% of GDP in 2003, and standing at 2.7% in 2006. The tax is projected to continue to raise revenues of around 2% of GDP. Today, it is the third largest federal revenue source, lagging behind the individual income tax, which is about 8% of GDP and the payroll tax, which is about 6.5%. It is much more significant, however, than excise taxes, which are slightly over 0.5%, and estate and gift taxes at 0.2%. (Note that the income tax share is expected to grow and will exceed 10% if the 2001-2003 tax cuts are not made permanent; estate and gift tax revenues will also rise slightly.)

Much of the historical decline arises from legislated reductions in the corporate effective tax rate on the return to new investment, which has fallen from 63% of corporate profits in 2003 to about 30% today. These changes include a reduction in the top statutory rate from 52% to 35% and much more liberal depreciation rules. The total tax burden on corporate source income has declined even more due to lower rates on dividends and capital gains at the shareholder level and the increased fraction of stocks held in tax exempt form.

While a large fraction of the decline in corporate tax revenues is associated with these changes in rates and depreciation, other causes may be more liberal rules that allow firms to obtain benefits of corporate status (such as limited liability) while still being taxed as unincorporated businesses and tax evasion, particularly through international tax shelters. The Treasury Report documents the significant rise in the share of total business net income received by unincorporated businesses since 1980, from 21% of total net income to 50%. While the share of proprietorships (which have no limited liability) has declined slightly, from 17% to 14%, the share of Subchapter S firms (firms that are incorporated but are allowed to elect taxation as an unincorporated business) rose from 1% to 15%. These changes followed a dramatic increase in the number of shareholders allowed for the election (the limit of 10 was raised to 35 in 1982, to 75 in 1996, and to 100 in 2004). Partnerships (including limited liability corporations and limited liability partnerships) increased from 3% to 21%, with most of the increase occurring after 1990. This growth reflects in part the growth of limited liability corporations established under state law (the first state adopted such a provision in 1982), which qualify as unincorporated business for corporate tax purposes. While Subchapter S firms are constrained by the shareholder limit, partnerships are not.

Although it has declined considerably in importance, the corporate tax remains a major source of federal revenue, and a significant change in individual income taxes would be required to offset a substantial reduction in corporate taxes. Current pressures to find revenue sources to pay for relief from the AMT make an overall corporate tax cut difficult to envision. For that reason, the Bush Administration has proposed trading off rate reductions, or possibly broad investment subsidies that reduce the effective burden on new investment, for base broadening, through reduction of corporate tax preferences.

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[12] (...continued)
[http://www.cbo.gov/ftpdoc.cfm?index=7731&type=0].

The Role of the Corporate Tax in Backstopping the Individual Tax

Measuring corporate tax revenue falls short of describing the full role of the corporate tax in contributing to federal revenues because the corporate tax protects the collection of individual income taxes. As long as taxes on individual income are imposed, a significant corporate income tax is likely to be necessary to forestall the use of the corporation as a tax shelter. Without a corporate tax, high income individuals could channel funds into corporations, and, with a large part of earnings retained, obtain lower tax rates than if they operated in partnership or proprietorship form or in a way that allowed them to be taxed as such. As suggested by the growth in unincorporated business forms above, wealthy business owners may be quick to take advantage of tax rate differentials, which currently tend to favor unincorporated businesses. (Since 1986, when individual tax rates were lowered dramatically, the corporate tax rate has been high relative to the individual tax rate). The Treasury Study indicated that 61% of the income of unincorporated businesses was associated with taxpayers in the top income tax bracket.

Although the top tax rate on corporations is equal to the top individual rate (35%), the corporate tax is graduated. Consequently, for high income taxpayers, there is an advantage to shifting part of one's income into a corporation because corporate tax rates are graduated (15% on the first $50,000 and 25% on the next $25,000) and are lower than the top marginal tax. This opportunity, however, is restricted by: (1) limiting to one the number of corporations income can be shifted to; (2) the amount on which rates are graduated; and (3) disallowing graduated rates for personal service corporations. There are over 600,000 corporations with earnings less than $50,000, according to Internal Revenue Service statistics, suggesting some shifting occurs. In recognition of the potential use of the corporation as a shelter, tax law has in the past contained a tax on accumulated earnings. As long as dividends were taxed as ordinary income and the accumulated earnings tax was strict enough, it was difficult to use the corporate form to shelter a great deal of income.

This tax shelter constraint on lowering the corporate rate is arguably more binding today because of the lower rates on dividends and capital gains enacted as part of the Administration's corporate relief package in 2003. **Table 1** calculates the effective tax rate for operating through a corporation, versus an unincorporated business, for an individual in the 35% tax bracket. If dividends are taxed at 15% and the corporate rate is lowered to 27% as suggested in the Treasury conference, the tax rate in the corporate form would be less than the tax rate on unincorporated businesses. In fact, with a 15% rate on dividends, corporations that distributed less than 73% of their income would present a tax shelter opportunity with a 27% tax rate. This outcome would occur even without the benefit of graduated rates and could potentially benefit labor income as well as individual capital income. Moreover, although there are rules restricting accumulated earnings, it is common for corporations to reinvest a significant fraction of their earnings. This unlimited sheltering option would not exist as long as the corporate tax were as high as the individual tax, and its scope would be limited if dividends and capital gains were taxed at higher rates.

Some reforms might address these shelter issues directly, including raising tax rates on dividends and capital gains at the individual level while lowering the rate at the firm level, eliminating the graduated rate structure, and more formal methods of integrating the individual and corporate income taxes.

Table 1. Tax Rates For Alternative Forms of Organization Under Alternative Rate Structures, Individual at 35% Rate

	100% of Income Distributed	50% of Income Distributed	No Income Distributed
Corporate Business			
Dividends Taxed at 15% Rate			
Corporate Tax Rate of 35%	45	40	35
Corporate Tax Rate of 27%	38	32	27
Dividends Taxed at Ordinary Rates			
Corporate Tax Rate of 35%	58	46	35
Corporate Tax Rate of 27%	46	36	27
Unincorporated Business	35	35	35

Source: CRS analysis.

Behavioral Responses and Revenue Maximizing Tax Rate

Although it has long been recognized that there are behavioral responses to the corporate tax (even aside from the tax sheltering issues indicated above), and that these responses have important implications for the efficiency of the economy and the burden of the tax, the issue of a revenue maximizing tax rate, popularly associated with the "Laffer" curve, has rarely entered into the discussion. A Laffer curve graphs revenue against the tax rate, and is based on the notion that revenue is zero at a zero tax rate and zero at a 100% tax rate (at least with respect to some taxes).[13] In a Laffer curve, the revenue first rises with the tax rate and then falls, and at the point it reverses direction is the revenue-maximizing tax rate.

A Laffer curve for the corporate tax has been proposed or alluded to recently in several articles in the popular press. One is the article by Glenn Hubbard, cited above. In *National Review*, Kevin Hassett discusses the Laffer curve and presents a chart that he indicates is an illustration that appears to show a negative relationship

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[13] Excise taxes can be set at more than 100% and still yield revenue. Taxes on real capital income in excess of 100% can also yield revenues because inflation is an implicit tax on the holding of cash.

between corporate revenues as a share of GDP and the tax rate.[14] Only 13 countries
are shown on this graph, however, and the negative relationship is clearly strongly
affected by an outlier, Ireland, which is a well known tax haven; most economists
would not find this illustration persuasive proof. Another discussion of this issue
appeared in an editorial in *The Wall Street Journal*, which also presented a chart with
a number of OECD countries on it.[15] In this chart, the editors simply drew a curve,
which passed through a couple of points. There was no statistical fitting to the data
and no informative value to such an analysis; moreover the two points through which
the freehand curve was drawn were questionable: one was the United Arab Emirates
with no tax, which is neither a typical country nor in the OECD, and the other was
Norway, whose corporate tax revenue tends to be high because of oil. The bulk of the
data showed no obvious trend.[16]

The Hubbard and Hassett articles do, however, cite some more sophisticated
research. Hassett referred to a paper by Kimberly Clausing,[17] and Hubbard referred
to a paper by Michael Devereux.[18] In addition, Alex Brill and Kevin Hassett also
prepared a statistical analysis examining the change in the relationship over time.[19]
A cross country study was also prepared by Mintz.[20] Clausing, who is referred to in
the Hassett article, is quoted as claiming that the United States is likely to the right
of the revenue maximizing point on the Laffer curve, but this statement, presumably
from an earlier draft, is not found in her published article. That article finds a
revenue maximizing tax rate of 33%, in her simple specification, but as she added
variables and accounted for other features the revenue maximizing tax rate seemed
to rise, as indicated in **Table 2**. Large countries and countries that are less open, such

[14] Kevin A. Hassett, "Art Laffer, Righter Than Ever," *National Review*, February 13, 2006.

[15] "We're Number One, Alas," *The Wall Street Journal*, July 13, 2007, p. A12.

[16] For insight into how this graph was viewed by economists, see Brad DeLong, an
economist at Stanford and author of a website, *Brad DeLong's Daily Journal*, who titled his
entry "Most Dishonest Wall Street Journal Editorial Ever." There was some perception,
which was incorrect, that this graph was prepared by Kevin Hassett because he was
mentioned as a source, but that was not the case; he provided some of the data (personal
communication with Kevin Hassett). Based on data provided by one of the correspondents
in that debate, a simple regression of corporate share on tax and tax squared showed no
significant coefficients for tax variables, indicating no relationship:
[http://delong.typepad.com/sdj/2007/07/most-dishonest-.html].

[17] Kimberly A. Clausing, "Corporate Tax Revenues in OECD Countries," *International Tax
and Public Finance*, vol. 14 (April 2007), pp. 115-133.

[18] Michael P. Devereux, *Developments in the Taxation of Corporate Profit in the OECD
Since 1965: Rates, Bases and Revenues*, May 2006 presented at a conference of the Alliance
for Competitive Taxation and the American Enterprise Institute, June 2, 2006.

[19] Alex Brill and Kevin Hassett, *Revenue Maximizing Corporate Income Taxes*, AEI
working paper # 137, American Enterprise Institute, July 31, 2007.

[20] Jack M. Mintz, *2007 Tax Competitiveness Report: A Call for comprehensive Tax Reform*,
C.D. Howe Institute, No. 254, September 2007.

as the United States, have a revenue maximizing tax rate of 57% — much larger than the combined federal and state rate for U.S. firms of 39%.[21]

Table 2. Revenue Maximizing Tax Rates and Share of Variance Explained in the Clausing Study

Specification	Tax Rate	R-Squared
(1) Basic	33%	0.13
(2) Additional Variables	39	0.43
(3) Additional Variables	42	0.46
(4) Additional Variables	41	0.23
(5) Additional Variables	37	0.21
(6) Openness	43	0.27
(7) Size	45	0.23
(8) Openness and size	57	0.28

Source: Kimberly Clausing (2007).
Note: The R-Squared is a statistical term that measures the share of the variance in the dependent variable explained by the independent variables.

Michael Devereux's paper indicates that, while he finds a revenue maximizing rate of 33% under the same specification as Clausing, he finds only weak evidence of a relationship between tax rates and corporate tax revenues as a percentage of GDP. Many of his specifications do not yield statistically significant effects. Brill and Hassett find a rate of around 30%, which has been falling over time. Mintz finds a rate of 28%, but his data span only a few years (2001-2005).[22]

In the remainder of this section, we first discuss theoretical expectations of this relationship and then examine these empirical studies. Both the theoretical and empirical assessments suggest that the results of these analyses are questionable.

Theoretical Issues

The issue of a Laffer curve has not been a part of the debate because the notion of a revenue maximizing tax rate other than at very high tax rates is inconsistent with most of the models of the corporate tax. Traditionally, the main behavioral response associated with the corporate tax was the substitution of noncorporate capital for corporate capital within an economy where the amount of capital was fixed. Imposing a corporate tax (in excess of the noncorporate tax) caused capital to earn

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[21] The 33% tax rate is from the simplest regression; the other regressions, which include other variables, or control for country size and/or openness, lead to higher revenue maximizing rates.

[22] Hence, most of the variation is across countries, which, as discussed below, is a potentially serious problem.

a lower return in the corporate sector and to flow out of that sector and into the noncorporate sector, thereby lowering the return in the noncorporate sector and raising the return, before taxes, in the corporate sector. The higher pre-tax return on capital also caused prices to go up in the corporate sector and fall in the noncorporate sector, causing a shift towards non-corporate sector total production. The corporate profits tax base, therefore, had two opposing forces: the amount of capital was falling but the profit rate was rising. The taxable base could, therefore, either increase as tax rates increased, or it could decrease. The direction depended on the substitutability of capital and labor in the corporate sector. The central tendency of most models (with unitary elasticities) suggested, however, that the tax base was relatively invariant to tax rates, and revenues would always rise with the tax rate. Consequently, under any reasonable set of assumptions there would either be no revenue maximizing tax rate or an extremely high one.[23]

If behavioral responses caused the total capital in the U.S. economy to contract, the outcome could be different. One such model, the open economy model, appears to be a motivation for the belief in a relatively low revenue maximizing tax rate. Brill and Hassett discuss elasticity estimates of foreign capital flows to after tax returns in the range of 1.5 to 3 (they also cite a recent study with an elasticity of 3.3) in their paper that finds a revenue maximizing tax rate of around 30%. They conclude that "[t]hese high elasticities are consistent with the view that reductions in corporate rates could lure a significant enough amount of economic activity to a locality to create a Laffer curve in the corporate tax space."[24]

As shown in the Appendix A, however, one cannot achieve this tax rate even with infinite elasticities. In the most extreme case, where: (1) the country is too small to affect worldwide prices and rates of return; (2) capital is perfectly mobile; and (3) products in international trade are perfectly substitutable, the revenue maximizing tax rate would be the ratio of the labor share of income to the factor substitution elasticity. Assuming fairly common values for a model without depreciation of 75% for labor's share of income and a factor substitution elasticity of 1, the tax rate would be 75% — far above the rates of around 30% reported by Brill and Hassett. This rate could rise as these conditions are relaxed. If the U.S. is assumed to have 30% of world resources, the rate rises to 81%; if imperfect substitutability between investments across countries and between foreign and domestic products is allowed, it would rise further.

Although it is possible to have a revenue maximizing tax rate that does not asymptotically approach 100% it is probably not possible to find a rate that maximizes revenues as a percentage of GDP, because GDP falls as well as tax revenues. In this case, we are back to the same circumstances as in the reallocation

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[23] An invariant tax base would occur when both production and utility were of the Cobb Douglas form, that is unitary factor substitution elasticities and unitary product substitution elasticities. At 100% tax rate a corner solution would be presumably be reached where the corporate sector would entirely disappear, but only at that extreme rate would such an effect occur.

[24] Brill and Hassett, *Revenue Maximizing Corporate Income Taxes*, p. 6.

of capital in the closed economy: with unitary elasticities, the corporate share of income is constant relative to GDP, and with other elasticities it can rise or fall.

A related circumstance where capital can contract would be in a model where savings responds so powerfully that the savings supply is infinitely elastic, that is, when a tax is imposed, the capital stock must contract so much, and the pre-tax rate of return rises so much that the after-tax return comes back to its original value. This extreme savings response model yields the same revenue maximizing tax rate as the extreme open economy, 75%, and probably no revenue maximizing tax rate for revenues as a percent of GDP. Moreover, the slowness with which the capital stock adjusts (most models allow 150 years for full adjustments) means that the revenue would be affected by tax rates in the past.

The result of this discussion makes it clear that revenue maximizing tax rates cannot arise from physical reallocations or contractions of capital. Nor are they likely to arise from a substitution between debt and equity, since the debt share has changed very little despite significant changes in the relative tax burden, and estimates of elasticities that do exist are small.

A remaining source of a different outcome is profit shifting. This could involve firms maintaining the same activity and shifting the form of operation to unincorporated businesses. This could be a possibility (although the point of revenue maximization would be much too low because much of the tax has not disappeared, but rather has shifted). But, at least in the United States, this shift is probably less the result of high corporate tax rates and more the result of increasingly loose restrictions on operating with limited liability outside the corporate form, actions that have not been taken by other countries.[25] The other profit shifting issue is the shifting of profits (rather than activity) to foreign countries. Such effects are possible, but it would seem unlikely that tax avoidance could be of this magnitude, given that only 5% of the U.S. capital stock is invested abroad. While a small low income country, as is characteristic of most tax havens, might have little enough domestic capital that they could afford the loss from lowering the rate in order to attract more capital, such an outcome is much less likely for the United States.

Empirical Analysis

As noted above, several recent studies have examined the relationship between corporate tax rates and corporate tax revenues as a percentage of gross domestic product (GDP). We obtained the data used for two of these studies to replicate and extend the analyses. Both studies and our analysis estimate the effect of the top

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[25] The Treasury Study provides data on the growth over time in unincorporated business forms and suggests that the large share of this income in the United States relative to other countries is due to the ability to avoid the corporate tax and still retain limited liability in the United States. The growth in Subchapter S income (partnerships that can elect to be taxed as corporations) corresponds to increasing limits on the number of permissible shareholders, and the growth in partnership income to the growth in the number of states allowing limited liability companies that do not fall under the corporate tax. Proprietorship income shares have changed very little. In any case, this growth occurred during a period when the corporate tax was constant or falling.

corporate tax rate (and its square) on corporate tax revenues as a percentage of GDP. Panel data for 29 OECD countries is used for the analysis.

Brill and Hassett Study

In their study, Brill and Hassett use panel data for the OECD countries from 1981 to 2003.[26] They use regression analysis (OLS) to estimate the effects. Brill and Hassett find that the corporate tax rate has at first a positive effect on corporate tax revenues as a percentage of GDP and then a decreasing effect — the effect looks like an inverted U, the shape of the classic Laffer curve. All of their coefficient estimates are statistically significant. However, they do not account for problems often encountered with the use of panel data, and their coefficient estimates would appear to be biased and inconsistent.[27]

The estimation results from our re-analysis of the Brill and Hassett study are reported in **Table 3**. The regression includes a tax rate and a tax rate squared to allow for a curve. Panel A of the table displays the results for central government corporate tax data (in the case of the U.S., this is federal government tax data). The coefficient estimates for the full time period (1980 to 2003) and the four subperiods defined by Brill and Hassett are reported. In all cases, the coefficient estimates are fairly small and none are statistically significant at conventional confidence levels. Panel B of the table displays the results for total government (that is, governments at all levels) corporate tax data. Again, the coefficient estimates are fairly small and none are statistically significant. Once appropriate estimation methods are used to correct problems arising with panel data, there appears to be no statistically significant relation between corporate tax rates and corporate tax revenues as a percentage of GDP.

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[26] See Alex Brill and Kevin A. Hassett, *Revenue-Maximizing Corporate Income Taxes: The Laffer Curve in OECD Countries*. We obtained our data from the same sources as Brill and Hassett.

[27] The terms "biased" and "inconsistent" are technical statistical terms. See Appendix B for a description and the consequences of these problems, and the statistical definitions for biased and inconsistent.

Table 3. Coefficient Estimates: Dependent Variable is Corporate Revenues as a Percentage of GDP (Brill and Hassett Model)

	1980-1986	1987-1992	1993-1997	1998-2003	1980-2003
A. Central government corporate tax revenues; federal corporate tax rate					
Tax rate	-0.037 (0.090)	-0.110 (0.081)	0.048 (0.087)	0.049 (0.117)	-0.040 (0.040)
Tax rate squared	0.087 (0.109)	0.122 (0.100)	-0.082 (0.129)	-0.060 (0.178)	0.052 (0.053)
F (joint)	5.15	1.21	0.33	0.21	0.51
Prob>F	0.008	0.303	0.719	0.809	0.603
B. Total government corporate tax revenues; total corporate tax rate					
Tax rate	0.204 (0.195)	-0.042 (0.077)	0.069 (0.076)	0.037 (0.094)	-0.016 (0.038)
Tax rate squared	-0.193 (0.214)	0.044 (0.091)	-0.106 (0.109)	-0.008 (0.123)	0.028 (0.047)
F (joint)	2.25	0.21	0.51	0.74	0.44
Prob>F	0.112	0.811	0.602	0.481	0.612

Source: Authors' analysis.
Notes: Standard errors in parenthesis. Fixed effects linear model with AR(1) disturbance. Other variables include time dummy variables.

Clausing Study

Clausing uses panel data for the OECD countries from 1979 to 2002 to study the effect of corporate tax rates on corporate tax revenue as a percentage of GDP.[28] She includes more explanatory variables than did Brill and Hassett, but her overall research findings and conclusions are essentially the same as theirs — there is a Laffer curve relationship between corporate tax rates and corporate tax revenue as a percentage of GDP. However, her estimation methods would lead to biased and inconsistent coefficient estimates.[29]

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[28] See Kimberly A. Clausing, "Corporate Tax Revenues in OECD Countries." The authors thank Kimberly Clausing for providing her data.

[29] Clausing included two variables in her analysis indicating the type of corporate tax system that do not vary over time for a country. The coefficients of these variables are not identified when using the fixed effect estimation method, which is probably why she estimated the coefficients using OLS. While she obtained coefficient estimates for these two variables, the estimates are biased and inconsistent.

The estimation results for five different specifications are reported in **Table 4**. The five specifications differ by what explanatory variables are included in the analysis. In all five specifications, the coefficient estimates of the corporate tax rate (and its square) are smaller than those estimated by Clausing and have the opposite signs. Most of the coefficient estimates are not statistically significant at conventional confidence levels, but two are statistically significant at the 10% level only. (In these cases where the coefficients are significant on the tax squared term they still do not produce the Laffer curve shape but rather suggest rising revenue with a rising tax rate). Overall, these results suggest that the corporate tax rate has little effect on corporate tax revenues as a percentage of GDP. Consequently, there is little evidence to support the existence of a corporate tax Laffer curve.

Table 4. Coefficient Estimates: Dependent Variable is Corporate Revenues as a Percentage of GDP (Clausing Model)

	Specification				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Tax rate	-0.055 (0.035)	-0.073 (0.111)	-0.075 (0.046)	-0.048 (0.036)	-0.067 (0.047)
Tax rate squared	0.078* (0.047)	0.118 (0.147)	0.102* (0.061)	0.069 (0.048)	0.093 (0.061)
Profit rate		X			
Corporate share		X			
Unemployment rate			X		X
Per capita GDP growth rate			X		X
Per capita GDP			X		X
Openness				X	X
F (joint)	1.39	0.75	1.45	1.04	1.21
Prob>F	0.251	0.473	0.236	0.354	0.298

Source: Authors' analysis.
Notes: Standard errors in parenthesis. Fixed effects linear model with AR(1) disturbance. Other variables include the indicated variables and time dummy variables. *significant at 10% level.

Cross Country Investment Estimates:
The Djankov Study

Cross country empirical studies, as noted above, have recently been employed to address the Laffer curve issue and, as will be discussed subsequently, the incidence of the corporate tax on wages. In addition to these direct estimates, there are numerous empirical studies that examine underlying relationships, such as the effect of the user cost of capital (which incorporates the tax rate along with other variables) on investment. Most of these studies have found modest effects on domestic investment and have employed times series estimates within the United States.[30]

One recent study on investment, Djankov et al.,[31] is similar to the other studies in that it employs a cross country data base and an independent variable reflecting the tax rate to directly estimate estimate the effect of the corporate tax rate on investment, emtrepreneurship and other variables. The study found no effect on investment for statutory tax rates, but very large effects for constructed first year and five year cash flow tax rates. This study, unlike the others discussed in this paper, is a single cross section, so there is no way to introduce fixed country effects.

Theoretical Issues

Several difficulties arise in the Djankov analysis. First, the cash flow tax rate variable they construct is hypothetical one (for a hypothetical firm) which is not representative of the capital stock or the firm size in a country (or in all countries). The denominator is income measured before labor income taxes paid by the firm (such as social security taxes in the United states) and economic depreciation. The first is very problematic because the capital income tax rate increases as the labor income tax rate falls, which is a relationship that seems to have no obvious economic justification. It also measures taxes on a cash flow basis for the first year (or the first five years in an alternative scenario), rather than over the life of the investment.

An examination of scatter-plots of their data suggest that the results are highly affected by outliers, particularly Bolivia (which has a very high tax rate and a very low investment rate) and Mongolia, a low tax country where investment has been flowing in recently due to mining.

The tax rate for Bolivia is about twice the typical tax rate and is inconsistent with the corporate rate in Bolivia. According to the authors, the tax rate reflects an alternative transactions tax. However, a transactions tax is not a tax on corporate

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[30] For reviews see Robert Chirinko, "Investment Tax Credits," in *The Encyclopedia of Taxation and Tax Policy*, ed. by Joseph J. Cordes, Robert D. Ebel and Jane G. Gravelle, Washington, D.C., the Urban Institute. 2005, pp. 226-229 and Kevin A. Hassett and R. Glenn Hubbard, "Tax Policy and Business Investment", *Handbook of Public Economics*, New York, Elsiever, 2002, pp. 1293-1343.

[31] Simeon Djankov, Tim Ganser, Caralee McLiesh, Rita Ramalho, and Andrei Shleifer, "The Effect of Corporate Taxes on Investment and Entreprenuership," National Bureau of Economic Research, Canbridge, MA, Working Paper 13756, January 2008.

income but falls on all income in the economy. Assuming that about a quarter of income is capital incomes, the tax should be reduced by 75%.

As with the Laffer-curve estimates, the results of this study, at least for the United States, are not plausible. According to their estimates, a 10 percentage point drop in corporate tax increased investment by 2.2 percentage points. According to an open economy model developed by Gravelle and Smetters,[32] however, U.S. capital would increase a maximum of 0.7 percentage points with the elimination of corporate tax; with more reasonable elasticities, it would increase by 0.3 percentage points. (This study was directed at the question of tax incidence and will be discussed in more detail in the section below which addresses distributional issues and the burden on labor). Moreover, these effects may understate the investment effects because they do not take into account debt. Thus, their results suggest an investment increase that is at least 11 times too large and that could be 25 or more times too large.

Empirical Analysis

While the issue of fixed effects would cause this study to remain problematic in any case, this section explores the effects of the tax rate changes and of specifications that include multiple control variables.

The Djankov et al. sample consists of 2004 tax and economic data for 85 countries. They examine the effect of the corporate tax rate on (1) aggregate investment, (2) foreign direct investment, and (3) two measures of entrepreneurial activity. The main results of their study and our reanalysis are reported in **Table 5**. The first row of the table displays the coefficient estimate of the effective corporate tax rate variable taken from the Djankov et al. study. Their basic specification includes only the tax rate as an independent variable. The second row of the table reports the range of estimates when a single additional independent variable is added — the authors add 10 variables, one at a time. In all but one instance, the estimates are statistically significant at the 1% or 5% confidence level, and at the 10% level in the remaining case.

We reanalyzed their data after correcting an error in their tax rate for Bolivia, and cumulatively added selected independent variables that Djankov et al. included in their analysis; we also included a region-of-the-world variable for each country. The first row of the bottom panel in **Table 5** presents the coefficient estimates for the basic model with only a single independent variable: the effective corporate tax rate. For each dependent variable, the coefficient estimate of the tax rate variable is smaller than Djankov et al.'s estimate, which illustrates the importance of Bolivia to their results. Furthermore, the estimated effect of the tax rate on aggregate investment is not statistically significant. The final row of **Table 5** reports the coefficient estimate of the tax rate when the full set of independent variables is included in the analysis. The estimated effect of the tax rate on aggregate investment

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[32] Jane G. Gravelle and Kent A. Smetters, "Does the Open Economy Assumption Really Mean That Labor Bears the Burden of a Capital Income Tax?" *Advances in Economic Policy and Analysis*, vol. 6, No. 1, 2006.

is much smaller than Djankov et al.'s estimate and not statistically significant. The estimated effect of the corporate tax rate on foreign direct investment and entrepreneurial activity is somewhat smaller than the effects estimated by Djankov et al., but the estimates are statistically significant.

Table 5. Coefficient Estimates: Key Independent Variable is Constructed Effective Tax Rate (Djankov, Ganser, McLiesh, Ramalho, and Shleifer Model)

	Dependent Variable			
	Investment	Foreign Direct Investment	Business Density per 100 People	Average Business Entry Rate
Original Basic Estimate	-0.218*** (0.074)	-0.226*** (0.045)	-0.194*** (0.063)	-0.138*** (0.057)
Range of Estimate	-0.165 to -0.236	-0.189 to -0.233	-0.090 to -0.196	-0.110 to -0.141
Coefficient Estimates of Tax Rate Variable with Corrected Data				
Basic Estimate	-0.108 (0.073)	-0.194*** (0.044)	-0.150** (0.060)	-0.116** (0.055)
PLUS				
Region Indicators	-0.046 (0.071)	-0.191*** (0.045)	-0.115* (0.058)	-0.126** (0.056)
PLUS				
Per Capital GDP	-0.031 (0.070)	-0.190*** (0.045)	-0.148*** (0.050)	-0.146** (0.055)
PLUS				
Number of Tax Payments	-0.025 (0.076)	-0.179*** (0.048)	-0.154*** (0.055)	-0.097* (0.057)
Employment Rigidity Index				
Procedures to Start a Business				

Source: Author's analysis.
Notes: Standard errors in parenthesis.
* significant at 10% level.
** significant at 5% level;
*** significant at 1% level;

Distributional Effects

A second issue that was a focus of the Hubbard article, but was not in the Treasury Report was the distributional effects of the corporate income tax. If the corporate tax falls on owners of the corporation, or on capital in general, it contributes to a progressive tax system, since higher income individuals have more income from capital than from labor. Based on tax data, for taxpayers with incomes up to $100,000, over 90% of income is labor income, while for those over $1,000,000, less than a third is labor income.[33] The traditional analysis of the corporate income tax indicates that the burden generally spread to all capital, but does not fall on labor income. Most government and private agencies that routinely do distributional analysis allocate the corporate tax to capital income.[34]

Hubbard refers to three studies in his article: one a working paper by economist Arnold Harberger,[35] one a working paper by William Randolph of the Congressional Budget Office,[36] and one a recent empirical cross-country study using data similar to the studies discussed above, by Hassett and Mathur.[37] Three other empirical studies that use cross country data have also been released recently, by Felix,[38] by Desai, Hines and Foley,[39] and by Arulampalam, Devereux, and Maffiini.[40] Mankiw refers to the Randolph and Arulampalam, Devereux, and Maffinni studies.

The Harberger and Randolph Studies

The first two studies explicitly focus on the effects of an open economy. It is a standard finding that for a small open single-good economy with perfect capital

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[33] See CRS Report RL33285, *Tax Reform and Distributional Issues*, by Jane G. Gravelle.

[34] This is the allocation used by the Congressional Budget Office, the Treasury Department, and the Urban-Brookings Tax Policy Center.

[35] It is not clear which of Harberger's papers is being referred to, but it is presumably the more recent one: Arnold C. Harberger, *Corporate Tax Incidence: What is Known, Unknown, and Unknowable*, University of California, 2006. This paper was presented at a conference at Rice University in 2006, and will be published with other papers.

[36] The paper in question is not an official CBO paper but rather a working paper by William Randolph. William C. Randolph, *International Burdens of the Corporate Tax*, CBO working paper 2006-09, August 2006.

[37] Kevin A. Hassett and Aparna Mathur, *Taxes and Wages*, American Enterprise Institute, working paper, April 2008.

[38] Rachel Alison Felix, *Passing the Burden: Corporate Tax Incidence in Open Economies*, November 2006. This paper was a dissertation essay, University of Michigan.

[39] Mihir A. Desai, C. Fritz Foley, and James R. Hines, Jr., *Labor and Capital shares of the corporate Tax Burden: International Evidence*. Prepared for the International Tax forum and Urban-Brookings TAx Policy Center conference on Who Pays the Corporate Tax in an Open Economy, December 18, 2007.

[40] Wiji Aralampalam, Michael P. Devereux, and Giorgia Maffini, *The Direct Incidence of Corporate Income Tax on Wages*, Oxford University Center for Business Taxation, May, 2008.

mobility and perfect product substitution, the burden of any source based capital income tax falls on labor (whereas for residence based taxes, that is taxes that apply to domestic owners of capital regardless of where they are domiciled, the burden would fall on capital). The corporate tax has some aspects of a source based tax and some of a residence based tax.

Both the Harberger and the Randolph studies are based on this simple model of perfect substitution, altered to account for the United States as a large county (which lowers the elasticities) and to account for multiple sectors. Randolph's study does not so much predict the burden of the tax as explore incidence in certain types of models; he acknowledges that less capital mobility causes the burden to shift from labor to capital. Harberger's model has four sectors, corporate and non-corporate tradeable sectors and corporate and non-corporate nontradeable sectors. He assumes that the corporate tradeable sector is more capital intensive that the average industry, which leads to a burden of greater than 100% of the tax falling on capital. Despite the vision of the manufacturing sector as highly capital intensive, it actually is not: housing services, which are 100% capital, accounts for over a third of the capital stock in the country, and many other industries, such as utilities and agriculture are also more capital intensive than manufacturing. Using the same assumptions about mobility, but with a less capital intensive manufacturing sector, Randolph finds 70% of the corporate tax burden falls on labor.

To permit other than perfect substitutability, a much more complex computable general equilibrium model would be required, which neither Harberger nor Randolph has provided. Such a model has been developed by Gravelle and Smetters[41] who find, with reasonable elasticities, that capital still bears most of the burden, about 80%.

While the Gravelle and Smetters model is a very complex, it still abstracts from some important features of the corporate tax. There are two other factors that would further push the corporate tax burden towards capital. First, the current corporate tax has elements of a residence based tax, and the burden of a residence based tax falls on capital. Second, the current corporate tax actually subsidizes debt finance at the firm level, and if debt is much more substitutable than equity, total capital would be less likely to be exported: indeed, raising the corporate tax could cause capital to flow in.

Finally, note that as long as countries tend to choose tax rates similar to each other, which appears to be the case, the world becomes like the original closed economy, a model stressed by Harberger, with the burden falling on capital. According to the Treasury Study, the U.S. combined state and federal corporate statutory rate is 39%, the G-7 average is 36% and the OECD average is 31%. Effective tax rates, which should govern the movement of capital, are even closer together, and in some cases are lower for the U.S. than for other countries.

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[41] Jane G. Gravelle and Kent A. Smetters, "Does the Open Economy Assumption Really Mean That Labor Bears the Burden of a Capital Income Tax?" *Advances in Economic Policy and Analysis*, vol. 6, No. 1, 2006.

An argument is often made that the burden of any capital income tax tends to fall on labor because it reduces savings, an effect that would also occur in a closed economy. While one model predicts that the entire burden of a capital income tax eventually falls on labor, this model requires some extreme assumptions about human behavior such as perfect information, an infinite planning horizon, perfect liquidity, and asexual reproduction. Models allowing for finite lives (such as the life-cycle models) find results that vary, but if the revenue loss is made up by higher taxes on labor, there is little or no effect. Some economists believe that these models are inappropriate, as they assume too much information and skill on the part of individuals; they suggest that individuals use rules of thumb, such as fixed savings rates or targets, instead. These rules of thumb suggest that a cut in capital income taxes either has no effect on saving or reduces savings. These economists also point out that most empirical evidence does not point to an increase in savings; historically, savings rates do not appear to respond to reduced tax rates.[42]

The Hassett and Mathur Study

While the theoretical models do not provide much support for the corporate tax burden falling on labor, Hubbard also refers to an empirical study by Hassett and Mathur that uses the corporate tax rate to explain differences in manufacturing wages. They find a statistically significant result that indicates a 1% increase in the corporate tax causes manufacturing wages to fall by 0.8% to 1%. These results are impossible, however, to reconcile with the magnitudes in the economy. Through competition, wage changes in manufacturing should be reflected in wages throughout the economy, implying that a 1% rise in corporate revenues would cause an 0.8% to 1% fall in wage income. However, corporate taxes are only about 2.5% of GDP, while labor income is about two thirds. These results imply that a dollar increase in the corporate tax would decrease wages by $22 to $26 dollars, an effect that no model could ever come close to predicting.[43]

The lack of theoretical reasonableness of the results may be explained by statistical issues. The Hassett and Mathur study used data from 72 developed and

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[42] These issues surrounding savings are discussed in greater detail in CRS Report RL32517, *Distributional Effects of Taxes on Corporate Profits, Investment Income and Estates,* by Jane G. Gravelle; CRS Report RL33545, *The Advisory Panel's Tax Reform Proposals*, by Jane G. Gravelle; and CRS Report RL33482, *Savings Incentives: What May Work, What May Not*, by Thomas L. Hungerford. The recognition that replacement of capital income taxes by wage taxes in a life cycle model could have little effect on savings or contract them can be found in numerous simulation studies, for example, Alan Auerbach and Laurence Kotlikoff, *Dynamic Fiscal Policy* (Cambridge, MA: Cambridge University Press, 1987).

[43] Two other studies using cross country data have examined the incidence of the tax on labor income. Passing the Burden: Corporate Tax Incidence in Open Economies, by Rachel Alison Felix, November 2006, finds smaller effects than Hassett and Mathur, but ones that are still too large to be predicted by a theoretical model. This study has problems similar to those that are discussed subsequently and, in addition, do not control for country fixed effects.

developing countries for the 1981 to 2003 period.[44]   For their analysis, their dependent variable is the logarithm of the five-year average of the average manufacturing wage. They justify their use of the five-year average wage by (1) noting that due to capital adjustment costs, the economic effects of corporate tax rate changes show up over longer time periods, and (2) arguing that this may control for possible measurement error induced by the business cycle.[45]   The wage rates for all countries were converted to U.S. dollars using annual exchange rates. Hassett and Mathur include the price level of consumption as an explanatory variable to capture cost of living differences across countries. The main explanatory variable of interest is the logarithm of the top corporate tax rate. Hassett and Mathur also use the average effective and marginal effective corporate tax rates (in logarithms) as explanatory variables in some specifications.

We repeated the Hassett and Mathur basic estimation exercise; the results are reported in the first row of **Table 6**.[46]   The coefficient estimate reported in the first column (-0.759) suggests that a 10% increase in the top corporate tax rate will lead to an 7.6% decrease in the average manufacturing wage rate. This estimate is statistically significant at the 5% level.[47]   The results are not as strong (the estimates are closer to zero) when using alternative measures of the corporate tax rate (see the next two columns of **Table 6**).

The exchange rate between two currencies reflects the relative supply and demand for those two currencies, and is affected by financial markets and government policies. Exchange rates may not be good indicators of the relative buying power of wage rates in two countries. Purchasing Power Parities (PPPs), however, are specifically designed to equalize the internal purchasing power of the currencies. Workers in Australia, for example, are concerned with what their wages will purchase in Australia, and not how many dollars their wages will buy. Using PPPs is a more appropriate way to convert national currencies to a common currency (U.S. dollars).

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[44] Hassett and Mathur, *Taxes and Wages*. We are grateful to Kevin Hassett and Aparna Mathur for providing their data. Several of the countries only have data for shorter periods.

[45] Their independent or explanatory variables take their value from the beginning of the five-year period over which wages are averaged. It should also be noted that Hassett and Mathur calculate the five-year average with nominal wages (that is, they are not corrected for inflation).

[46] See Appendix B for a description of the estimation method. Visual inspection of the Hassett and Mathur data uncovered some errors with their 5-year averages of wage rates — some averages were based on 6 years of data and others were based on less than 5 years of data. We corrected the errors so that each 5-year period for each country contains 5 years of data. Some of the averages are based on less than 5 years of data because of missing values in the wage series; most of the missing valued are in the 2001 to 2005 period.

[47] The specific test of statistical significance of the coefficient estimates is the t-test. This is a test of whether or not the estimate is equal to zero (the null hypothesis is the estimate is equal to zero). The significance level indicates the risk of rejecting the null hypothesis when it is, in fact, true. A significance level of 5% indicates that the null hypothesis will be inadvertently rejected only 5% of the time. Significance levels commonly used in empirical social science work are the 1%, 5%, and 10% levels.

The second row of **Table 6** reports the coefficient estimates when the wage rates are converted to U.S. dollars using the consumption PPPs. Consumption PPPs are more appropriate for converting wages than using general PPPs (over GDP) because they omit national expenditures for government and investment goods. Again, nominal wages are the dependent variable. The coefficient estimates are closer to zero than the estimates reported in the first row, but the coefficient estimate reported in the first column (-0.728) is statistically significant at the 5% level. The estimates for the alternative measures of the corporate tax rate are not statistically significant at the conventional confidence levels.

Table 6. Coefficient Estimates: Dependent Variable is the Logarithm of the 5-Year Average of Wage Rates

How Wage Variable Converted to U.S. Dollars	Corporate Tax Rate Variable		
	Top Tax Rate	**Effective Average**	**Effective Marginal**
Exchange Rate	-0.759** (0.297)	-0.630* (0.334)	-0.384* (0.226)
Purchasing Power Parity Exchange Rate (PPP)	-0.728** (0.303)	-0.528 (0.340)	-0.334 (0.230)
PPP — Constant Dollars	-0.488* (0.298)	-0.294 (0.318)	-0.218 (0.215)
Observations with 5-year Averages based on 5 Years of Data			
Exchange Rate	0.089 (0.353)	-0.229 (0.363)	-0.184 (0.240)
Purchasing Power Parity Exchange Rate (PPP)	-0.037 (0.354)	-0.187 (0.373)	-0.156 (0.246)
PPP — Constant Dollars	-0.064 (0.350)	-0.230 (0.351)	-0.180 (0.231)

Source: Authors' analysis.
Notes: Standard errors in parenthesis. Fixed effects linear model. Other variables include time dummies, log personal tax rate, log real value-added, log consumer price variable (except for real PPP). ** significant at 5% level; *significant at 10% level.

The most appropriate measure of wages is the inflation-adjusted consumption PPP-adjusted wage rate. Wages in each country were converted to U.S. dollars using the consumption PPP and then converted to constant (inflation-adjusted) dollars using the CPI-U before calculating the 5-year average. The final row of **Table 6** displays the coefficient estimates for the model using this measure as the dependent variable. The estimates are closer to zero than in the other two cases. The coefficient estimate in the first column (-0.488) is statistically significant at the 10% level but not at the 5% level. The other two estimates in columns two and three are not

statistically significant at the conventional confidence levels. While there is still some evidence of corporate tax rates having a negative influence on wage rates in manufacturing, the effect is smaller and less robust than reported in the Hassett and Mathur study.

Hassett and Mathur averaged wages over 5-year periods. They justify using 5-year averages by arguing that it helps to control for possible measurement error induced by the business cycle. But, because of missing values in the wage data, 66 observations have the average wage based on less than 5 years of data (60 observations use only 2 consecutive years of data for the calculation of the average, which would likely not affect any measurement error). The bottom panel of **Table 6** reports the estimation results when these 66 observations are excluded from the analysis (leaving 153 observations). In all cases, the coefficient estimates for all measures of the corporate tax rate are not statistically significant.

Averaging the wage data over five years and using the beginning of period value for the explanatory variables, however, eliminates much of the variation in wages and tax rates, thus throwing away much of the information needed to estimate the economic effects. The statistical analysis is repeated using annual data and including various lagged values of the corporate tax rate as explanatory variables.[48] The results are reported in **Table 7**. The first column of the table displays the coefficient estimates for the current value of the corporate tax rate (labeled t in the first column) and the values for the previous five years (t-1 to t-5), which allows for longer term effects of tax rates on wages. In each case, the coefficient estimates are negative but very close to zero; none are statistically significant at the conventional confidence levels. Furthermore, all the tax rate variables in column (1) are not jointly statistically significant. The next six columns report the results when the corporate tax rate values (current and lagged) are entered individually. In every case, the coefficient estimates are close to zero and are not statistically significant at conventional confidence levels. In using annual data, we can find no evidence that changes in the top corporate tax rate affects wage rates in manufacturing.[49]

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[48] Including the lagged values of the corporate tax rate allows the tax rates for the previous five years to individually have an impact on wages. All tax rates are entered into the model in logarithms.

[49] We obtain the same estimation results when the exchange rate is used to convert wage rates to U.S. dollars — the method used by Hassett and Mathur.

Table 7. Coefficient Estimates: Dependent Variable is Annual Logarithm of Real PPP-Adjusted Wage Rates

Tax Rate Lag	(1)	(2)	(3)	(4)	(5)	(6)	(7)
t	-0.031 (0.208)						0.010 (0.140)
t-1	-0.217 (0.188)					-0.219 (0.143)	
t-2	-0.076 (0.166)				-0.074 (0.144)		
t-3	-0.040 (0.159)			0.021 (0.145)			
t-4	-0.113 (0.156)		-0.070 (0.146)				
t-5	-0.154 (0.155)	-0.165 (0.147)					
F (joint)	0.49						
Prob>F	0.819						

Source: Authors' analysis.
Notes: Standard errors in parenthesis. Fixed effects linear model with AR(1) disturbance. Other variables include time dummies, log personal tax rate, log real value-added. ***significant at 1% level; ** significant at 5% level; *significant at 10% level.

Other Cross Country Wage Studies

Three other recent studies using cross country data have examined the incidence of the tax on labor income. Felix,[50] in a study that controls for education, finds much smaller effects than Hassett and Mathur, but ones that are still too large to be predicted by a theoretical model (about $4 dollars for each dollar of corporate tax revenue). This study has problems similar to those that for Hassett and Mathur and, in addition, does not control for country fixed effects, and thus reflect cross country variation. The sample is unusual as well, with 19 countries covered for varying years. Out of the total of 65 observations (countries and years), about a quarter of the sample is drawn from Italy and Mexico and seven of the 19 countries had only one or two years of data.

A second study, by Desai, Foley and Hines[51] uses observations on foreign owned affiliates of U.S. firms across countries and in different time periods. This study uses data on multinational subsidiaries of U.S. firms to estimate the allocation of the tax burden between labor and capital using a seeming unrelated regression for capital

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[50] Rachael Alison Felix, Paaing the Burden: Corporate Tax Incidence in Open Economies, November 2006. This paper was a dissertation essay at the University of Michigan.

[51] Mehir A. Desai, C. Fritz Foley, and James R. Hines, Jr., "Labor and Capital Shares of the Corporate Tax Burden: International Evidence," Prepared for the International Tax Policy Forum and Urban-Brookings Tax Policy Center conference on Who Pays he Corporate Tax in an Open Economy?, December 18, 2007.

income (which they measure by the interest rate) and labor income. In their model, labor and capital burdens are restricted to the total of taxes, and they impose a cross-equation restriction on the estimated burdens. They find the share of the burden falling on labor income to fall between about 45% and 75% of the total, a number that is not inconsistent with theoretical expectations.

This approach, however, has the fundamental theoretical problem that wages at an individual firm should not reflect tax burdens at an individual firm. In deriving a model that assumes it does, they assume that the price level of their goods is fixed and base their results only on their sample of firms (which is comprised solely of multinational corporate sector firms). This approach creates both econometric problems in their analysis and also means that their results cannot be construed as reflecting actual burdens in any of their economies, as discussed in more detail in Appendix C.

They have also represented equity returns through the interest rate, under the assumptions that investors equate (net of risk) debt and equity returns. If these assets are generally substitutable, the increase in corporate tax should cause portfolios to shift toward debt and drive the interest rate up (while driving the equity return down). Moreover, the tax burdens on debt and equity differ at the individual level and those differences depend, among other things, on any special tax rates for dividends and capital gains, the deferral advantage of capital gains and the inflation rate.

Aside from these theoretical problems, an important issue with their study is that it appears that their results are forced by the cross equation restriction. Bill Randolph, a discussant at a recent conference, found that if the restriction is eliminated there are no statistically significant results from their study.[52] In an example he presented, the estimates of the wage effect was 48% of the burden, with a standard error of 18% in the original study; in a regression without the restriction the share was 19% with a standard error of 100%.[53] Randolph considered a number of other specifications, including excluding the largest countries, but found no statistically significant results. He also suggested that only manufacturing subsidiaries be considered since other subsidiaries may be involved in tax sheltering operations. In the case where he considered only manufacturing subsidiaries, the sign reversed (indicating labor benefitted from the tax) but it was not statistically significant.

A third study, by Arulampalam, Devereux, and Maffini, uses firm level data (for about 55,000 firms) from several European countries (primarily France, Italy, Spain and Germany) over a relatively short time frame of 1996-2003.[54] It controls for firm-specific effects. About a quarter of the observations are for only 4 years and about 45% only 5 years so that the panel, like that of Felix, shows changes over the short

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[52] His remarks were made at a seminar at the American Enterprise Institute, March 17, 2008.

[53] The coefficient must be close to twice the standard error to be statistically significant; thus the result from the unrestricted regression showed no relationship between taxes and wages.

[54] Arulampalam, Wiji, Michael P. Devereux, and Georgia Maffinin, The Direct Incidence of Corporate Income Tax on Wages, Oxford University Centre for Business Taxation, May 2008.

run. The same authors had a earlier version of their study with a smaller sample.[55] Although the authors control for firm level fixed effects, they do not control for country-specific effects.

The premise of this study is quite different from the premise of the other empirical studies or the theoretical literature on the incidence of the corporate income tax. The authors present a bargaining model, where capital and labor split the excess profit (profit over a normal required return). Thus, the theoretical motivation is not driven by shifts in capital in response to changes in return, but by other factors that do not have implications for capital income distortions.

The study reports, for the preferred specification, that labor bears 96% of an increase in tax in the short run, and 92% in the long run. (These numbers were considerably different in an earlier version of the study, which found that labor bore 54% in the short run and 176% in the long run, at least for the specification that the authors reported.)

There are several reservations about this study, with the estimation results, the plausibility of the findings, and the underlying theory and execution. Perhaps the most serious of these reservations is in translating from the motivating theory to the actual estimation process. The theory addresses a bargaining division of excess profits (including the taxes on those excess profits) between labor and capital as a steady state long-run relationship. But the actual empirical implementation examines the change in wages as a function of the change in output and taxes. It does not allow for normal profit or taxes on normal profit, or for possible changes in options. It is thus an estimate of the short run incidence of a tax change that could fall on both normal return and excess profits, not the long-run sharing of the tax on rents. Traditionally, economists have assumed that the burden of the corporate tax falls on owners of the firm in the short run since capital cannot be easily shifted.

Even though it is technically possible to derive a long-run elasticity if the regression includes lagged dependent variables,[56] these short-term data are unlikely to be useful. As a long-run specification, the estimating relationship is deeply flawed because the factors that determine the incidence of the tax on normal returns, which are held fixed in the model, can also change. For this part of the tax, the burden on labor arises from general equilibrium effects in the economy and the effects on wages in a particular firm bears no relationship to the tax burden of that firm.

To the extent that the study is measuring the short-run effects, the results, as reported, are not plausible. To expect that labor would bear all of the short-run

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[55] Arulampalam, Wiji, Michael P. Devereux, and Georgia Maffinin, The Incidence of Corporate Income Tax on Wages, Oxford University Centre for Business Taxation, April 2007.

[56] One can trace an infinite series of tax changes through a lagged dependent variable. For example, if there is an effect of the tax rate in this year and an effect of the wage rate last year, then the wage rate last year is a function of the tax rate last year and the wage rate two years before, which is in turn a function of tax and wage rates. By continuous substitution the taxes can be traced back infinitely long and converge on a long run effect.

burden of a corporate tax in a bargaining model would seem unreasonable. There are implicit or explicit multi-year contracts that likely make short-run adjustments of this nature difficult. In the more intermediate term, if all firms are considered, labor is free to move from the firms with high taxes per worker to those with lower taxes.

At the same time, it is not clear that the results do imply such a large share is born by labor. The regression is estimated in logarithms, for reasons that are not apparent — such as specification is not consistent with the model presented and implies a burden that rises as the wage rises relative to taxes. A change in wages due to a change in taxes equals the estimated coefficient, multiplied by the rate of wages per worker to taxes per worker times the change in taxes. The authors report the value calculated at the median. If one took such a formula literally, it would imply that burdens for more labor-intensive firms would be more than 100% of the change, an implausible outcome for bargaining. The normal way to report results of this nature is to measure them at the mean. In this case, the short run incidence would fall from 96% to around 52%, based on data reported in the study.

There are also some important reservations about the econometric methods. Panel data with short time periods (where persistence effects can be serious) and the need to control for firm specific effects face some significant econometric problems. The authors use a number of different specifications, with widely varying results, which suggest that the results are not robust.[57] There are several other aspects of the econometrics that are not transparent.[58]

Overall, it is not clear what relationship or phenomenon the study is measuring. We are interested ideally in how an exogenous tax change affects incomes. Yet for some of the countries that constitute a large share of the data, there were no changes in tax rates. In others tax rate changes were virtually all declines, with most of those declines occurring during the growth period of the late 1990s, when productivity and output was rising. It is possible that the results are capturing that phenomenon.

Economic Efficiency Issues

The traditional criticism of the corporate tax, as spelled out in the Treasury Study, is that the tax causes distortions, and that these distortions are exacerbated by corporate tax preferences that prevent, for a given level of tax revenue, a lower tax rate. The issues discussed in this section include allocation of capital within the domestic economy, savings effects, and international capital flows.

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[57] The tests used by the authors to determine their preferred specification are not without problems. See David Roodman, "How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata," Center for Global Development, Working Paper 103, December 2006.

[58] For example, no reason is presented for using a dynamic specification or the specific number of lagged variables, and the number of instruments was not reported.

Allocation of Capital Within the Domestic Economy

Traditionally, the efficiency concern about the corporate tax is related to the misallocation of resources between corporate and noncorporate production (including owner-occupied housing). Over time, efficiency issues have also encompassed differential taxation of the returns to assets of different physical types, and financial distortions, which affect the debt-equity ratio, payout choice, and decision to realize capital gains.

Some efficiency costs, including those that alter the mix of a firm's physical assets, arise not so much from the existence of a corporate tax but from its design. **Table 8** captures the effects of the two most significant generally available provisions that affect tax burdens on different assets: depreciation rules and the recently enacted production activities deduction, which in effect allows a lower tax rate on certain domestic activities that are deemed production (manufacturing, construction, etc.). The tax rates in this table account only for the corporate tax (that is, they do not include the benefits of deducting interest or the tax at the individual level on interest, dividends, and capital gains). They are also forward looking and marginal: they estimate the share of the return on a prospective investment that is paid in tax. If income were correctly measured and taxed that share would be the statutory rate; most assets face lower tax rates.

The variations within a column illustrate the distortions firms face in choosing the mix of capital within a firm. Overall the variations not only distort the mix of capital within a firm, but also the allocation of capital across different industries. In general, the most favored major industry is oil and gas extraction where a large fraction of investment is deducted when incurred. Other things equal, firms eligible for the production activities deduction and firms that have a larger share of their capital stock in equipment than average will be favored.

In the aggregate, the tax rate on equipment is estimated at about 25%, a full 10 percentage points below the statutory tax rate, while structures (covering the last seven rows of **Table 8**) are subject to a 30% rate. Inventories are subject to a 37% rate and the overall rate on reproducible capital is 29%.[59]

The Treasury Study reports aggregated asset specific data, which provide a similar result, indicating that equipment is favored. Their measures include the total tax burden, including the benefit of deducting interest, and individual level taxes. They estimate a tax rate of 25% on equipment, 34% on structures, and 33% on land and inventories.

These estimates are somewhat overstated because they do not include intangible investments, such as research and advertising. Some research and experimentation expenditures are expensed (leading to a zero tax rate on those expenditures) and eligible for a credit as well (leading to a negative rate, but only intangible

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[59] These estimates are reported in CRS Report RL33545, *The Advisory Panel's Tax Reform Proposals*, by Jane G. Gravelle.

expenditures, however, are eligible). Spending on advertising is expensed and subject to a zero rate even though some advertising has future benefits.

Table 9 reports the types of distortions that are an artifact of the corporate tax as a separate tax. These estimates, unlike those in **Table 8**, take into account all levels of taxes. One of the complications of estimating these tax rates is whether the estimates should consider the significant (over 50%) fraction of individual passive income that is held in tax exempt form through pensions, IRAs, life insurance annuities and non-profits. In some ways, these sources can be viewed largely as not affecting marginal investment (for example, overall savings) because they are capped or not controlled directly by the investors and in other ways they affect choices (such as debt or equity of pension funds). For this reason, in addition to the estimates presented by Treasury, two sets of CRS estimates are provided which assume either no tax exempt investment or half is tax exempt.

Within the corporate sector, in addition to asset differences, there is a larger differential with respect to debt versus equity finance. The aggregate tax burden on debt is slightly negative, while equity is taxed at close to 40%. If economic income were measured correctly, interest would be subject to the individual income tax rate, which is typically slightly above 20%. Debt is subsidized at the firm level, however, because nominal interest is deducted (including the inflation premium) while corporate profits before this deduction are effectively taxed at a rate below the statutory rate on real income. The result is that at the firm level, equity is subject to a tax rate of around 30% while debt is subsidized at about the same level (a negative 32% tax rate). At the individual level, the tax on interest for taxable recipients is higher than the statutory rate because nominal interest is taxed, which pushes the overall tax rate towards a small but negative rate.

Table 8. Differential Tax Rates across Asset Types

Asset	No Production Deduction	With Production Deduction
Autos	34	31
Office/Computing Equipment	31	28
Trucks/Buses/Trailers	29	26
Aircraft	29	26
Construction Machinery	23	21
Mining/Oilfield Equipment	28	25
Service Industry Equipment	28	25
Tractors	27	24
Instruments	28	25
Other Equipment	27	24
General Industrial Equipment	25	23
Metalworking Machinery	23	21
Electric Transmission Equipment	33	30
Communications Equipment	19	17
Other Electrical Equipment	24	21
Furniture and Fixtures	23	20
Special Industrial Equipment	21	19
Agricultural Equipment	21	19
Fabricated Metal	29	26
Engines and Turbines	36	33
Ships and Boats	17	15
Railroad Equipment	18	16
Mining Structures	7	6
Other Structures	40	37
Industrial Structures	37	34
Public Utility Structures	27	24
Commercial Structures	34	3 1
Farm Structures	26	23
Residential Structures	31	NA

Table 9. Effective Tax Rates by Sector and Type of Finance

Sector	Treasury Estimates	CRS Estimates, No Tax Exempt Investment	CRS Estimates, Half of Investment Tax Exempt
All Business	26	28	22
Corporate Business	30	32	25
Debt	-2	9	-11
Equity	40	37	33
Non-corporate business	20	20	14
Owner Occupied Housing	4	-3	-13
Economy wide	17	18	11

Source: Treasury Report; CRS Report RL33545, *The Advisory Panel's Tax Reform Proposals*, by Jane G. Gravelle.

Evidence on the size of this distortion is limited, but since there appears to be limited substitution between debt and equity, it is probably less than 5% of corporate tax revenue.[60] Some simple measures, however, could significantly reduce this distortion (such as indexing interest payments for inflation). Lower corporate tax rates would also reduce this distortion.

The distortion that has probably received the most attention by those studying the corporate tax is the misallocation of capital between the corporate and noncorporate sectors. One source of the distortion arising from the corporate tax system is the taxation of corporate business at around 30%, while unincorporated business is taxed at only 20%. The higher corporate tax also contributes to a larger wedge between corporate production and owner-occupied housing, which is generally taxed at a negligible rate. The magnitude of the estimated distortion produced by having a separate corporate tax varies depending on the model used and ranges from less than 10% of corporate tax revenue to about a third.[61] Since the deadweight loss varies with the square of the tax rate, the recent decline in the differential due to lower tax rates on dividends and capital gains suggests the

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[60] See Jane G. Gravelle, *The Economic Effects of Taxing Capital Income* (Cambridge: MIT Press, 1994), pp. 82-83, suggesting a distortion of about 0.17% of total consumption. With consumption (including government spending) about 83% of output, and the corporate tax 2.7%, this amounts to about 5% of corporate revenue. This amount has fallen slightly due to lower rates on capital gains and dividends.

[61] See the review in Gravelle, *The Economic Effects of Taxing Capital Income*, pp. 77-82.

distortion relative to revenue would be smaller — probably no more than 4% to 7% of revenue.[62]

A distortion not captured in **Table 9** is the one that affects corporate payouts. Given that appreciation in stock values is not taxed until realized, there is a benefit to retaining earnings. There is a dispute about what determines payout ratios, and what the consequences of the tax are, but, in general, the welfare cost is small. There is also some distortion due to the lock-in effect for capital gains realizations.[63]

Considering all of these distortions together, they are probably in the range of 10% to 15% of corporate tax revenues, a magnitude that could be considered as a significant component of the burden of the tax. However, given the revenue needs of the government, there would also be distortions, perhaps smaller, associated with alternative taxes. Ways to reduce these distortions may, however, be worth considering.

Savings Effects

Much of the Treasury Study's discussion emphasized effects on savings although this is not normally the focus of efficiency concerns about the corporate income tax. This distortion is not unique to corporate income taxes, but occurs with all capital income taxes. There are many difficulties with analyzing this issue. The first is that, as noted above in the discussion about the potential effect of savings on the wage rate, the economic distortion depends on the behavioral response of savings to tax changes, and what tax replaces them. Some economists have a strong view that taxes on the rate of return are always distorting, but these views are based on dynamic infinite-horizon models that may not be very realistic. With life-cycle models, the distortions depend on what revenue substitute is provided; substituting taxes on wages for taxes on capital, the most likely substitute in the U.S. tax system, could potentially increase distortions, depending on the responses in the models.[64]

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[62] The distortion is proportional to the square of the wedge between pretax returns, which is $t_c/(1-t_c) - t/(1-t)$, where t_c is the corporate tax rate and t the unincorporated. The corporate tax fell from about 44% in the mid-1980s to 32% today, while the noncorporate tax fell from 22% to 20% and the rate on owner occupied housing remained about the same (roughly zero). Holding the after-tax return constant, the wedge between corporate and noncorporate capital fell by over a half, and the square of the wedge by 80%. A calculation for owner-occupied housing suggests that the wedge fell by 40% and the deadweight loss by two thirds. For the largest deadweight loss estimates, virtually all of the distortion was due to the corporate non-corporate differential, so that the current deadweight loss would be only 20% as large, while for the others, both assets played an important role.

[63] Estimates of 0.04% to 0.11% of consumption translate into 1% to 4% of corporate revenues, see Gravelle, *The Economic Effects of Taxing Capital Income*, p. 89. With the reduction in tax rates of almost 50%, and the welfare cost proportional to the square of the tax wedge, the welfare cost would be about 30% of its former value or less than 1%. There is also a welfare cost from the realizations response of about 1%, but recent evidence has shown this response to be small, about the same size as the pay-out distortion.

[64] See Jane G. Gravelle, "Income Consumption and Wage Taxation in a Life Cycle Model:

In models of bounded rationality, where savings are based on rules of thumb such as fixed shares of income or fixed targets, there is no response, or only an income effect, which would not produce a distorting effect.

International Capital Flows

Tax rules can affect the efficiency of allocation of capital around the world, and, if the U.S. rate is different from other countries, it can cause misallocations of capital. Despite claims that the U. S. tax rate is much higher than other countries, its rate of 39% (including state and local rates) is only slightly above the G-7 rate of 36% according to data in the Treasury Study. Since the production activities deduction acts in the same way as a statutory tax rate reduction, the actual U.S. rate is not 39%, but rather about 37%, virtually the same as the G-7 average.[65] The G-7 rate would be higher if weighted by GDP. The U.S. rate is below the 38% rate in Germany and 40% rate in Japan, the two largest of the G-7 other than the U.S. In addition, it is at the same rate as Italy, just above the 36% rate of Canada, and slightly above the 30% rate of Great Britain. The 19 OECD countries had an average of 31%, but this average would be higher if weighted by country size because larger countries have higher rates (if Ireland, with a 13% tax rate were eliminated, the average would be 33%). Although these rates put the United States rate close to those of other large developed countries, the report also indicates that several countries, in particular Germany, are planning to cut their corporate tax rates.

The Treasury Study also reports effective marginal tax rates on equipment investment (which accounts for tax preferences such as depreciation): the effective tax rate for the United States at 24%, was the same as the G-7 average, and just 4 percentage points above the 19 OECD country average. For debt finance, the U.S. had a higher negative rate, -46% (and thus more beneficial tax treatment) than the G-7 average at -39%, and the average for 19 OECD countries of -32%. If the measure is simply the average tax rate (corporate tax dividend by corporate surplus), which accounts for various corporate preferences, the U.S. average rate is 17%, which is below the OECD average of 22%.

These data do not indicate the U.S. is a high tax country with respect to investment, and would probably not become so even if some reductions occur in the future in other countries. The main source of international distortion, therefore, is probably the increased investment that occurs in low tax and tax haven countries because the United States and other developed countries do not tax that income at all or tax it on a deferred basis. This inefficiency is not due to the corporate effective tax rate, but rather is due to the provision of a tax benefit for investment abroad.[66]

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[64] (...continued)
Separating Efficiency from Redistribution," *American Economic Review*, vol. 81, no. 4 (September 1991), pp. 985-995.

[65] This reduction of two percentage points was based on the estimates for the production activities deduction relative to corporate revenues presented in the paper.

[66] The issues of efficiency in international taxation are discussed in much more detail in

Even when tax rates diverge, the efficiency costs may not be significant because the evidence suggests, as noted in previous sections, limited mobility of capital as a result of varying tax rates.

Potential Revisions in the Corporate Tax

There are a variety of potential revisions that could be made to the corporate tax to permit lowering the rate. The revisions discussed here include (1) broadening the corporate tax base and using the revenues to reduce the rate or to provide investment incentives, (2) correcting interest deductions and income for inflation, and (3) increasing the individual level tax to permit a lower tax at the firm level.

Eliminating Corporate Tax Preferences

One type of revision that would probably be supported by most economic analysts, is to eliminate corporate preferences in exchange for a lower statutory corporate tax rate. The Treasury Study estimates that eliminating corporate preferences would allow the tax rate to be lowered to 27%. **Table 10** shows the preferences the Treasury Study lists and the FY2008-2017 revenue costs.

The largest preference in the list is expensing and accelerated depreciation ($410 billion) and the second largest is the production activities deduction ($210 billion); both provisions are captured in effective tax rates cited above. Other significant provisions (worth over $100 billion each in these years) include the exclusion of interest on state and local bonds, the research and experimentation tax credit, and the deferral of income from foreign sources, which is probably responsible for much of the international distortions.[67]

Interestingly, their list does not include graduated rates for small corporations, which costs slightly over $4 billion per year, and would, allowing for growth, raise over $50 billion in revenue over the period if were eliminated. Since owners of small corporations are typically as wealthy (or more wealthy) than owners of large ones, there appears to be little economic justification for not including these rates.

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[66] (...continued)
CRS Report RL34115, *Reform of U.S. International Taxes: Alternatives*, by David L. Brumbaugh and Jane G. Gravelle.

[67] The purpose of most of the provisions is self explanatory; note, however, the property sales source rule (also known as the title passage rule) is effectively an export subsidy. Percentage depletion benefits independent oil and gas producers and mineral and coal producers and allows a deduction of costs based on a percentage of receipts rather than the actual costs.

Table 10. Corporate Tax Preferences and Projected Revenue Costs, FY2008-FY2017

Preference	Revenue Cost ($ Billions)
Expensing and accelerated depreciation	410
Deduction for U.S. production activities	210
Exclusion of interest on state and local debt	135
Research and experimentation (R&E) credit	132
Deferral of income of controlled foreign corporations	120
Low income housing credit	55
Exclusion of interest on life insurance savings	30
Inventory property sales source rule	29
Deductibility of charitable contributions	28
Special Employee Stock Ownership Plan (ESOP) rules	23
Exemption of credit union income	19
New technology credit	8
Special Blue Cross/Blue Shield Deduction	8
Excess of percentage over cost depletion	7
Other corporate preferences.	27

Source: Treasury Study.

A full discussion of the economic merits of these provisions is beyond the scope of this paper, but are discussed in the Senate Budget Committee Print, *Tax Expenditure Compendium*;[68] most would be regarded as provisions that lead to economic distortions. One possible exception is the Research and Experimentation (R&E) credit, since social returns to research and development appear higher than private returns, but many economists believe that the credit is probably poorly targeted and possibly abused. Arguments could also be made that the tax exempt bond benefit is shifted to state and local governments (which can charge lower interest rates) and that these assets and revenue loss would be shifted to individuals. Arguments could also be made that the benefits of the charitable contribution

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[68] See U.S. Congress, Senate Committee on the Budget, *Tax Expenditures*, committee print, 109th Cong., 2nd sess., December 2006, S. Prt. 109-072 (Washington: GPO, 2006). The document is posted at [http://frwebgate.access.gpo.gov/cgi-bin/useftp.cgi?IPaddress= 162.140.64.88&filename=31188.pdf&directory=/diskb/wais/data/109_cong_senate_com mittee_prints].

deduction and the low income housing credit ultimately accrue to charities and lower income tenants, at least in part. Many other provisions have some support, and may, therefore, be difficult to repeal.

H.R. 3970 would lower the tax rate to 30.5% (at a 10 year cost in FY2008-FY2017 of $363.8 billion), as well as a permanent extension of provisions allowing expensing for small business (at a cost of $20.5 billion). As shown in **Table 11**, eliminating the production activities deduction is the proposal's largest base broadener. It also includes a provision that is somewhat more limited than eliminating deferral: disallowing expenses associated with foreign source income that is tax-deferred. The proposal also includes two other international provisions, one eliminating a provision adopted in 2004 that included worldwide (rather than domestic) interest in allocation rules for the foreign tax credit limit and one restricting the availability of lower withholding tax rates on income invested in the United States under treaty rules. Another major revenue raiser is a restriction in inventory accounting rules. The only depreciation base broadener in the proposal is one to extend the depreciation period for acquired intangibles. As is often the case in tax legislative proposals, revenue raisers are not always in the tax expenditure list.

Table 11. Corporate Revenue Raisers in H.R. 3970

Provision	10-Year Revenue Gain ($billions)
Production Activities Deduction	114.932
Allocation of Expenses for Deferred Income	106.385
Repeal of Worldwide Allocation of Interest	26.204
Limitation Eligibility for Reduced Treaty Withholding	6.397
Repeal Last-In First-Out Inventory Accounting	106.506
Repeal Lower of Cost or Market Inventory Method	7.146
Special Rule for Service Providers	0.225
20-Year Amortization of Intangibles	20.967
Economic Substance Doctrine	3.787
Reduction in Dividends Received Deduction	4.596
Ordinary Tax on S Corporation Stock Options in an ESOP	0.606
Terminate Domestic International Sales Corporation Benefit	0.881
Tax Debt Securities as a Tax Free Spin Off	0.235

Source: Joint Committee on Taxation.

The Treasury Study also discussed the possibility of using this base broadening to provide an investment incentive, such as a partial expensing. Such a provision would have a larger effect on lowering the tax rate on new investment than is the case for a rate reduction. It is difficult, however, to design investment subsidies in a fashion that is both neutral across types of assets and generates an even revenue loss pattern over time. Historically, investment subsidies have been restricted to equipment. The provision used most frequently in the past is the investment tax credit which, if allowed at a flat rate, favors short-lived assets. Partial expensing is neutral across investments if allowed for all types but its revenue loss is very large in the short run. Accelerated depreciation can be designed to be neutral, but it also has an uneven revenue loss pattern and cannot be applied to non-depreciable assets, such as inventories. A benefit of lowering the statutory rate is that it reduces the incentive to shift profits abroad to tax havens, although that incentive would probably be considerably lessened in any case if deferral of taxation of foreign source income were ended.

The ending of deferral might be a controversial provision, and indeed some pressure has been exerted to move in the other direction, toward a territorial tax.[69] There are, however, some more limited approaches. For example, the President's advisory panel proposed to exempt dividends of active businesses but disallow costs such as interest to the extent income is exempt. And, as proposed in H.R. 3970, one could also defer interest deductions associated with deferred income without making any other changes, or direct restrictive rules to tax havens.

Interest Deduction Inflation Correction

If the inflation premium were disallowed for interest deductions, assuming that about half of interest is inflation, the savings would eventually be $30 billion per year at the corporate level, which would be offset by about a $10 billion loss at the individual level. This could allow a 2.5 percentage point reduction in the corporate tax rate. The important aspect of this change is that it would virtually eliminate the distortion between debt and equity, which is responsible for a significant portion of the overall distortion in the corporate tax, while maintaining the overall corporate tax burden.

Reducing Tax at the Firm Level and Increasing Individual Level Taxes

Given the value of lowering the corporate tax rate to reduce the shifting of income into tax havens and concerns over the U.S. position among other countries, one change that would allow this reduction is to raise the tax at the individual level and use the revenues to lower the corporate tax rate. Since individual taxes tend to

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[69] A territorial tax system is one where the tax is imposed only in the country where business activity occurs and not in the country of ownership. While the present international tax system results in distortions, it is not clear how moving to a territorial tax would reduce these distortions, and even less clear how it would improve tax compliance and profit shifting. For a more detailed discussion see CRS Report RL34115, *Reform of U.S. International Taxes: Alternatives*, by David L. Brumbaugh and Jane G. Gravelle

be collected regardless of where income is earned, these taxes are neutral with respect to international allocation. This approach also allows more scope for lowering corporate tax rates without creating sheltering opportunities for high income individuals. If the 2003 tax changes that lowered rates on dividends and capital gains to 15% were rolled back, the federal corporate tax rate could be reduced to 31%.[70] Taxing capital gains at full rates, as was enacted in 1986 and remained largely in place until 1997 would allow two or three more percentage points in reduction. One could go even further, by taxing corporate capital gains on an accrual basis, which would yield dramatically more revenue. This type of change would also eliminate distortions arising from payout policies and realizations response. Even lower corporate rates could be achieved by taxing non-profits enough to offset their savings from the lower corporate rates — a change that would leave them unaffected, but would simply shift the source of tax collection. These latter proposals would arguably be broad enough to move much of the way towards an integration of the corporate and individual income taxes.

Conclusion

Is there an urgent need to lower the corporate tax rate, as some recent discussions and analyses have suggested? On the whole, many of the new concerns expressed about the tax appear not to stand up under empirical examination. The claims that behavioral responses could cause revenues to rise if rates were cut does not hold up on both a theoretical basis and an empirical basis. Studies that purport to show a revenue maximizing tax rate of 30% contain econometric errors that produce biased and inconsistent results; when those problems are corrected the results disappear. Cross-country studies to provide direct evidence showing that the burden of the corporate tax actually falls on labor yield unreasonable results and prove to suffer from econometric flaws that also lead to a disappearance of the results when corrected. Similarly, claims that high U.S. tax rates will create problems for the United States in a global economy suffer from a mis-representation of the U.S. tax rate compared to other countries and are less important when capital is imperfectly mobile, as it appears to be.

While these new arguments appear to rely on questionable data, the traditional concerns about the corporate tax appear valid. While many economists believe that the tax is still needed as a backstop to individual tax collections, it does result in some economic distortions. These economic distortions, however, have declined substantially over time as corporate rates and shares of output have fallen. There are a number of revenue-neutral changes that could reduce these distortions, allow for a lower corporate statutory tax rate, and lead to a more efficient corporate tax system.

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[70] Details of these proposals are provided in CRS Report RL34115, *Reform of U.S. International Taxes: Alternatives*, by David L. Brumbaugh and Jane G. Gravelle.

Appendix A. Revenue Maximizing Tax Rates
in an Open Economy

For an exploration of corporate tax revenue, consider a very simplified example where there is a U.S. corporate sector and the rest of the world with no tax. The lowest revenue maximizing rate would apply in a case where there is a small country which is a price-taker (that is, worldwide price and rate of return after tax are fixed because there is perfect capital mobility and perfect product substitutability). To determine the revenue maximizing tax rate, begin with the equation for corporate tax revenues:

$$REV = \frac{tRK}{1-t} \tag{A1}$$

where K, the corporate capital stock, and R, the after-tax rate of return, are potentially functions of the tax rate, t. Revenue is maximized when the total differential of equation (A1) with respect to taxes is equal to zero, which is:

$$(1-t)\left(tR\frac{dK}{dt} + tK\frac{dR}{dt} \right) + RK = 0 \tag{A2}$$

Assuming the rest of the world can be treated as a aggregate and has a zero capital income tax rate, Gravelle and Smetters[71] show that, in a case of a small country with perfect substitutability, R does not change and

$$\frac{dK}{K} = -\frac{\mu}{\sigma}\frac{dt}{(1-t)} \tag{A3}$$

where μ is the labor share of income and σ is the factor substitution elasticity.

Substituting equation (A3) into equation (A2) we obtain the revenue maximizing rate of μ/σ. To use some common values, if μ is 0.75 and σ is 1, the revenue maximizing rate is 75%.

Since the United States is a large country, the rates would be even higher, because the tax can affect the world wide interest rate. The Gravelle and Smetters paper provide effects for R and K for a given country share, which can also be substituted into equation (A2). As a result, the revenue-maximizing tax rate is $\mu/(\mu\gamma + \sigma(1-\gamma))$ where γ is the output share. For example, if the United States has approximately 30% of the total output, the tax rate would be 81%. The rates would rise further if capital were not perfectly mobile or products not perfectly

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[71] Jane G. Gravelle and Kent A. Smetters, "Does the Open Economy Assumption Really Mean That Labor Bears the Burden of a Capital Income Tax?" *Advances in Economic Policy and Analysis*, vol. 6, No. 1, 2006.

substitutable, since these factors would allow R to fall further. At the extreme, it would return to a closed economy solution. Gravelle and Smetters present evidence to suggest that the outcome is more similar to a closed economy than a small open economy solution.

This same outcome, a 75% rate, would also apply for the most extreme case of growth models, the Ramsey model, where the supply of savings is perfectly elastic.

Note that in both of these extreme cases, the after tax return is fixed and the total burden falls on wage income, so that labor income would fall. One could also calculate a corporate tax rate than maximizes revenue while taking into account the effect on wages and keeping the wage rate constant. Again, relying on the model in Gravelle and Smetters and maximizing,

$$REV = \frac{tRK}{(1 - t)} + t_l WL \tag{A4}$$

Where t_l is the tax rate wages, we obtain a revenue maximizing corporate tax rate of $t = (\mu(1 - t_l))/(\sigma - t_l \mu)$. With an approximate 20% tax rate on labor income, the revenue maximizing corporate tax rate is 70%. Note however, that this is not the rate that would be found in the cross-section analysis.

Appendix B. Data and Estimation Methods

We obtained the data used in the Hassett and Mathur study and the Clausing study.[72] The data used to replicate the Brill and Hassett study were obtained from the original sources cited in the study.[73] We were able to replicate the results reported for all studies.

The data we use are for several countries for a period of several years, and are known as panel data. The model of the relationship between the corporate tax rate (the independent variable) and the various dependent variables takes a linear form:

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it} \tag{B1}$$

where Y_{it} is the dependent variable, X_{it} is the independent variable (the corporate tax rate in our case), α and β are the regression parameters to be estimated, and ε_{it} is a random error term.[74] The subscripts, i and t, indicate that information for a particular observation comes from country i for year t (for example, information for Australia for 1992). The random error term, ε_{it}, is a random variable and captures omitted and unobservable factors or variables that affect the dependent variable. The error term will be discussed in further detail below.

If the following conditions are met:

- the expected value (mean) of the random error term, ε_{it}, is zero;
- the variance of the random error term is constant for all observations;
- the random error term for one observation is uncorrelated with the error term for another observation; and
- the random error terms are uncorrelated with the explanatory variables...

then the ordinary least squares (OLS) estimators will yield the best linear unbiased estimators of the parameters (α and β). The β parameter shows the true relationship between the dependent variable and the independent variable, and is the

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[72] We thank the authors for providing their data to us. The studies are Kevin A. Hassett and Aparna Mathur, *Taxes and Wages*, American Enterprise Institute, working paper, 2006; and Kimberly A. Clausing, "Corporate Tax Revenues in OECD Countries," *International Tax and Public Finance*, vol. 14 (2007), pp. 115-133.

[73] Alex Brill and Kevin A. Hassett, *Revenue-Maximizing Corporate Income Taxes: The Laffer Curve in OECD Countries*, AEI working paper #137, American Enterprise Institute, July 31, 2007.

[74] For ease of exposition only one independent variable is written in the equation. Generally, several independent variables are included in the linear model. This simplification does not change the following discussion of our model and estimation techniques.

parameter of interest to us. Denote the estimate of β as $\hat{\beta}$. Since $\hat{\beta}$ is an estimate, it is a random variable drawn from a probability or sampling distribution with an expected value (mean) and variance. This estimator will have the following desirable properties:

- unbiased: the expected value of $\hat{\beta}$ is β;
- efficient: the variance of $\hat{\beta}$ is smaller than the variance of all other unbiased estimators; and
- consistent: the probability distribution of $\hat{\beta}$ collapses on β as the number of observations gets arbitrarily large.

Estimation problems often arise with panel data because one or more of the conditions listed above are not met. The result is the OLS estimator will be biased and inconsistent. Problems arise with panel data, as is demonstrated when equation (B1) is rewritten as:

$$Y_{it} = \alpha + \beta X_{it} + v_i + \phi_t + \eta_{it}. \qquad (B2)$$

The term v_i is an effect (unobserved heterogeneity) specific to a particular country capturing differences among countries in (1) the measurement of economic data, (2) economic institutions, (3) laws and regulations applying to business, and (4) attitudes toward business, among other things. The term ϕ_t is a time specific effect capturing such things as the international business cycle. Since the corporate tax rate is a reflection of the attitudes toward business in a country, X_{it} and v_i will be correlated. Ignoring the country-specific unobserved heterogeneity means that the OLS estimate of β is biased and inconsistent because the error term in equation (B1) is correlated with the explanatory variable — one of the conditions listed above is violated. Another problem often encountered with data that has a time dimension is the error terms are correlated from one year to the next year (called autocorrelation). Statistical tests indicate that these problems exist with the data we obtained. Consequently, we estimate the parameters of the model using the fixed effect estimation procedure allowing for an AR(1) error structure.[75]

Identification

Neither Brill and Hassett nor Clausing offer any justification in their studies for using OLS rather than the fixed effects method to estimate the parameters of their model. A well-known drawback of the fixed effects method is variables that vary across countries, but not across time within a country, cannot be included in the estimation (that is, the parameters associated with these variables are not identified).

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[75] See Christopher F. Baum, *An Introduction to Modern Econometrics Using Stata* (College Station, TX: Stata Press, 2006) for a description of this technique. Our overall results and conclusions are not changed when using the random effects estimation procedure allowing for an AR(1) error structure.

Devereux (2006) claims "changes in the statutory [corporate tax] rate within a country are comparatively rare. In practice, as found by Clausing (2006), there is not enough variation within country to identify an effect of the statutory rate, conditional on country fixed effects."[76]

To check the correctness of this statement and the justification for using OLS, we directly examine the variation of the corporate tax rate across countries and over time. **Table B1** displays the results for the data from the three studies we reanalyzed. The first row displays the relevant explanatory corporate tax rate variable used in the study. The second row reports of mean of the variable. The third row reports the standard deviation (a measure of variation of a variable) of the corporate tax rate variable. The last two rows decompose the standard deviation into the between country component and the within country component. If there is no variation in the variable over time within countries, then the within component of the standard deviation will be zero. Consequently, the effect of that variable on the dependent variable is not identified conditional on fixed effects (that is, it cannot be estimated using the fixed effects procedure). As can be seen from the table, there is almost as much variation within countries (the within component) as there is between countries (the between component).

Table B1. Standard Deviation of Corporate Tax Rate Variables in the Three Data Sets

	Brill and Hassett Data	**Clausing Data**	**Hassett and Mathur Data**
Variable	Corporate tax rate	Corporate tax rate	Logarithm of corporate tax rate
Mean	0.362	0.354	-1.106
Overall Standard Deviation	0.092	0.101	0.396
Between Component	0.065	0.078	0.307
Within Component	0.064	0.063	0.248

Source: Authors' analysis of data.

In addition, we find that all OECD countries changed their corporate tax rate at least once between 1979 and 2002. Four countries (Ireland, Norway, Spain, and Switzerland) changed their corporate tax rate only once during this period. In contrast, Luxembourg changed their corporate rate 12 times over this period. On average, OECD countries changed their corporate tax rates once every five years. Therefore, we can find no evidence to support the argument that the effect of the corporate tax rate on corporate tax revenues is not identified conditional on fixed effects.

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[76] Michael P. Devereux, *Developments in the Taxation of Corporate Profit in the OECD Since 1965: Rates, Bases and Revenues*, University of Warwick, working paper, May 2006, p. 20.

Appendix C: Modeling Problems of the Desai, Foley, and Hines Study

This appendix explains in further detail the modeling problems associated with the Desai, Foley, and Hines study (hereafter DFH) study, which include the failure to recognize price variability. This means that their cross-equation restriction is not justified (and that restriction is what gives rise to their results). The DFH study also fails to correctly interpret their results given that other sectors exist in the economy.

The DFH model effectively begins with an equation that forms a basic part of any general equilibrium model, namely that a percentage change in price is a weighted average of the percentage in costs for small changes. In the case of an imposition of a tax, that is:

(1) $\hat{p} = \alpha(\hat{r} + \hat{\tau}) + (1 - \alpha)\hat{w}$

where p is price, r is rate of return, w is the wage rate, τ is the tax rate and α is the share of capital income. The hat notation refers to a percentage change except in the case of the tax variable, where the hat means the change in tax rate divided by one minus the tax rate. Beginning with a no tax world, that variable is simply $d\tau$. This relationship can be derived from a profit maximization problem. DFH derive such an equation to motivate their seemingly unrelated regression model. They then assume that p, the price of the good, does not change, which produces an equation of the form:

(2) $0 = \alpha(\hat{r} + \hat{\tau}) + (1 - \alpha)\hat{w}$

Since τ is an exogenous variable this equation indicates that the change in the tax would be shared by interest rates and wages, and this is the basis for the two seemingly unrelated regressions where the dependent variables are r and w, and the coefficients are constrained so that the burden will add up to one.

The argument for keeping the price fixed is that such a good would have its price fixed due to trade: e.g. all commodities have to sell at the same price. There are two difficulties with this assumption. First, if consumers in different countries have different preferences for goods based, in part, on country of origin (i.e. they do not consider French wine and German wine to be perfect substitutes) these prices will not be fixed. Indeed, this phenomenon is widely recognized, and the price responses are referred to as Armington elasticities — and they have been estimated empirically. Second, their observations are the weighted average of firms in each country but the firms themselves produce heterogeneous products, and all of these product prices cannot stay fixed because they have different capital intensities and because the products will vary from one country to another. Indeed, the trading of heterogeneous products means that fixed prices cannot be assumed because, in such a model, countries could not produce, consume and trade numerous products with differential taxation because such a world economy would be characterized by corner solutions (i.e. no internal equilibrium).

This problem means that there is another variable, price, that is affecting the results and presumably is correlated with the error term (that is, the price would tend to be higher when the tax rate is higher, making the regression suspect and that the coefficient restriction is not appropriate.

Even if these problems did not exist, there is an additional problem with the interpretation of their findings, namely that they did not adjust for other sectors in the economy, including non-traded sectors and sectors not subject to the corporate tax. Incidence results must be adjusted for the fact that the tax is only a partial one.

To illustrate in the simplest fashion, suppose the remaining sector of the economy is a non-corporate non-traded sector of the economy whose price is denoted by a capital P:

(3) $\hat{P} = \beta(\hat{r}) + (1 - \beta)\hat{w}$

This commodity has no taxes and if we estimate the effects on r and w, those can be used to determine the change in P.

What we ultimately want to determine is the fraction of the tax, $rK_c\,d\tau$ (where K_c is the capital in the corporate traded sector) that falls on labor, that is what share of Ldw, where L is total labor in the economy, is of $rK_c\,d\tau$.

To derive the real change in wages, we want the change in nominal wage divided by the change in total price level in the economy, or, if the corporate sector is responsible for $(1-\theta)$ of output in the economy the percentage change in real wage (which we denote with a capital W) can be expressed as follows:

(4) $\hat{W} = \hat{w} - (1 - \theta)\hat{p} - \theta\hat{P}$

If s is the share of the burden falling on labor income, from equation (1),

$\hat{r} = -(1 - s)d\tau$ and $\hat{w} = -\dfrac{-s\alpha d\tau}{(1 - \alpha)}$.

And, by substitution of these values into (3) and in turn into (4), and allowing the initial price level to be normalized at 1, we obtain the equation for incidence in the economy, noting that $\alpha / (1 - \alpha)$ equals rK_c/wL_c:

(5) $Ldw = -(L / L_c)(s - \theta s(1 - \beta) - \theta(1 - s)(1 - \alpha)\beta / \alpha)rK_c d\tau$

The first term, total labor divided by labor in the tax sector reflects the increased burden from the spread of the nominal fall in wages to the other sector, while the negative terms inside the next parenthesis reflects the rise in real wages due to the fall in the price of the untaxed sector. Whether the burden rises or falls depends on a variety of factors. As the capital intensity of the untaxed sector rises the burden falls; at the extreme when β becomes 1, the first term collapses to 1 and the second term is less than s, so the total burden on labor is less in the economy than it is in the

estimation. This possibility is more important than it might initially appear, because one of the most important uses of capital not subject to the corporate income tax is in housing in the United States.