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Macroeconomic Effects of the Inflation Reduction Act

John W. Diamond, Ph.D.
Edward A. and Hermena Hancock Kelly Fellow in Public Finance
Director, Center for Public Finance
Adjunct Professor of Economics, Rice University

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The opinions expressed in this paper are those of the author and should not be construed as reflecting the views of any entity with which the author is affiliated, including Rice University and the Baker Institute for Public Policy.

This paper is a work in progress.

I. OVERVIEW

H.R. 5376, previously known as the Build Back Better Act, has been revamped and renamed the Inflation Reduction Act of 2022 and is currently being considered by the Senate Finance Committee. The new version of H.R. 5376 would enact a 15 percent minimum corporate tax on book income, close the carried interest loophole, increase IRS funding, enact prescription drug pricing reform, make new investments in clean energy, extend health care subsidies, and reduce deficits. The Joint Committee on Taxation (JCT)[1] provides estimates of the tax provisions in the Inflation Reduction Act. JCT estimates that the 15 percent minimum corporate tax on book income will raise $313 billion, closing the carried interest loophole will raise $13 billion, the provisions on investments in clean energy reduce revenues by $258 billion. The Congressional Budget Office (CBO, 2022) estimates that the net effect of the revenue provisions and the spending provisions is a reduction in deficits by roughly $300 billion from 2022 to 2031 (after including net effects of increased IRS outlays and enforcement). In this paper, we analyze the macroeconomic effects of the Inflation Reduction Act assuming that the revenue and spending provisions are permanent.

The analysis is performed in the context of an extended version of the Diamond-Zodrow (DZ) dynamic, overlapping generations, computable general equilibrium (CGE) model of the U.S. economy. The basic model is designed to examine both the short run and the long run macroeconomic effects of fiscal policy changes.

The paper proceeds as follows. In the following section, we describe the features of the fiscal plan that we analyze. Section III provides a brief description of our computable general

[1] JCT estimates are located at https://s3.amazonaws.com/pdfs.taxnotes.com/2022/2022-25032_TNT_Docs_jct.pdf.

equilibrium model. The simulation results are reported in Section IV. The final section summarizes the results and offers some caveats.

II. DETAILS OF THE FISCAL PLAN ANALYZED

The tax and expenditure components of the IRA are detailed below. In addition, we briefly discuss the current state of the economy, how the proposed fiscal policy changes will impact inflation, and issues related to a minimum tax based on book income.

A. Fiscal Policy Changes

We include all of the major provisions of the Inflation Reduction Act, which enacts a 15 percent minimum corporate tax on book income, closes the carried interest loophole, increases IRS funding for increased enforcement, reforms the pricing mechanisms of prescription drugs, increases spending on clean energy projects, extends health care subsidies, and reduces deficits. The 15 percent minimum corporate tax on book income would raise $313 billion from 2022 to 2031. In the model, this is equivalent to imposing a 1.6 percentage point increase in the corporate tax rate (increasing the federal corporate rate from 21 to 22.6 percent) in order to raise the target amount of revenue. Closing the carried interest loophole raises $13 billion. Increasing IRS funding by $80 billion increases enforcement and is estimated to yield $200 billion in additional revenue, leading to a net fiscal impact of roughly $120 billion. Spending on clean energy projects is estimated to cost roughly $258 billion. We allocate the revenue changes in JCT (2022) across the five production sectors in the model—owner housing (OH), rental housing (RH), non-corporate (NC), corporate competitive (CP), and the international corporate imperfectly competitive sector (CM). Within each model sector, the revenue changes are input as production deductions, investment credits, or lump sum changes in firm tax liability. It is assumed that the IRA would increase housing credits by $30 billion (split between owner and rental housing),

decrease noncorporate revenues by $10 billion related to tax rate changes and by roughly another $35 billion from increased deductions and credits, decrease $40 billion in lump sum corporate tax liability split between the CP and CM sectors, decrease revenues by $67 billion in the CM sector by increasing production deductions and investment credits, and decrease revenues by $67 billion in the CP sector by increasing production deductions and investment credits. In addition, we account for provisions that affect individuals directly as either changes in individual tax rates, increases in tax credits, or increased transfer payments. CBO (2022) shows that all other spending provisions (including extending Affordable Care Act subsidies and prescription drug pricing reforms) would cost about $101 billion. The net effect of the revenue and spending provisions are estimated to decrease deficits by $300 billion from 2022 to 2031. Table II.2 shows net revenue, net outlays, and net deficit effects.

We assume that the revenue raised from the tax changes enacted from 2022 to 2031 are permanent. We examine the case in which the deficit is reduced by $303 billion from 2022 to 2031 (before macroeconomic effects), however after 2031 transfers are adjusted to hold the debt-to-GDP ratio constant.

Table I: Revenue, Outlays, and Deficit Effects 2022-2031
($ billions)

Budget effects of the Inflation Reduction Act (before macroeconomic effects)	**Revenues**	**Outlays**	**Deficit**
Tax Provisions			

Corporate Tax	$313		
Carried Interest	$13		
Increase in IRS enforcement	$200		
Clean Energy Provisions	-$258		
ACA Subsidies	-$31		
Spending Provisions			
IRS Expansion		$80	
All Other Spending		-$14	
Totals	$237	-$66	$303

B. Economic Issues Related to the IRA

The current economy is characterized by high levels of inflation, two quarters of decreasing growth in GDP, but solid yet softening employment data. In addition, the Federal Reserve is resolute in its attempt to bring inflation under control by increasing the fed funds rate and reducing the size of its balance sheet. Current inflationary pressures are widely believed to be caused by sizable fiscal stimulus, continued bottlenecks in production and the supply chain, food and energy production issues related to the war in Ukraine, massive budget deficits, reduced labor force participation rates, and increases in inflation expectations.

Inflation reduces the purchasing power of consumers' income and wealth and leads to uncertainty in consumers' consumption and investment choices. Inflation also creates uncertainty for firms and leads to lower levels of production and investment. For example, inflation increases nominal capital gains but these gains do not represent a real gain in wealth. The fact that the United States does not index capital gains for inflation implies that taxing the nominal value will reduce the real rate of return on investment, and may do so by enough to result in negative rates of return in periods of moderate to high inflation. Lower real rates of return reduce investment, the size of the capital stock, productivity, growth in wage rates, and labor supply. Reducing

inflation is an important goal to maintain stable and long-term economic growth. Price stability is one of the two main goals of the Federal Reserve, but it is important that fiscal policy support the role of the Federal Reserve in bring down inflation instead of working against it (for example by continuing to provide fiscal stimulus).

There is uncertainty about whether the Inflation Reduction Act will reduce inflation. It is a contentious issue but the two sides are not far apart. For example, a study using the Penn Wharton Budget Model (PWBM)[2] found that inflation would slightly increase in the first two years after reform and then slightly decrease after 2024. Overall, the study finds that changes in inflation are not statistically different from zero or to put it another way that IRA would have no effect on inflation. The Committee for a Responsible Federal Budget (CRFB) argues the reductions in inflation caused by the IRA would be larger than predicted by PWBM. CRFB[3] argues that inflation reduction will be larger because (1) deficit reduction will likely be larger than estimated, (2) regulatory reforms will lead to more energy production and lower energy prices, and (3) provisions in the IRA will lower prices for health care premiums, prescription drugs, and electric vehicles and renewable energy.

However, it is worth noting that higher taxes on corporations may lead to lower production and exacerbate existing production and supply chain issues. From a policy perspective it is important to acknowledge that not all policies that lead to deficit reduction will impact inflation and economic growth in the same manner. For example, removing fiscal stimulus in the form of reduced transfer payments to individuals would reduce demand and act to

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[2] The PWBM study is located https://budgetmodel.wharton.upenn.edu/issues/2022/7/29/inflation-reduction-act-preliminary-estimates.

[3] The CRFB blog post arguing for greater inflation reductions is located https://www.crfb.org/blogs/ira-will-help-fed-fight-inflation.

lower inflationary pressures by helping to balance the forces of supply and demand. Alternatively, enacting fiscal stimulus through tax increases on firms may lead to reductions in the supply of goods and services, and thus at least temporarily, increase the imbalances between supply and demand that lead to inflationary pressures. Thus, increasing taxes on corporations and other suppliers of goods and services may do more harm than good. In addition, imposing a tax on book income creates a new set of issues. Book income is used to share important financial information to investors and creditors. Creating incentives to calculate book income for a alternative reason, such as to reduce or minimize tax liability, may reduce or cloud the information available to investors and creditors. Furthermore, creating a minimum tax to correct undesirable tax liability outcomes of the existing tax system is redundant and complex. The same goal could be accomplished by reforming the underlying tax laws to produce the desired result. The Inflation Reduction Act suffers from these issues. In addition, there seems to be agreement that the IRA will likely not reduce inflation significantly in the short term.

III. OVERVIEW OF THE DIAMOND-ZODROW MODEL

This section provides a short description of the model used in this analysis.[4] Versions of the model have been used in analyses of tax reforms by the U.S. Department of the Treasury (President's Advisory Panel on Federal Tax Reform, 2005), the Joint Committee on Taxation (2005), and in numerous recent tax policy studies (Diamond and Zodrow, 2007, 2008, 2013,

[4] For more details, see Zodrow and Diamond (2013), Diamond and Zodrow (2015), and Gunning, Diamond, and Zodrow (2008). The model combines various features from other broadly similar CGE models, including those constructed by Auerbach and Kotlikoff (1987), Goulder and Summers (1989), Goulder (1989), Keuschnigg (1990), and Fullerton and Rogers (1993).

2014, 2015, 2018, 2020, 2021; Diamond, Zodrow, Neubig, and Carroll, 2014; Diamond and Viard, 2008). Key parameter values used in the simulations are provided in the appendix.

The domestic component of the DZ model includes both corporate and non-corporate composite consumption goods and owner-occupied and rental housing. The corporate sector is subject to the corporate income tax and subdivided into domestic and multinational firms as described below, and the "non-corporate" sector – which includes S corporations as well as LLCs, LLPs, partnerships and sole-proprietorships – is taxed on a "pass-through" basis at the individual level. Firms combine labor and several different types of capital to produce their outputs at minimum after-tax costs. The time paths of investment are determined by profit-maximizing firm managers who consider all business taxes as well as the costs of adjusting their capital stocks, correctly anticipating the macroeconomic changes that will occur as a result of any change in the tax structure. Firms finance their investments with a mix of equity and debt, choosing an optimal debt-asset ratio that balances the costs and benefits of additional debt, including its tax advantages.

On the consumption side, household supplies of labor and saving for capital investment and demands for all housing and non-housing goods are modeled using an overlapping generations structure. A representative individual in each generation (1) spends a fixed number of years working and in retirement, (2) makes consumption and labor supply choices to maximize lifetime welfare subject to a lifetime budget constraint that includes personal income and other taxes and a fixed number of hours available for work and leisure, and (3) makes a fixed "target" bequest.

The government purchases the composite goods and makes transfer payments, which it finances with the corporate income tax, a progressive tax on labor income after deductions and

exemptions, and constant individual-level average marginal tax rates applied to capital income in the form of interest receipts, dividends, and capital gains.[5] The modeling of corporate income tax revenues includes explicit consideration of deductions for depreciation or immediate expensing for both new and old assets (which are treated separately), other production and investment incentives, and state and local sales, income, and property taxes.

The DZ model also includes a simplified foreign or "rest-of-the-world" (RW) sector, with international trade and capital movements between the US and RW. The model includes US and foreign multinational enterprises (MNEs), both parents and subsidiaries, which determine the allocation across the US and RW of relatively mobile firm-specific capital (*FSK*) that earns above-normal returns as well as the allocation of less mobile ordinary capital that earns normal returns.[6] *FSK* captures a wide variety of intangibles, including patents, copyrights, designs, or other proprietary technology, R&D spending, new software, unique data bases, brand names and trademarks, and good will and reputation, which are coupled with unique managerial or organizational skills or knowledge of production processes and distribution networks to create a factor that is assumed to be fixed in total supply and grows at the exogenously specified growth rate (and is thus independent of any tax changes), is unique to the firm, and allows it to

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[5] The DZ model explicitly includes two types of government spending: (1) transfer payments made to individuals and firms or (2) government public investment expenditures that directly affect private sector productivity. We assume that all spending in the Inflation Adjustment Act analyzed in this paper is transfer spending as opposed to investments in productive government infrastructure that increases the productivity of private capital. The clean energy provisions are modeled as production deductions, investment credits or rate reducing transfers to firms in the model, and thus can positively impact firm productivity and investment. However, given the nature of the provisions, it does not seem appropriate to model these expenditures as infrastructure investment that makes other private capital more productive. For example, the tax credits intended to increase carbon capture and clean hydrogen will lead to more productive privately-owned capital, but not capital that makes all other private capital more productive. Note that the climate and health benefits from reducing negative externalities related to carbon are not included in the macroeconomic effects but would generally be included in welfare analysis.

[6] The assumption of differential international mobility of capital follows Becker and Fuest (2011); see also Zodrow (2010).

permanently earn above-normal returns.[7] The model also allows for income shifting by MNEs in response to tax differentials across countries,[8] the use of intermediate goods that are traded between the affiliates of the MNEs,[9] and international trade in the goods produced by the MNEs in the US and RW. To simplify the analysis, RW is modeled as consisting entirely of the MNE sector (both US-MNE subsidiaries and RW-MNE parents); we thus effectively assume that the remainder of RW is unaffected by the tax reforms in the United States that we analyze. We assume that the tax system in RW is fixed and thus does not respond to changes in the US tax structure. In particular, the US tax reforms considered in this paper include an increase and expansion of the existing U.S. minimum tax regime on foreign source income (global intangible low-taxed income or GILTI). We do not consider the possibility, currently being discussed, of the enactment of similar minimum taxes in the OECD, perhaps coordinated with the United States; if enacted, these taxes would have the effect of dampening to some extent the tax-induced outflows of firm-specific capital that occur in our model.

Note that the model includes several fundamental assumptions that are typical of such dynamic computable general equilibrium (CGE) models, including those used by the Joint Committee on Taxation (see Diamond and Moomau (2003) and Auerbach and Grinberg (2017) for general discussions) and the Congressional Budget Office (Nelson and Phillips, 2019), as

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[7] The modeling of firm-specific capital generally follows Bettendorf, Devereux, van der Horst, Loretz, and de Mooij (2009), de Mooij and Devereux (2011), Auerbach and Devereux (2018), and McKeehan and Zodrow (2017). Numerous recent analyses have stressed the increasing importance of the combination of intellectual capital and organizational and managerial skill, including an OECD study by Demmou et al., (2019) as well as Hassett and Shapiro (2011), Peters and Taylor (2017), and Ewens et al. (2020). These studies suggest that such firm-specific capital may be 40 percent or more of total capital.

[8] For recent discussions of the controversial issue of the extent of income shifting by US multinationals, see Dharmapala (2014, 2018), Clausing (2020a, b), and Blouin and Robinson (2020).

[9] The inclusion of intermediate goods in the production functions of MNE parent firms and subsidiaries follows Desai, Foley, and Hines (2009).

well as the models cited above. Specifically, all markets are assumed to be in equilibrium in all periods, and the economy must always begin and end in a steady-state equilibrium, with all of the key macroeconomic variables growing at an exogenous growth rate that equals the sum of the population and productivity growth rates. Note that this implies that tax changes do not affect the long term growth rate in the economy; for example, a tax reform might increase the levels of GDP relative to the steady state levels in the absence of reform for many years after the enactment of reform, but eventually GDP will grow at the fixed steady state growth rate of the economy.

Our model also assumes a full employment equilibrium in the labor market in each period and thus is not well suited to analyzing fiscal policies designed to stimulate an economy with high unemployment. Any simulated changes in hours worked necessarily reflect changes in labor supply and demand in response to tax-induced changes in prices and incomes within the context of a full-employment economy. These include the effects of any increases in government transfers, which reduce labor supply as individuals choose to "consume" more leisure because their income level has increased. In addition, the model depends on relative prices only and thus can not be used to examine the effects of various policies on inflation.

IV. Simulation Results

In this section we report the simulation results. We assume the tax and spending provisions are permanent. The macroeconomic effects of the Inflation Reduction Act of 2022 are shown in Table II. GDP decreases by 0.1 percent (roughly $190 billion from 2022 to 2031) in every year after reform. Aggregate private consumption of goods and services decreases by 0.2 percent in the year after reform, by 0.2 percent in 2028, by 0.2 percent in 2033, by 0.1 percent in

2043, and by 0.1 percent in the long run. Total private investment increases by about 0.1 percent in most years after reform. The net stock of imported ordinary capital is unchanged. The stock of ordinary capital is unchanged in most years after reform. The stock of FSK (highly mobile intangible capital) decreases by 0.9 percent in the year after reform, by 1.2 percent in 2028, by 1.2 percent in 2033, by 1.2 percent in 2043, and by 1.0 percent in the long run.

The simulation results also indicate that the reform would lead to a decrease in hours worked by 0.1 percent in every year after reform. The real after-tax wage increases by 0.1 percent in the year after reform and in 2028, but is unchanged from 2033 to 2043, and by 0.1 percent in the long run. Labor compensation is unchanged as declines in hours worked and increases in the real wage roughly offset each other. Transfer payments increase by 5.1 percent in each of the first ten years, and then increase by 8.6 percent in 2043, and by 8.3 percent in the long run. The debt-to-GDP ratio decreases from 88.5 percent in the initial steady state to 87.5 percent 10 years after the reform and to 86.8 percent in the long run.[10]

Table II: Macroeconomic Effects of the Inflation Reduction Act of 2022
(Percentage changes in aggregate variables, relative to steady state with no reform)

Variable % Change in Year:	**2023**	**2028**	**2033**	**2043**	**2073**	**LR**
GDP	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Private consumption	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1
Private investment in ordinary *K* in US	0.1	0.1	0.0	0.1	0.1	0.1
Stock of imported ordinary *K* in US	0.0	0.0	0.0	0.0	0.0	0.0
Stock of ordinary *K* in US	0.0	0.0	0.0	0.0	0.1	0.0

[10] Allowing debt reduction for 20 years, until 2041, yields slightly more positive but very similar results. GDP is reduced by 0.1 percent in every year after reform for the next 100 years, labor supply is reduced by 0.1 percent, and consumption falls by 0.2 percent for the first 20 years after reform. The debt to GDP ratio falls from 88.5 percent to 83.9 percent as more debt is paid off. The increase in investment in ordinary capital is slightly larger at 0.4 percent in the long run.

Stock of *FSK* in US	-0.9	-1.2	-1.2	-1.2	-1.1	-1.0
Employment (hours worked)	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Labor compensation	0.0	0.0	0.0	0.0	0.0	0.0
Real wage	0.1	0.1	0.0	0.0	0.1	0.1
Transfers	-5.1	-5.1	-5.1	4.6	5.3	5.8
Debt-to-GDP ratio	88.5	88.3	87.5	86.8	86.8	86.8

V. CONCLUSION

In this paper, we use the Diamond-Zodrow computable general equilibrium model of the U.S. economy to simulate the dynamic macroeconomic effects of the Inflation Reduction Act. The reform leads to long run reductions in GDP (by 0.1 percent), private investment increases (by 0.1 percent), the stock of ordinary capital is unchanged, hours worked decreases (by 0.1 percent), and labor compensation is unchanged. Relatively mobile firm-specific capital decreases by 0.9 percent in the year after enactment and by 1.0 percent in the long run. Transfer payments increase by 5.1 percent in the ten years after enactment and by 5.8 percent in the long run. The debt-to-GDP ratio decreases by roughly 1.7 percentage points from 88.5 percent to 86.8 percent.

In addition, there are several problems with the structure of the Inflation Reduction Act. First, enacting fiscal reforms by increasing taxes on firms may lead to reductions in the supply of goods and services, and thus at least temporarily, increase the imbalances between supply and demand that lead to inflationary pressures. In inflationary environments policymakers should focus on reducing demand side fiscal stimulus, while maintaining or possibly increasing fiscal support on the supply side. Moreover, imposing a tax on book income may create incentives to calculate book income for reasons other than sharing financial information, such as to reduce or minimize tax liability, and thus may reduce or cloud the information available to investors and creditors. This is an undesirable outcome that will likely lead to unintended negative economic

outcomes. Furthermore, creating a minimum tax to correct undesirable outcomes under the existing tax system is redundant and breeds complexity. The same goal could be accomplished by enacting changes to existing provisions that produce the undesired outcomes.

We conclude with some caveats. In our view, dynamic, overlapping generations computable general equilibrium models of the type used in this analysis are one of the best tools available to analyze the real economic effects of tax policy changes such as those analyzed in this study. In particular, such models provide a rich structure based on fundamental economic theory that captures many of the complex and interacting effects of changes in fiscal policy, including their dynamic and intergenerational effects, in a comprehensive general equilibrium framework. Such models, including our version, can also be used to analyze the intragenerational and intergenerational distributional effects of changes in fiscal policy, although we do not do so in this study.

Nevertheless, the results of any study that attempts to model the effects of corporate and individual income tax changes as well as changes in government expenditures including those that increase the stock of public capital in today's highly complex and internationally integrated economy are subject to uncertainty, and this analysis is no exception. In particular, such results always depend on the details of the policy proposed and how they are modeled, including how the revenues are used, the structural assumptions that characterize the model, and the specific model parameters that are utilized in the simulations.

APPENDIX

Table A. Parameter Values Used in the DZ Model

Symbol	Description	Value
Utility Function Parameters		
ρ	Rate of time preference	0.015
σ_U	Intertemporal elasticity of substitution (EOS)	0.50
σ_C	Intratemporal EOS	0.80
σ_H	EOS between composite good, housing	0.30
σ_N	EOS between corporate composite good and noncorporate good	2.00
σ_{NS}	EOS between subsidized and nonsubsidized noncorporate good	2.00
σ_M	EOS between M-sector and C-sector corporate goods	2.00
σ_I	EOS between domestic and foreign produced goods	5.00
σ_R	EOS between rental and owner-occupied housing	1.50
α_C	Utility weight on the composite consumption good	0.73
α_H	Utility weight on non-housing consumption good	0.48
α_{NS}	Utility weight on subsidized non-corporate consumption good	0.50
α_N	Utility weight on composite corporate good	0.62
α_M	Utility weight on M-sector corporate good	0.42
α_R	Utility weight on owner-occupied housing	0.76
α_{LE}	Leisure share parameter of time endowment	0.30

Production Function Parameters

ε_C, ε_M	EOS for C-sector and M-sector corporate goods	1.00
ε_N	EOS for noncorporate good	1.00
ε_H, ε_R	EOS for owner and rental housing	1.00
ε_G	EOS for government-produced goods	1.00
γ_C	Capital shares for C-sector corporate goods	0.27
γ_N	Capital share for noncorporate good	0.30
γ_H, γ_R	Capital share for owner and rental housing	0.98
γ_G	Capital share for government-produced good	0.64
$\beta_X, \beta_N, \beta_H$	Capital stock adjustment cost parameters	5.0, 10
ζ	Dividend payout ratio in corporate sector	0.40
b_C, b_N, b_H, b_R	Debt-asset ratios	0.35, 0.40
β_d	Cost of excessive debt parameter	0.30
γ_{KM}	Capital share parameter in M-sector composite *KEL* factor	0.27
γ_{MK}	*KEL* share parameter in M-sector production function	0.66
γ_{MI}	Intermediate good share in M-sector production function	0.05
	Other Parameters	
ε_K	Portfolio elasticity for ordinary capital	1.0
ε_{FSK}	Portfolio elasticity for firm-specific capital	2.0
n	Exogenous growth rate (population plus productivity)	2.0
θ_G	Output elasticity of public capital	0.06
ϕ^{GSL}	Share of federal investment offset by state/local reductions	0.33

DISCLAIMER

This study uses the Diamond-Zodrow model, a dynamic computable general equilibrium model copyrighted by Tax Policy Advisers, LLC, in which the authors have an ownership interest. The terms of this arrangement have been reviewed and approved by Rice University in accordance with its conflict of interest policies.

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ABOUT THE AUTHOR

John W. Diamond, Ph.D., is the Edward A. and Hermena Hancock Kelly Fellow in Public Finance and director of the Center for Public Finance at the Baker Institute, an adjunct professor of economics at Rice University, and CEO of Tax Policy Advisers, LLC. His research interests are federal tax and expenditure policy, state and local public finance, and the construction and simulation of computable general equilibrium models. His current research focuses on the economic effects of corporate tax reform, the economic and distributional effects of fundamental tax reform, taxation and housing values, public sector pensions, and various other tax and expenditure policy issues. Diamond is co-editor of *Pathways to Fiscal Reform in the United States* (MIT Press, 2015) and *Fundamental Tax Reform: Issues, Choices and Implications*" (MIT Press, 2008). He has testified before the U.S. House Ways and Means Committee, the U.S. House Budget Committee, the Senate Finance Committee, the Joint Economic Committee and other federal and state committees on issues related to tax policy and the U.S. economy. Diamond served as forum editor for the *National Tax Journal* (2009-2017) and on the staff of the Joint Committee on Taxation, U.S. Congress (2000-2004). He has also served as a consultant for the World Bank on the efficacy of structural adjustment programs. He received his Ph.D. in economics from Rice University in 2000.