

# Taxes, Regulations and Business Structure in the US \*

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October 2023

## Abstract

The United States has experienced a dramatic shift in the distribution of output across different business structures in the US since the 1980s. The share of output of pass-through entities (S-corporations, LLCs, partnerships, sole proprietorships) almost doubled, while that of C-corporations declined by one-fourth. During this period, there have been notable changes in the tax structure and tax avoidance within these entities. Using a dynamic growth model with endogenous tax avoidance, occupation choice, and uninsurable entrepreneurial risk, I study the extent to which changes in taxation can account for the observed reallocation of output. My quantitative results indicate that changes in tax rates account for 14 percent of the reallocation of output share observed in the US. I also find that taking into account changes in the borrowing ability and changes in tax avoidance, the tax changes account for about 26 percent of the reallocation of output. Moreover, other regulatory changes, reflected by overhead costs, can lead to a substantial output reallocation toward pass-through entities. A policy experiment of imposing a tax on top wealth holders leads to significant increases in the net-tax gap and resources allocated to tax avoidance activities, and a decline in government revenue.

**Keywords:** Business Taxation, Tax Avoidance, Output Reallocation, Pass-through Entities

**JEL Codes:** E60, K20, H24, H25

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\*I am extremely grateful to thank Gustavo Ventura for his continuous help and guidance. I also thank Galina Vereshchagina, Domenico Ferraro, Rajnish Mehra, Sebastian Dyrda, Virgiliu Midrigan, Alessandra Peter, Pascual Restrepo Mesa and seminar participants at ASU and Midwest Macroeconomics Meeting in Southern Methodist University for their helpful comments and discussions. All errors are my own.

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# 1 Introduction

The evolution of business structures has been a significant feature of the US economy since the 1980s. During this period, the share of firms, their average size, and their business activities have undergone a considerable transformation.<sup>1</sup> Specifically, the dominance of C-corporations decreased significantly, dropping from 78% to 57%, while pass-through entities such as S-corporations, LLCs, partnerships, and sole proprietorships experienced a remarkable surge in their relative composition of output, rising from 22% to 43%, during the period between 1985 and 2015, as shown in Figure 1. This transition gives rise to the question regarding the driving forces behind the reallocation of economic output since the 1980s.

Investigating the determinants of this shift becomes crucial, as unexplored forces have the potential to shape the allocation of labor and capital resources among various legal forms of organizations. Since the US tax code differs among these legal forms, the tax framework that governs these legal entities determines output distortions and productivity both within legal structures and on a broader, aggregate scale. Furthermore, this reallocation has implications for the aggregate tax revenue collected through legal forms. This arises because changes in the tax payment structures across these legal entities can give rise to challenges in compliance, stemming from activities related to tax avoidance and tax evasion. Consequently, understanding the dynamics of this reallocation is essential not only for economic analysis but also for the formulation of effective tax policies that take into account compliance issues.

One plausible explanation for this phenomenon is the distinct tax structure for different legal entities. A critical distinction exists between C-corporations and pass-through entities: C-corporations are subject to the corporate tax, with their shareholders additionally bearing the burden of dividend taxes, while pass-through entities are only subject to individual income tax. However, pass-through businesses encounter distinct challenges, including limited access to external financing, which may compound the distorting effects of taxation, and leading to inefficient investment decisions within these businesses. The Tax Reform Act of 1986 decreased the personal income tax rates, which, in turn, reduced the tax burden of pass-through entities compared to C-corporations. Consequently, this change mitigated the distorting impact of taxes on pass-through businesses, leading to a potential rise in their importance. How large these effects are is the central question of the paper.

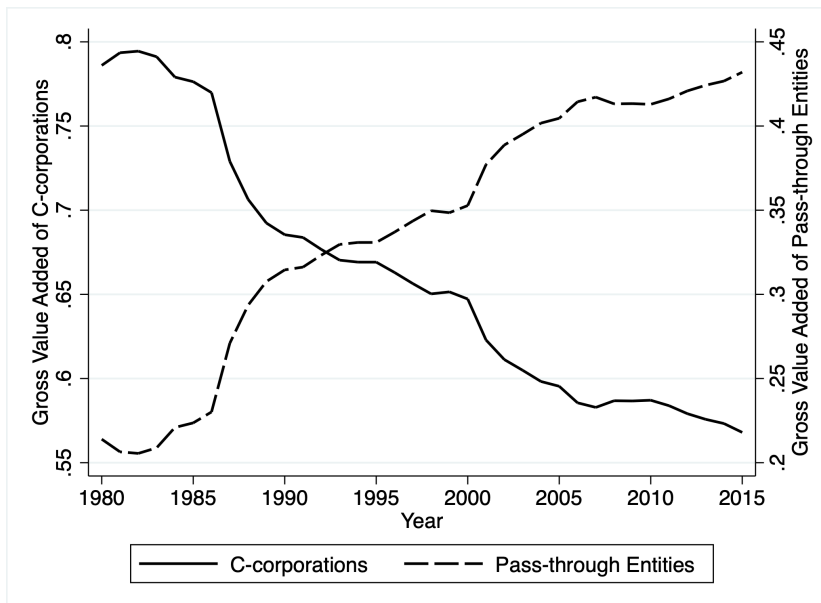
The tax avoidance and tax evasion practices in pass-through sector are also potential factors contributing to the rise of pass-through entities over time.<sup>2</sup> Pass-through entities

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<sup>1</sup>For more information, see [Dyrda and Pugsley \(2019\)](#).

<sup>2</sup>In the US, pass-through entities engage in both tax evasion and tax avoidance but for the remainder of this paper, I will use tax avoidance to refer these activities.

Figure 1: Share of Gross Value Added of Business Structures



*Sources:* NIPA, IRS SOI and author's calculation *Notes:* Figure 1 shows gross value added of C-corporations and pass-through entities. The corporate sector's gross value added is obtained from NIPA while the non-corporate sector's is estimated using "National Income: Sole Proprietorships and Partnerships" and "Consumption of Fixed Capital: Sole Proprietorships and Partnerships". The rest of the estimation procedure and gross output can be found in the Appendix D.

are required to accurately report their income and expenses, however, there has been a substantial rise in the net-tax gap among these entities, increasing from 0.3% in 1985 to 0.6% relative to output between 2011 and 2013. One key reason for this rise in misreporting could be attributed to the flexibility of pass-through ownership and reporting, which allows owners to allocate their income and deductions in ways that minimize their tax liability.<sup>3</sup> For instance, partnerships owned by high-income individuals may experience lower effective tax rates because they can flexibly allocate their income and deductions among other partnerships (Cooper et al. (2016)). Another contributing factor to the rise in tax avoidance is the decline in the budget allocated to tax return examination and enforcement by Internal Revenue Service (IRS), which decreased by 30% during the same period.<sup>4</sup> Consequently, the increasing ability to avoid taxes leads to a rise in pass-through activities in the US.

The output shift towards pass-through entities can also be attributed to changes in regulations and amendments that have contributed to their increased popularity. Firstly, S-corporations, for instance, underwent a series of changes in the 1990s that made operating them easier and more flexible. These changes included eliminating a five-year waiting period, creating qualifications for tax exemptions and deductions, allowing a second class of stock,

<sup>3</sup>For example, S-corporation owners may report their income as profits are exempt from payroll and social security taxes, whereas wages are not.

<sup>4</sup>In 1985, 1% of S-corps and 1.4% of partnerships' tax returns were examined, but this rate declined to just 0.4% in 2015.

and increasing the number of shareholders.<sup>5</sup> Subsequently, a series of Small Business Acts over the 2000s extended these benefits to S-corporations.<sup>6</sup> Secondly, the emergence of limited liability companies (LLCs) in the 1990s provided business owners with protection against personal liability without double taxation, similar to S-corporations.<sup>7</sup> Thirdly, through loan programs and Small Business Administration (SBA), these entities have improved their borrowing capacity. As a result of these regulatory changes and amendments, the ascent of pass-through entities accelerated.

To study the determinants of the division of output between pass-through entities and C-corporations, I develop a dynamic growth model with occupation choice and uninsurable entrepreneurial risk, incorporating endogenous tax avoidance, similar to [Quadrini \(2000\)](#), [Cagetti and De Nardi \(2006\)](#), [Di Nola et al. \(2021\)](#) and others. Households can be workers or pass-through business owners in every period. Business owners are subject to financial frictions and business risks that cannot be insured against while C-corporations do not encounter the frictions faced by pass-through business owners. While C-corporations are subject to a proportional corporate tax rate pass-through business owners are subject to a progressive income tax structure. In this framework, pass-through business owners have the opportunity to engage in tax avoidance activities, both at an extensive and intensive margin. The decision to engage in these activities is influenced by the presence of fixed costs. If they do engage, they will also incur progressively rising expenses associated with tax avoidance. These expenses are proportionate to both the undisclosed portion of their business income and the scale of their production. Additionally, aside from these fixed and variable costs of tax avoidance, there is an added penalty for avoiding tax payments, which is proportional to the amount of unpaid taxes, in case of government authorities detecting these actions.

I parametrize the model under the assumption that the tax structure imitates the 1985 tax level in the US. In the parametrization, I calibrate the benchmark economy to match critical features of the US, including the share of pass-throughs, the share of value added from pass-throughs, their debt-to equity ratio and the net-tax gap relative to output in 1985. The model also considers pass-through entities, whether they engage in tax avoidance activities, and, if engaged, the extent to which they avoid taxes relative to their reported income. To compare steady-state equilibria, I then implement both corporate and income tax changes on the benchmark economy, thereby calibrating the economy to 2015 tax rates.

My main results indicate that both corporate tax and income tax changes account for a 14.1% change in the output share of pass-through entities in the US, along with a 3.6%

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<sup>5</sup>Small Business Job Protection Act in 1996 is an illustration of these changes toward S-corporations.

<sup>6</sup>For more details on these benefits, see Appendix E. In this period (2000-2012), 183,000 firms made the transition from C-corporations to S-corporations. ([Smith et al. \(2019b\)](#))

<sup>7</sup>With this emergence, business receipts of LLCs, increased from 0% to 10% between 1995-2015.

increase in overall production in the economy. Additionally, when targeting the 2015 net-tax gap to output ratio level, tax avoidance contributes only 2.9% of the observed reallocation of output. Combining the tax changes and the increase in tax avoidance, my analysis reveals that these factorss together account for a 17.3% shift in the reallocation of output in the US.

Regulations aimed at enhancing financial conditions for pass-through entities play a substantial role in alleviating financial constraints faced by business owners. To assess the impact of these regulatory improvements on output reallocation, I relax the borrowing constraints to calibrate the debt-to-equity ratio for pass-through entities to the 2015 level. My findings indicate that the rise in borrowing capacity accounts for over 10% of the observed reallocation of output among legal forms of organizations in the US. When combined with the tax changes and the rise in the tax avoidance, the cumulative effect of these channels contributes to 26% of the observed reallocation of output among business organizations in the US.

The allowance for depreciation deductibility and debt deductibility can substantially change the model’s outcomes. In an economy where depreciated capital lacks full deductibility, I find that the collective impact of tax changes, tax avoidance strategies, and increase in the borrowing constraints account for 29.3% of the observed output reallocation in the US. Additionally, in an economy characterized by almost fully deductible debt, the corresponding percentage is lower: 20.7% of the output shift is accounted for by the changes in taxation, tax avoidance, and the rise in the capacity to borrow.

This paper makes three key contributions. First and foremost, it investigates the reallocation of output within legal forms of organizations since 1985 due to US tax changes, a crucial aspect that has remained largely unexplored in the existing literature. While [Dyrda and Pugsley \(2019\)](#) primarily focus on the 1986 Tax Reform Act with an emphasis on income inequality, this study instead focuses on the shift in the magnitudes of output shares between C-corporations and pass-through entities. Secondly, this paper is a first attempt to examine the impact of the rise in tax avoidance among pass-through entities on the output shift in the US in the context of a dynamic general equilibrium model. While [Slemrod \(1996\)](#) discusses that the rise in pass-through entities is due to these activities, my findings reveal that the increase in tax avoidance can only explain 3% of the output shift itself, with tax avoidance adds 3.2% to the effect of taxation. Lastly, this paper quantifies the interplay of different driving forces to answer how far beyond taxation these forces can account for the reallocation of output. My analysis suggests that the rise in the capacity to borrow can account for over 10% of the output reallocation, while a 30% decline in overhead costs can result in a 7.7% reallocation of output across legal forms of organizations.

The paper is organized as follows. Section 2 presents the related papers in the litera-

ture. Section 3 expresses the institutional dynamics and reforms that influence the business structures in the United States. Section 4 describes the model while Section 5 illustrates the calibration procedure and benchmark economy. Section 6 illustrates the main results of the paper, and Section 7 exhibits the robustness check. Section 8 discusses the policy experiments by introducing wealth tax, and Section 9 concludes the paper.

## 2 Related Literature

It is a central focus of the literature to address the question of what has caused the reallocation of output across legal forms, given its profound implications for the economy. [Kopczuk and Zwick \(2020\)](#) document a significant decline in the share of business income from C-corporations, which plummeted from 90% to 40% between 1980 and 2012. In terms of inequality concerns, the share of income earned by top 1% surged from 10% to 20% between 1980 and 2010, with 40% of this increase attributed to pass-through business income ([Cooper et al. \(2016\)](#)). Furthermore, the decline in the labor share is a significant concern within the economy, and [Smith et al. \(2019b\)](#) link it to the rise in pass-through entities. They examine the increase in pass-throughs between 1978 and 2017 on the labor share decline in the US, finding that the reallocation of activities through partnerships and S-corporations accounts for 30% of the observed reduction in the labor share in the corporate sector.

In a manner similar to this study, [Dyrda and Pugsley \(2019\)](#) investigate the impact of tax changes in the US, albeit from a distinct perspective centered around income inequality. Their research reveals that the surge in pass-through entities contributes to approximately 40% of the overall increase in pre-tax top 1% income shares since 1980. Furthermore, their quantitative analysis indicates that the tax changes resulting from the 1986 Tax Reform Act augment the presence of pass-through entities and the concentration of income among the top 10%, yet concurrently result in a decline in output and capital stock. [Dyrda and Pugsley \(2023\)](#) provides additional insights into the rise in the pass-through entities. Notably, the Tax Reform Act of 1986 played a significant role in driving the growth of pass-through entities for the subsequent three decades. It is worth emphasizing that the entry of new businesses contributed significantly to this growth, accounting for 60% of the overall increase in this sector. [Smith et al. \(2019a\)](#) study the sources of top income in pass-through entities, asserting that human capital plays a more significant role than financial capital. [Barro and Wheaton \(2020\)](#) find that the decline in the tax wedge and the productivity gap between C-corporations and pass-through entities contributed to the total factor productivity (TFP) growth rate between 1958 and 2013. This TFP growth was notably high between 1994-2004, primarily due to the emergence of limited liability companies. [Bhandari and McGrattan](#)

(2021) develop a theory of sweat equity, defining it as the value of business owners' time and expenses in building intangible assets for pass-through entities. Their findings suggest that the value of sweat equity is substantial and can be partly transferred through sale or inheritance. They also estimate that the aggregate sweat equity value is 1.2 times US output, equivalent to the value of fixed assets used in pass-through entities. My research, however, aims to fill a notable gap in the existing literature by examining the transformative changes in the output of legal forms of businesses that have unfolded since the 1980s.

The existing literature has consistently emphasized the significance of the distortionary impact of taxation. [Meh \(2005\)](#), while addressing a similar context but with a different focus, demonstrates that transitioning from a progressive tax structure to a proportional taxation system leads to an increase in both output and capital stock. Building upon this, [Meh \(2008\)](#) reveals that the removal of corporate taxes results in a smaller output increase when liquidity constraints and idiosyncratic risks are absent. Furthermore, the distortionary effects of double taxation on C-corporations have been investigated by [Bilicka and Raei \(2020\)](#), who find that implementing a uniform tax system across all business structures leads to an increase in output in the economy. [Chen et al. \(2018\)](#) analyze the aggregate effects of differential taxation among various legal forms of businesses and observe a rise in job growth and production following a corporate tax reduction in 2017. [Yagan \(2015\)](#) investigates the effects of dividend tax changes introduced in the 2003 Dividend Tax Cut and concludes that a decline in dividend tax has minimal impact on C-corporations' investment relative to S-corporations, largely due to the marginal effect of the dividend tax on firms' cost of capital. However, in this paper, I extend beyond taxation considerations to incorporate an examination of regulatory changes and tax avoidance, exploring their influences on business structures and the overall economy.

This paper is closely connected to the extensive literature on tax evasion and tax avoidance. Early seminal works by [Allingham et al. \(1972\)](#), [Yitzhaki et al. \(1974\)](#) and [Andreoni \(1992\)](#) study the microeconomic theory of tax evasion, providing valuable insights into this phenomenon. [Maffezzoli et al. \(2011\)](#) examine tax evasion within a heterogeneous agent model framework, finding that the implementation of a proportional tax structure reduces tax evasion while increasing government revenue. [Di Nola et al. \(2021\)](#) and [Fernández Bastidas \(2022\)](#) extend this framework to include occupational choices, considering various aspects of tax evasion, including its impact on welfare and the overall effects of transitioning from a progressive to a proportional tax structure, respectively. [Rotberg and Steinberg \(2021\)](#) indicate that taxing capital can lead to higher tax revenue and welfare, accompanied by a decrease in inequality. However, when tax evasion is considered, there is a substantial rise in inequality, along with a decline in welfare and revenue. Similarly, [Di Nola et al. \(2023\)](#)



explore the consequences of raising the top marginal income tax rate in the presence of tax avoidance, finding evidence of both welfare and productive losses. In this paper, my primary objective is to quantitatively assess the influence of tax avoidance on reallocation of output towards pass-through entities.

### 3 Institutional Dynamics and Reforms in the US

The United States offers a variety of legal business structures, each with its own characteristics in terms of flexibility, costs, capital raising options, stock ownership, and liability protection. My primary focus in this paper is on the tax structure of these businesses. While C-corporations face both corporate tax and dividend tax, pass-through businesses such as sole proprietorships, partnerships, LLCs, and S-corporations allow profits to pass directly to the owners, who are only subject to personal income tax. However, it is important to mention that there are additional distinctions among these legal forms.

Table 1: Legal Form of Businesses

Business Type	Taxation	Ownership	Advantage
Pass-through Entities			
Sole Proprietorships	Regular Income Tax and SE Tax	One person	Easy to set up Low cost
Partnerships	Regular Income Tax and SE Tax	Two or more	Easy to set up Low cost
LLCs	Regular Income Tax and SE Tax	One or more	Hybrid form of C-corporation and partnerships Limited Liability
S-corporations	Regular Income Tax and SE Tax	No more than 100 US citizens	Tax entity to eliminate double tax Limited Liability
C-corporations	Corporate Tax and Dividend Tax	One or more	Can go public, raise capital Limited Liability

*Notes:* Partnerships are divided into General and Limited Partnerships. LLCs stands for limited liability companies. The upper iteration of the table is extracted from [Dyrda and Pugsley \(2019\)](#).

The C-corporation is the most intricate business structure. It is characterized as a distinct legal entity that is separate from its owners and offering them limited liability protection. In contrast to unincorporated businesses, C-corporations have the capacity to raise capital through stocks and bonds. Nonetheless, the establishment and maintenance of a C-corporation entail substantial fixed costs attributed to legal paperwork, accounting obligations, operational procedures, and record-keeping. Additionally, C-corporations confront double taxation, wherein corporate tax is initially paid by the business, followed by shareholders being subject to dividend tax upon receiving distributions.



On the other hand, the most prevalent form of pass-through entity is the sole proprietorship, where a single owner operates the business under their own name. In this case, the owner assumes unlimited liability, signifying that they are personally responsible for any debts and obligations of the business. Sole proprietorships are subject to regular income tax and self-employment tax.<sup>8</sup> Another type of pass-through entity is a partnership, which can be created as a general or limited partnership. Partnerships involve two or more owners, and, akin to sole proprietorships, the managing partners do not have limited liability. From a taxation perspective, partnerships are treated similarly to sole proprietorships.<sup>9</sup>

An S-corporation is not a legal entity but rather a tax-based entity created for specific purposes. It was established in 1958 to provide businesses with the benefits of limited liability, similar to C-corporations, while avoiding corporate taxation. It functions as a unique type of corporation aimed at eliminating the double taxation faced by C-corporations. S-corporations are subject to regular income tax and self-employment tax.<sup>10</sup> One key difference between S-corporations and other pass-through entities is that the owner of an S-corporation is required to allocate their income as both compensation and profit. The profit portion is not subject to self-employment tax, which is excluded in the context of this paper.<sup>11</sup> There are also certain limitations associated with S-corporations. For example, the number of shareholders is restricted to no more than 100 U.S. citizens, and only one class of stock can be issued.

The Limited Liability Company (LLC) is another business structure in the United States, functioning as a hybrid entity that combines aspects of partnerships and corporations. It was initially introduced in Wyoming in 1977 and later adopted by all 50 states by 1996 through LLC statutes. An LLC offers the advantage of being taxed in a manner akin to partnerships or S-corporations, while providing owners with limited liability protection. Notably, an LLC is not formally recognized as a tax entity by the Internal Revenue Service (IRS). Consequently, LLCs are compelled to elect their preferred tax treatment, which may involve being taxed as sole proprietorships, partnerships, or S-corporations.

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<sup>8</sup>The self-employment tax comprises Medicare and Medicaid taxes, totaling 15.3%. It necessitates the completion of Schedule-C for profit and losses and Schedule-SE form for self-employment tax.

<sup>9</sup>However, partnerships are required to complete form Schedule K-1 (form 1065) instead of Schedule-C for tax reporting purposes.

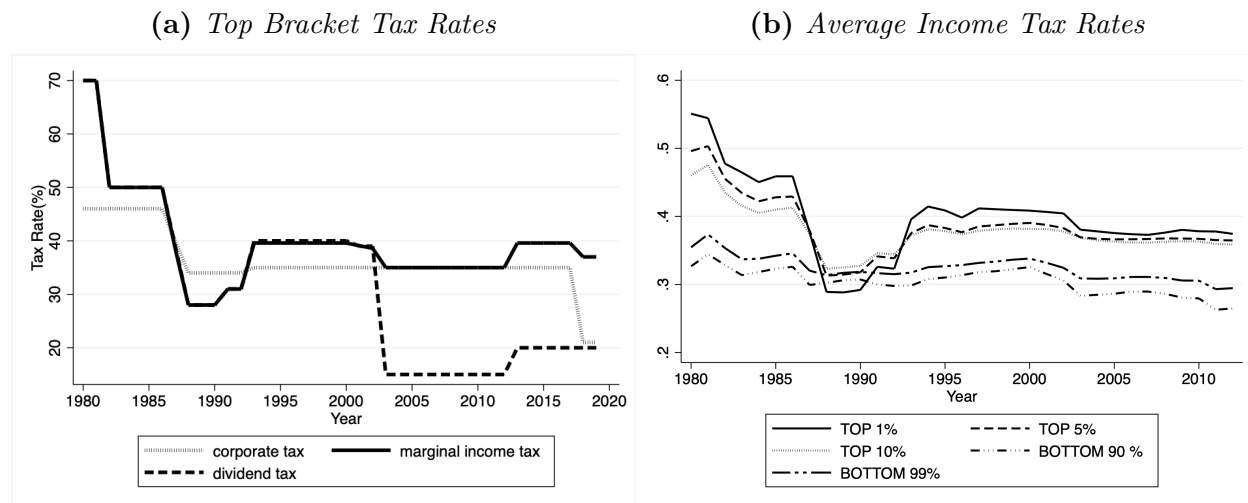
<sup>10</sup>C-corporations need to fill business form 1120 for tax purposes while S-corporations are required to fill form 1120S and Schedule-SE.

<sup>11</sup>S-corporation owners are inclined to report their income as profits due to the self-employment tax. However, IRS requires S-corporation shareholder-worker to receive a reasonable wage, defined as at least what other businesses pay for similar services.

### 3.1 Tax Reforms and Regulatory Changes

The tax reforms and regulations implemented in the United States since 1980 have brought about significant changes in the dynamics of business structures. Figure 2a provides an illustration of the top tax rates of corporate tax, dividend tax, and income tax.<sup>12</sup> During the Economic Recovery Tax Act of 1981, both individuals and pass-through entities witnessed a reduction in the top income tax rate, which dropped from 70% to 50%. Subsequently, the Tax Reform Act of 1986 not only lowered the top tax rates to 28% but also simplified the tax system by reducing the number of tax brackets from 15 to 4. Following these reforms, there were fluctuations in tax rates for households and pass-through entity owners. Reforms in 1991 and 1993 led to higher marginal tax levels, which were later reduced in 2003. By 2015, the top marginal tax rate reached 39.6%.

Figure 2: Tax Rates



Sources: Panel A. SOI Tax Stats – Historical Table 23 & 24 and [taxpolicycenter.org](http://taxpolicycenter.org). Panel B. Data from [Mertens and Montiel Olea \(2018\)](#) Notes: Figure Ia shows the top bracket tax rates of corporate tax, marginal income tax, and dividend tax across time in the US. Figure Ib expresses the average marginal income tax rates for different income brackets. The average income tax rates are calculated by [Mertens and Montiel Olea \(2018\)](#) by income-weighted averages of marginal federal individual income tax rates and social security (OASDI and HI) contribution rates.

The highest corporate tax rate impacting C-corporations experienced a decrease from 46% to 34% in 1986. However, it underwent an increase in 1993 with the implementation of the Omnibus Budget Reconciliation Act. The dividend tax rate, which imposes a financial obligation on shareholders of C-corporations, used to align with the personal income tax rate until 2003 when it was lowered to 15%. Subsequently, in 2012, the dividend tax rate saw a

<sup>12</sup>Bottom tax rates can be found in Appendix Figure B.1.

rise to 20%.<sup>13</sup>

Figure 2b depicts the average income tax rates for different percentiles, as analyzed by Mertens and Montiel Olea (2018). The data suggests that following the reforms of 1986, the disparity between the average tax rate of the top 1% and the bottom 90% and 99% percentiles decreased. However, the gap experienced a subsequent increase during the 1990s, although not to the same extent as in the 1980s. This implies that the progressivity of the income tax system became relatively lower compared to the 1980s. The average tax rates considered in this analysis comprise both the marginal individual income tax rate and the average marginal payroll tax rate, based on the income concept defined by Piketty and Saez (2003).<sup>14</sup>

One instance of regulatory changes affecting businesses is exemplified by the Small Business Job Protection Act of 1996, which aimed “*to provide tax relief for small businesses, to protect jobs, and to create opportunities.*” This act brought about several amendments regarding S-corporations. Firstly, it raised the limit on the number of shareholders from 35 to 75. Additionally, it granted S-corporations the ability to hold stocks in C-corporations and establish S-corporation subsidiaries. Furthermore, the act permitted S-corporations to have tax-exempt organizations and shareholders, including grantor trusts, voting trusts, certain testamentary trusts, and qualified sub-chapter S trusts.<sup>15</sup> Subsequently, the number of shareholders was further increased to 100 by the American Jobs Creation Act of 2004. This act also introduced the provision that six generations of shareholder family members could be considered as a single shareholder entity. The details of regulations and amendments can be found in Appendix E.

## 3.2 Change in Tax Avoidance

The pass-through entities are obligated to accurately report their profits, losses, and deductions on the tax form Schedule C and Schedule K. However, tax noncompliance, including the underreporting pass-through income, presents a significant challenge for the US government.<sup>16</sup> Based on IRS research conducted for the 1985 tax year, non-farm sole proprietorships exhibited an estimated gross tax gap of \$13.4 billion, with a net misreporting rate of 35%.

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<sup>13</sup>Note that the dividend tax here represents the qualified dividend tax rates in the US.

<sup>14</sup>The tax rates are for the all married men and singles aged 20 or more. The definition of income concept includes wages, self-employment, partnership, and S-corporation income, and non-labor income, but excludes capital gains and government transfers. The tax progressivity, estimated by Dyrdá and Pugsley (2019), can be found in Appendix.

<sup>15</sup>Financial institutions can hold safe harbor debt which can be seen as a legal provision to lower the legal or regulatory liability.

<sup>16</sup>According to the Internal Revenue Service (IRS), it was estimated that approximately 16% of federal taxes went unpaid during the tax years 2011-2013.

The research also revealed that partnerships had a gross tax gap of \$0.8 billion, with a net misreporting rate of 2.6%.<sup>17</sup> These estimates were even higher in the 2010s. The Federal Tax Compliance Research for 2011-2013 indicates that the tax gap for partnerships and S-corporations amounted to \$19 billion, with an 11% net misreporting rate. For non-farm sole proprietorships, the tax gap was \$68 billion, with a 56% net misreporting rate.

One plausible explanation for the increase in net misreporting among pass-through entities is a reduction in tax examinations. Table 2 provides the number of tax returns examined by the Internal Revenue Services (IRS) in both 1985 and 2015. It reveals that not only were there fewer examinations of sole proprietors examined, but also that the income thresholds for examination diminished, despite an expansion in the number of income brackets. For instance, in 1985, a scrutiny was applied to 5.4% of sole proprietors whose income exceeded over \$150,000. In contrast, in 2015, this figure had declined to just 2% for sole proprietors with incomes over \$140,000.<sup>18</sup>

Table 2: Examination of Schedule C Tax Returns Based on Income Brackets

Income Bracket(\$)	Examined Tax Return(%)
A. Tax Year 1985	
0-38,700	1.45
38,700-154,800	2.55
154,800+	5.4
B. Tax Year 2015	
0-17,575	0.9
17,575-70,300	2.4
70,300-140,600	2.5
140,600+	2

*Sources:* Internal Revenue Service Table 9A: Examination Coverage and author's calculation. *Notes:* Income Brackets are converted to 1999 US dollars.

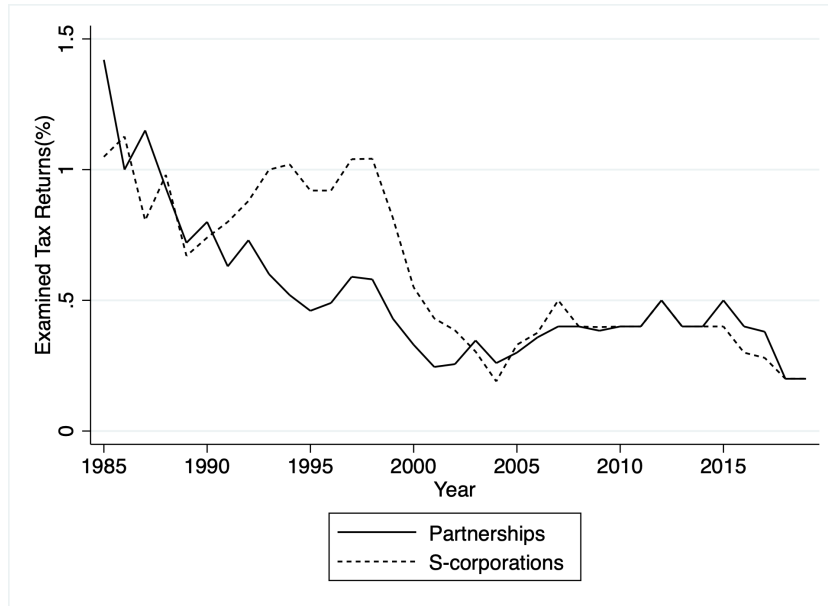
The estimation of misreporting does not account for the complexity of the structures of partnerships and S-corporations, which are often employed as strategies to mitigate tax liability. These entities may involve partial ownership by other entities, such as trusts, intermediaries, or additional partnerships, thereby fulfilling the detection of tax liabilities challenging. As disclosed by Cooper et al. (2016), 15% of partnership income is generated through circularly owned partnerships, a method applied to reduce tax liability, and 20% of partnership income remains unclassified in tax-return data. They also estimate that circular partnerships pay 10.6% tax rate that is one-third lower than the average tax rate

<sup>17</sup>For more detailed information, please refer to "Federal Tax Compliance Research, Individual Income Tax Gap Estimates for 1985, 1988, and 1992."

<sup>18</sup>Additional years of examination data can be found in Table A.1.

on partnership income overall.

Figure 3: Tax Returns Examined by IRS



Sources: Internal Revenue Service Table 9A: Examination Coverage

Guyton et al. (2021) argue that random auditing cannot effectively capture the tax misreporting in the top income distribution. The complexity of pass-through entities is one of the main factors contributing to the omission of the tax gap among high-income earners. The intricate nature of their structures and inadequate resource allocation for tax auditing exacerbate this issue. For instance, audit rates for S-corporations and partnerships have consistently been lower compared to C-corporations. In 1997, an S-corporation was only half as likely to be audited as a C-corporation. In particular, the IRS examined only 1.04% of S-corporation tax filings and 0.58% for partnerships, whereas the examination rate for C-corporations was 2.1%. These audit rates in 2015 were significantly lower than those in 1997, with only 0.5% of S-corporations and 0.4% of partnerships being audited, as shown in Figure 3. Additionally, the last random audit program for partnerships was conducted in 1982, and micro-scale auditing for S-corporations was carried out in the 2003-2004 tax year.<sup>19</sup> One notable incentive for S-corporation owners to reduce their tax liability is their preference for reporting income as profits rather than wages. This preference arises because wages are subject to regular income tax, payroll taxes, and social insurance taxes, whereas profits are only subject to regular income tax. By paying themselves in profits, S-corporation owners can reduce their tax burden by 3.8% (Smith et al., 2019b).

<sup>19</sup>As noted by Guyton et al. (2021), experts express that audits tend to focus on small businesses where records and financial statements are more accessible rather than on large and complex businesses.

These legislative reforms, regulatory measures and tax avoidance behaviors have triggered a substantial reallocation of output among various the legal forms of organizations. In the year 1985, C-corporations held a dominant position, contributing approximately 78% of the value added, while pass-through entities accounted for a modest 22%. However, following the enactment of the Tax Reform Act of 1986, pass-through entities experienced a rapid acceleration in their share. By the year 2015, C-corporations witnessed a significant decline, with their output diminishing by a quarter to approximately 57%, while pass-through entities surged to exceed 40% of the total share. Notably, the majority of this amplified output can be attributed to the emergence and expansion of S-corporations and limited liability companies.<sup>20</sup>

The reallocation of output is consistent across various industries. Figure B.7 provides a comprehensive representation of the sectoral gross output share of pass-throughs relative to the overall gross output. It reveals an upward trend from 1985 to 2015, encompassing all sectors, including the manufacturing sector.<sup>21</sup> This increase in relative share is not only evident in the context of overall gross output but is also observed within each industry. Figure B.9 specifically illustrates the share of gross output attributed to pass-through entities of each industry for both 1985 and 2015, indicating a consistent rise in the proportion of pass-through entities' share across all industries. This shift is accompanied by a corresponding decrease in the share held by C-corporations.

## 4 Model

I adopt a dynamic growth model with occupation choice and uninsurable idiosyncratic risks, similar to [Quadrini \(2000\)](#) and [Cagetti and De Nardi \(2006\)](#). Additionally, I integrate the decision of tax avoidance for pass-through business owners, expanding upon [Di Nola et al. \(2021\)](#). One noteworthy aspect of this model is that the choice to engage in tax avoidance is contingent on the taxation scheme applied to the income of business owners.<sup>22</sup>

The economic structure of the model encompasses households, pass-through businesses, C-corporations and the government. Each period in the model corresponds to a year, in the model, during which households encounter idiosyncratic shocks to their entrepreneurial and

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<sup>20</sup>It is worth noting that in the year 1980, S-corporations' share constituted approximately 3%, while LLCs were not yet available. However, by 2015, the share of gross output attributable to S-corporations had risen to approximately 21%, and LLCs had accounted for roughly 10% of the total output.

<sup>21</sup>These sectors are composed of finance, services, wholesale and retail trade, agriculture, construction, manufacturing, mining and transportation and public utilities.

<sup>22</sup>In this model, the tax structure distorts the capital decision of business owners which is in line with the IRS tax code.

labor abilities. These shocks influence households' decisions on whether to pursue employment as workers or to engage in pass-through business ownership within the economy.

A key assumption in this model is that while pass-through business owners have the technological capacity for tax avoidance, workers and C-corporations are lack of this capacity. This assumption is grounded in empirical evidence, as data suggests a substantial decrease in tax avoidance by C-corporations during the specified period, while instances of income misreporting among workers are significantly less frequent compared to pass-through business owners.<sup>23</sup>

Aggregate output in this model produced from the combined contributions of both C-corporations, which operate under a technology characterized by constant returns to scale, and pass-through entities. Notably, households are restricted from owning C-corporations, while pass-through business owners possess the capacity to do so. This differentiation stems from the primary focus on the reallocation of output, as opposed to shifts in labor share, changes in markups, or variations in income and wealth inequality between C-corporations and pass-through entities.

## 4.1 Demographics

There is a continuum of individual households with mass one. Each household has two stages of life, young and old. A young individual becomes old with probability  $(1 - \psi_y)$ , and an old individual dies with probability  $(1 - \psi_o)$ . In the event of an individual's death, new offspring enter the economy. During the young stage, households make the decision regarding their occupation. It is at this point that they choose between engaging in work or operating a pass-through business. In contrast, an old household neither work nor operates a pass-through business, as their role shifts towards retirement.

## 4.2 Preferences & Technology

Each individual has a constant relative risk-aversion utility function,  $u(c) = \frac{c^{1-\sigma}}{1-\sigma}$ , and she discounts future utility at the rate  $\beta$  where  $\beta < 1$ . She also discount her offspring at the rate  $\eta$  where  $\eta$  is in the range of  $[0, 1]$ .

Each individual has two abilities in the first stage of life, labor productivity  $(\epsilon_t)$ , and entrepreneurial ability  $(z_t)$ . Both abilities are idiosyncratic and positively autocorrelated, following independent AR(1) processes with transition functions  $\mathcal{F}(z, z')$  and  $\mathcal{G}(\epsilon, \epsilon')$ , respec-

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<sup>23</sup>Auten and Langetieg (2020) discover that under-reported income for wages amounted to only 0.2% between 2002-2011. Regarding corporations, IRS estimates indicate that the gross tax gap relative to output decreased from 0.3% to 0.2% between 1985 and 2011-2013.



tively. Newborns draw entrepreneurial ability from the density function  $f(z)$  on  $[0, \bar{z}]$  with a cumulative distribution function (CDF)  $F(z)$  and labor ability from the density function  $g(\epsilon)$  on  $[0, \bar{\epsilon}]$  with CDF  $G(\epsilon)$ .<sup>24</sup> Each individual also possesses assets denoted by  $a_t$ , and a new offspring starts life without any wealth. Individuals can choose to be either workers or business owners in the pass-through entities each period.

Workers supply labor inelastically and receive income of  $\epsilon_t w_t$  where  $w_t$  represents the efficiency unit of wage in the economy. Workers can save their assets,  $a_t$ , with a return of  $r_t$ , and they cannot borrow. Similar to workers, business owners also have the opportunity to save their assets,  $a_t$ , with the same return rate  $r_t$ . However, unlike workers, business owners have the additional capability of borrowing, with the amount they can borrow being proportional to their asset holdings, denoted by  $k \leq \Psi a$ . This implies that business owners can access larger borrowing amounts if they possess higher levels of assets. An individual with an entrepreneurial ability,  $z_t$ , has production technology:

$$f(z_t, k_t, n_t) = z_t^{1-\gamma} (k_t^\alpha n_t^{1-\alpha})^\gamma \quad (1)$$

where  $\gamma$  represents the span of control parameter ([Lucas Jr \(1978\)](#)),  $\alpha$  denotes the elasticity of capital for pass-through entities,  $k_t$  refers the amount of capital that is invested, and  $n_t$  indicates the amount of efficiency units of labor hired in the pass-through entity.

In the second stage of life, individuals neither supply labor nor operate a pass-through entities. Instead, they transition directly into retirement and consume their assets and pension payments while also saving for the next period.

There is also production from the C-corporate sector, as introduced in [Quadrini \(2000\)](#) and [Cagetti and De Nardi \(2006\)](#). Both sectors produce the single good of the economy, and capital depreciation rates are uniform across C-corporate sector and pass-through entities. The C-corporate sector is populated by a large number of firms that have Cobb Douglas production technology:

$$F(K_t, L_t) = K_t^\alpha L_t^{1-\alpha} \quad (2)$$

where  $\alpha$  represents capital share,  $K_t$  refers the amount of capital that is invested, and  $L_t$  induces the amount of efficiency units of labor hired in the C-corporate sector.

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<sup>24</sup>  $f(z)$  and  $g(\epsilon)$  are invariant distributions of Markov Processes.

### 4.3 Government

To finance its expenditures, the government implements a taxation system that involves collecting taxes from various sources. Workers, C-corporations, and pass-through entity owners are subject to taxation, while retired individuals receive pension and social security payments from the government. In the C-corporate sector, a proportional corporate tax rate ( $\tau_c$ ) is applied to output net of labor payments and depreciated capital. On the other hand, there is a progressive taxation system in place for workers' labor income and pass-through entities' taxable business income. Additionally, the government imposes penalties on pass-through business owners who engage in tax avoidance practices. It's important to note that in this environment, there is no altruistic transfer of assets from deceased individuals. Upon an individual's death, the government collects all their assets, which are then allocated for its own spending. As introduced in [Benabou \(2002\)](#) and [Heathcote et al. \(2017\)](#), the income tax function for individuals is given by:

$$T(y) = y - \lambda_y y^{1-\tau_y}$$

where  $y$  represents the income,  $\lambda_y$  determines the average tax rate, and  $\tau_y$  determines the progressivity of income tax. The advantage of this tax function is that when  $\tau_y = 0$ , distortions are the same for all income levels and have the same average tax rate of  $(1 - \lambda_y)$ . For  $\tau_y > 0$ , the average tax rate increases with income level, meaning that high earners are subject to higher tax levels.

The government can monitor pass-through entities by the probability function,  $p(k)$ . The key assumption of the probability function of being audited is that it is strictly increasing with the capital investment level of pass-through entities, similar to [Ordenez \(2014\)](#). This assumption implies that a bigger pass-through entity will be monitored with a higher probability that is in line with in the data.<sup>25</sup>

### 4.4 Households

**The Young Individual's Problem** In the first stage of life, in each period, the young individual has entrepreneurial ability,  $z_t$ , labor productivity,  $\epsilon_t$ , and asset level,  $a_t$ , which are known with certainty. New entrants are born with zero assets in the beginning of the period in case of no altruism. Each young individual faces a choice between becoming a business owner in the pass-through entity or becoming a worker. The young individual's occupation problem is:

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<sup>25</sup>[Slemrod et al. \(2014\)](#) show that the probability of auditing increases with income levels while [Ulyssea \(2018\)](#) document that tax evasion is more in small businesses.

$$V(a, z, \epsilon) = \max\{V^\omega(a, z, \epsilon), V^e(a, z, \epsilon)\} \quad (3)$$

where  $a$ ,  $z$  and  $\epsilon$  are the state variables,  $V^\omega(a, z, \epsilon)$  is the value function of being a worker, and  $V^e(a, z, \epsilon)$  is the value function of being a pass-through business owner. The problem of being a worker is the following:

$$V^\omega(a, z, \epsilon) = \max_{c, a'} u(c) + \beta\psi_y E(V(a', z', \epsilon')) + \beta(1 - \psi_y)W_r(a') \quad (4)$$

$$c + a' = w\epsilon + (1 + r)a - T(w\epsilon) \quad (5)$$

$$c \geq 0$$

$$a' \geq 0$$

The expectation of the value function is taken with respect to  $z'$  and  $\epsilon'$  conditional on the first-order Markov Process transition functions of  $\mathcal{F}(z, z')$  and  $\mathcal{G}(\epsilon, \epsilon')$  separately.  $W_r(a')$  is the value function of being a retired individual discounted by  $\beta$  with probability  $(1 - \psi_y)$ . The worker chooses the consumption level for today and asset holdings for tomorrow subject to Equation (5).  $w\epsilon$  is the labor income that she earns, and the second term on the right hand side is her asset level with its net return. The last term is the taxes on labor income that are paid to the government.

If the young individual is a business owner, she solves the problem below:

$$V^E(a, z, \epsilon) = \max_{k, \phi} \{p(k) * V^d(a, z, \epsilon, k, \phi) + (1 - p(k)) * V^{nd}(a, z, \epsilon, k, \phi)\} \quad (6)$$

$$k \leq \Psi a$$

where  $p(k)$  is the probability function of being detected,  $V^d(a, z, \epsilon, k, \phi)$  is the value function of being detected, and  $V^{nd}(a, z, \epsilon, k, \phi)$  is the value function of being non-detected. In the beginning of the period, pass-through business owners choose how much capital to invest their business and how much of their taxable income to avoid from their tax payments with respect to the borrowing constraints they face.

**The Case of Detection** The value for the detection case is as follows:

$$V^d(a, z, \epsilon, k, \phi) = \max_{c, a'} u(c) + \beta\psi_y E(V(a', z', \epsilon')) + \beta(1 - \psi_y)W_r(a') \quad (7)$$

$$\begin{aligned}
c + a' &= \tilde{\pi}(z, a, k, \phi) + (1 + r)a - \zeta[T(\tilde{\pi}(z, a, k, 0)) - T(\tilde{\pi}(z, a, k, \phi))] \\
&\quad - w * \mathbf{1}_{\phi > 0} * (\kappa + C(\phi) * f(z, a, k, \phi)) \} \\
c &\geq 0 \\
a' &\geq 0
\end{aligned} \tag{8}$$

In the case of detection, the expectation of the value function in case of being young is taken with respect to  $z'$  and  $\epsilon'$  conditional on transition functions, similar to the worker's problem (4). In the case of being old, which occurs with a probability of  $(1 - \psi_y)$ , the pass-through business owner transitions into retirement, becoming a retired individual with a value function denoted as  $W(a')$ , discounted by  $\beta$ . The optimization problem for the business owner is subject to the budget constraint (8). The term  $\tilde{\pi}(z, a, k, \phi)$  represents the after-tax profit of the pass-through business owner, while the second term represents the gross return from saving their assets. The subsequent term on the right-hand side accounts for penalties paid to the government, which are proportional to the underreported tax payments, with a parameter  $\zeta > 1$ . Finally, the last term captures the costs associated with tax avoidance.

It is important to note that tax avoidance requires labor, and the cost of avoiding one unit of goods is denoted as  $w$ . When tax avoidance is present, the cost of tax avoidance includes both a fixed term,  $\kappa$ , and a variable term  $C(\phi)$ , which is proportional to the production level. The function  $C(\phi)$  is assumed to be strictly increasing and strictly convex, indicating that, for a given misreported portion, tax avoidance becomes more costly for larger firms. The specific functional form of the variable cost, as specified in [Dyrda et al. \(2023\)](#), is as follows:

$$C(\phi) = B * (\phi + (1 - \phi) \log(1 - \phi))$$

where  $C'(\phi) = -\log(1 - \phi)$ ,  $C(0) = 0$ ,  $C(1) = 1$  and  $\phi \in [0, 1]$ . Here, the specific value of  $B$  determines the curvature and sensitivity of the tax-avoidance cost function, shaping how the cost of tax avoidance varies with different levels of misreporting and production. When  $B = 0$ , the cost of tax avoidance is a fixed amount of labor, meaning it remains constant regardless of the level of misreporting or production. In this case, the cost of tax avoidance does not change as the business owner's behavior or his production varies. On the other hand, when  $B = 1$ , the cost of tax avoidance is proportional to the functional form. This implies that the cost of tax avoidance increases in a one-to-one manner with the level of production. However, as the business owner chooses higher proportion of taxable business income as unreported, the cost of tax avoidance increases at an increasing rate. In this

context, after-tax profit of a business owner,  $\tilde{\pi}(z, a, k, \phi)$ , is defined as:

$$\begin{aligned} \tilde{\pi}(z, a, k, \phi) = & \max_n \{ \phi(z^{(1-\gamma)} (k^\alpha n^{1-\alpha})^\gamma - wn - \delta k) \\ & + (1 - \phi)\lambda_y(z^{(1-\gamma)} (k^\alpha n^{1-\alpha})^\gamma - wn - \delta k)^{(1-\tau_y)} - rk - c_f \end{aligned} \quad (9)$$

The optimization problem for after-tax profit maximization involves multiple terms. The first term pertains to the hidden amount of gross output, net of labor payment and depreciated capital, that the pass-through business owner conceals from the government. The parameter  $\phi$  represents the extent to which the business owner hides their taxable business income, where  $\phi \in [0, 1]$ . A value of  $\phi = 0$  indicates that taxable business income is reported as it is, while  $\phi = 0.5$  implies that 50% of the taxable business income is avoided from the government. The second term accounts for the reported amount of gross output, net of labor payment and depreciated capital, after tax payments have been made. The last two terms capture the costs associated with pass-through business owners, including capital investment costs and overhead costs.

**The Case of Non-detection** The value function for the non-detection case is as follows:

$$\begin{aligned} V^{nd}(a, z, \epsilon, k, \phi) = & \max_{c, a'} u(c) + \beta\psi_y E(V(a', z', \epsilon')) + \beta(1 - \psi_y)W_r(a') \\ c + a' = & \tilde{\pi}(z, a, k, \phi) + (1 + r)a - w * \mathbf{1}_{\phi > 0} * (\kappa + C(\phi)) * f(z, a, k, \phi)) \} \\ c \geq & 0 \\ a' \geq & 0 \end{aligned} \quad (10)$$

where the expectation of the value function is taken with respect to  $z'$  and  $\epsilon'$  conditional on transition functions, similar to the worker's problem (4). The only difference between value function of non-detected case from detected case is the budget constraints. Being not detected from the government implies that the business owner will not be penalized due to avoiding taxes.

**The Retired Individual's Problem** In the second stage of life, the old retired individual only decides how much to consume this period and to save for the next period with respect to her asset holdings,  $a_t$ . The value function for a retired individual is as below:

$$W_r(a) = \max_{c, a'} u(c) + \beta\psi_o W_r(a') + \beta\eta(1 - \psi_o)E(V(a', z', \epsilon')) \quad (11)$$

$$c + a' = (1 + r)a + p \quad (12)$$

$$c \geq 0$$

$$a' \geq 0$$

The old individual stays old with probability  $\psi_o$  and take the expectation of the value of the being a retired individual for the next period, and dies with probability  $1 - \psi_o$ . Notice that as individuals do not consider their offspring,  $\eta = 0$  in this framework. In case of  $\eta > 0$ , the offspring of a worker born with ability level  $(\epsilon', z')$  and the expected value function of the offspring's value function is with respect to the invariant distributions of  $z$  and  $\epsilon$ . The optimization problem is subject to the budget constraint (12) where the first-term on the right-hand side is the gross return of asset holdings and second term indicates the pensions and social security payments that a retired person receives.

**C-corporate Sector's Problem** The problem of the C-corporate sector is as follows:

$$\max_{K_c, L_c} (1 - \tau_c) [K_c^\alpha L_c^{1-\alpha} - wL_c - \delta K_c] - rK_c \quad (13)$$

where  $K_c$  and  $L_c$  are demand for capital and labor efficiency in the C-corporate sector,  $\tau_c$  is the corporate tax rate,  $r$  is the rental rate of capital and  $w$  is the wage rate for the labor.

## 4.5 Equilibrium

Given the model specified above, the stationary equilibrium is defined in the following way. At the steady-state equilibrium, the aggregate state of the economy and equilibrium prices are constant over time. Households solve their problem by taking prices and government policies as given. Similarly, given prices and government policies, the C-corporate sector chooses the factor demands. In the equilibrium, the market clearing condition for the factor demands and equilibrium prices are defined as below:

i) Labor market clearing condition is

$$\begin{aligned} \int_a \int_z \int_\epsilon \epsilon \mu_w(da, dz, d\epsilon) &= L_c + \int_a \int_z \int_\epsilon n^*(a, z, \epsilon) \mu_e(da, dz, d\epsilon) \\ &+ \int_a \int_z \int_\epsilon \mathbf{1}_{\phi > 0} (\kappa + C(\phi^*(a, z, \epsilon)) * (f(a, z, \epsilon))) \mu_e(da, dz, d\epsilon) \end{aligned}$$

The left-hand side of the equation represents the total amount of labor supplied by workers in the economy. On the right-hand side, we have the aggregate labor demand, which is composed of three components. The labor demand by C-corporations, which represents the total labor required by C-corporations to fulfill their production activities. The second terms represents the total labor needed by pass-through entities to operate their businesses. The last term captures the aggregate labor demand of pass-through entities specifically for the purpose of tax avoidance.

ii) Capital market clearing condition is

$$\int_a \int_z \int_\epsilon a \mu_w(da, dz, d\epsilon) + \int_a \int_z \int_\epsilon a \mu_e(da, dz, d\epsilon) + \int_a a \mu_o(da) =$$

$$K_c + \int_a \int_z \int_\epsilon g_k(a, z, \epsilon) \mu_e(da, dz, d\epsilon)$$

where aggregate capital supply is described on the left-hand side, containing supply of workers, young pass-through entity owners, and old retired individuals, respectively. The right-hand side illustrates the aggregate capital demand from C-corporations, and pass-through entities, respectively.

iii) C-corporate sector makes zero profits and prices are competitive:

$$w = (1 - \alpha) \left( \frac{K_c}{L_c} \right)^\alpha \text{ and } r = (1 - \tau_c) \left[ \alpha \left( \frac{K_c}{L_c} \right)^{\alpha-1} - \delta \right]$$

The formal definition of stationary recursive competitive equilibrium is left to Appendix C, while Appendix F presents the algorithm to solve the model quantitatively.

## 4.6 Discussion

It is noteworthy that tax rates have a significant impact on both the capital investment of pass-through entities and the proportion of taxable business income concealed from the government. Given that pass-through business owners are subject to non-linear income tax rates, the degree of progressivity plays a significant role in determining the level of tax distortion. For instance, in the presence of non-linear taxation with increasing marginal tax rates, larger pass-through businesses face higher levels of distortion because of their tax rates, whereas smaller ones encounter comparatively lower rates. This distortion primarily arises from the capital investment decisions of business owners, as capital expenditures in the model are non-tax-deductible. Conversely, labor payments being tax-deductible do not



induce distortion in labor choice.

In this framework, an increase in progressivity results in more pronounced distortions for larger businesses compared to their smaller counterparts. Consequently, this increase leads to reduced capital and labor demands for business owners, with the magnitude of the decrease being proportional to their respective sizes. Furthermore, higher progressivity fosters increased tax avoidance activities among pass-through businesses, occurring at both extensive and intensive levels. In an effort to mitigate the distortionary effects of high tax rates, some businesses engage in tax avoidance practices and allocate additional resources to such activities. Furthermore, at the intensive level, business owners raise their engagement in tax avoidance strategies. With a higher level of concealed income, the costs associated with tax avoidance activities surge at an increasing rate. This substantial rise in tax avoidance activities subsequently amplifies both the net-tax gap and the resources allocated to tax avoidance endeavors.

## 5 Parametrization

In this section, I describe the parameter values used in the model. The calibration of the economy is based on the tax structure of the year 1985, just before the 1986 Tax Reform Act (TRA). The first set of parameters is taken directly from the literature or calculated from the data. The second set of parameters is chosen jointly with the model to match important features of the US economy. The model period is one year. Table 3 Panel A shows the fixed parameters, and Panel B reports the calibrated parameters used in the paper.

**Externally Calibrated Parameters** I set the value of  $\psi_y = 0.975$  and  $\psi_o = 0.9$  such that the expected working life is 40 years and the average retired life is 10 years, respectively. As individuals do not consider their offspring, the altruism parameter is determined to be 0. Following [Attanasio et al. \(1999\)](#)’s estimation, I take the value of risk aversion to 1.5. The annual depreciation rate of capital is set to be 0.06, calculated by [Stokey and Rebelo \(1995\)](#). The span of the control parameter is chosen to be 0.8, the value computed by [Guner et al. \(2008\)](#). The capital share for the C-corporate sector is set to be 0.36, broadly in line with the literature.<sup>26</sup> In order to have the same capital share for both sectors, the elasticity of capital for pass-through entities ( $\alpha_2$ ) is set to 0.45.<sup>27</sup>

Labor productivity is assumed to follow the first-order autoregressive process in logarithm with mean labor productivity  $\lambda_\epsilon$ , persistence  $\rho_\epsilon$ , and a standard deviation of innovations with

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<sup>26</sup>[Castaneda et al. \(1999\)](#) set  $\alpha = 0.376$  and [Domeij and Heathcote \(2004\)](#)  $\alpha = 0.36$ .

<sup>27</sup>The capital share equality across sectors implies  $\alpha = \alpha_2\gamma$ .

$\sigma_\epsilon$ :

$$\log \epsilon_t = \lambda_\epsilon + \rho_\epsilon \log (\epsilon_{t-1}) + \varepsilon_\epsilon \quad (14)$$

where  $\varepsilon_\epsilon$  is i.i.d with shock mean zero and variance  $\sigma_\epsilon^2$ . In order to discretize the AR(1) process, I use [Rouwenhorst \(1995\)](#) method where I set the mean labor productivity to 0. The annual persistence of the autoregressive process parameter for labor productivity is set to be 0.95 and the standard deviation of  $\varepsilon$  is equal to 0.1225, estimated by [Storesletten et al. \(2004\)](#).

Table 3: Parameters of the Model

Parameter	Value	
A. Fixed Parameters		
Prob. of Staying Young	$\psi_y$	0.975
Prob. of Staying Old	$\psi_o$	0.9
Alturism	$\eta$	0
Risk Aversion	$\sigma$	1.5
Depreciation	$\delta$	0.06
Span of Control	$\gamma$	0.8
Capital Share for C Sector	$\alpha$	0.36
Capital Share for Pass Through Sector	$\alpha_2$	0.45
Mean of $\epsilon_t$	$\lambda_\epsilon$	0
Autocorrelation of $\epsilon_t$	$\rho_\epsilon$	0.95
Standard Dev. of $\varepsilon_{\epsilon,t}$	$\sigma_\varepsilon$	0.1225
Progressivity Parameter	$\tau_y$	0.149
Corporate Tax	$\tau_c$	0.186
Penalty Rate	$\zeta$	1.5
Variable Cost Parameter	$B$	1
B. Calibrated Parameters		
Discount Factor	$\beta$	0.9609
Mean of Entrepreneurial Productivity	$\lambda_z$	0.097
Persistence of Entrepreneurial Productivity	$\rho_z$	0.937
Standard Deviation of $\varepsilon_z$	$\sigma_z$	0.281
Overhead Cost of Pass-through Entities	$c_f$	0.1397
Average Tax Rate	$\lambda_y$	0.705
Borrowing Limit	$\Psi$	1.467
Pension	$p$	0.36
Parameter of $p(\cdot)$	$p_1$	178
Parameter of $p(\cdot)$	$p_2$	0.21
Fixed cost of tax avoidance	$\kappa$	0.0371

*Notes:* Table 3 Panel A illustrates the fixed parameters and Panel B indicates the calibrated parameters.

The average income tax function  $T(y) = 1 - \lambda_y y^{-\tau_y}$ , introduced by [Benabou \(2002\)](#), is imposed on the model. [Dyrda and Pugsley \(2019\)](#) estimate the progressive parameter

$\tau_y = 0.149$  for the year 1983-1985. They calculated the progressivity parameter by using the data on the average marginal income tax on wages, salaries, and entrepreneurial income provided by [Mertens and Montiel Olea \(2018\)](#), and IRS data. The estimated progressivity parameter includes both average marginal individual income tax rate (AMIITR) and average marginal payroll tax rate (AMPTR). Therefore, I take the progressive parameter equal to 0.149.

The corporate tax rate ( $\tau_c$ ) is computed as the ratio of the corporate tax liabilities to corporate profits before tax, following [McGrattan and Prescott \(2005\)](#). Federal Reserve Bank profits are subtracted since they are taxed at 100 percent. Therefore, the ratio is equal to NIPA profit tax liability (Table 1.16) less Federal Reserve Bank profits (Table 6.16) to the NIPA corporate before-tax profits (Table 1.16) less Federal Reserve Bank profits. This makes the corporate tax rate for the year 1983-1985 equal to 0.186. The penalty rate for tax avoidance is set to be 1.5, the civil fraud penalty of 50% in 1985 (IRS, 1985). The last parameter that determines the variable cost level is set to 1.

**Internally Calibrated Parameters** The remaining parameters are chosen such that the stationary equilibrium of the model matches eight features of the US economy in 1985: (i) after-tax return to capital, (ii) exit rate of the pass-through entities, (iii) share of production from pass-through entities, (iv) share of pass-through entities, (v) mean income of pass-through entities relative to workers, (vi) tax revenue to output ratio (vii) debt to equity ratio of pass-through entities, (viii) pension and social security payments to mean income ratio (ix) net tax gap to output ratio (x) tax avoidance rate of 80-90 percentile of reported business income relative to the of 60-80 percentile and (ix) tax avoidance rate of 95-99 percentile reported business income relative to that of 0-40 percentile. Table 3 Panel B displays the calibrated parameter values that are jointly determined with the equilibrium of the model to match these features of the US economy in 1985.

[Gomme et al. \(2011\)](#) estimate the after-tax return to capital as 5.16 percent, which is the target value for the discount factor,  $\beta$ . Also, entrepreneurial productivity is assumed to follow a logarithmic form of first-order autoregressive process which is as follows:

$$\log z_t = \lambda_z + \rho_z \log(z_{t-1}) + \varepsilon_z \quad (15)$$

where  $\lambda_z$  is the mean entrepreneurial ability,  $\rho_z$  is the persistence of the autoregressive process for entrepreneurial ability, and  $\varepsilon_z$  is i.i.d shock with mean zero and variance  $\sigma_z^2$ . I calibrate  $\lambda_z$  to match the share of production from pass-through entities, which is equal to 22.4 from IRS & NIPA. The persistence parameter,  $\rho_z$ , is targeted to the average exit

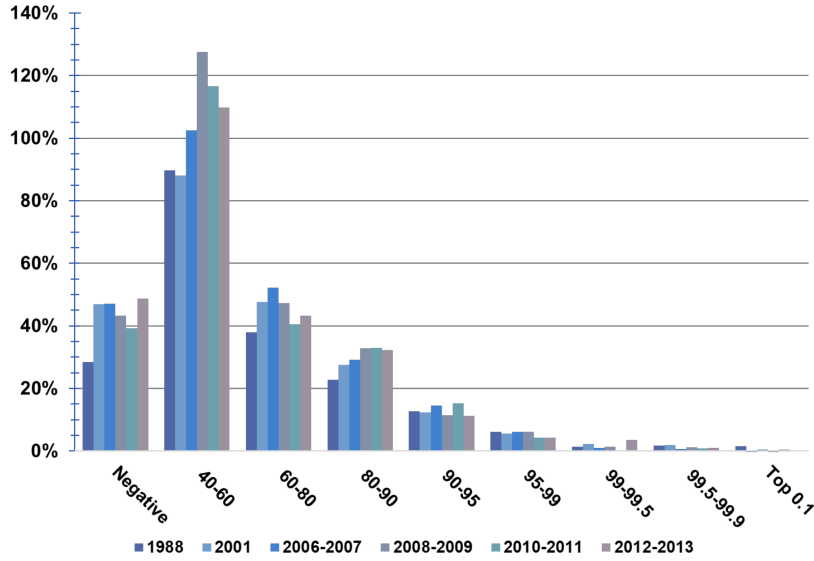
rate of business owners, estimated as 14 percent by [Quadrini \(1999\)](#). I target the standard deviation of  $\varepsilon_z$  to the share of self-employed pass-through active business owners of 6.6 percent, computed by SCF 1989 using the definition of entrepreneurs in [Cagetti and De Nardi \(2006\)](#).<sup>28</sup> Additionally, I calibrate the overhead costs of pass-through entities to match the pass-through entities' income to labor income before-tax ratio, estimated between 1.4-1.9 by [Quadrini \(1999\)](#). The debt-to equity ratio is targeted to 0.39, computed by Flow of Funds with IRS balance sheet of pass-through entities. Pension and social security payments to average income ratio, is calibrated to 0.4, calculated by [Kotlikoff et al. \(1999\)](#).

**Tax Avoidance Parameters** The audit probability function is assumed to be a logistic function following [Di Nola et al. \(2021\)](#):

$$p(k) = \frac{1}{p_1 + e^{-p_2 k}}$$

with  $p_1 > 0$  and  $p_2 > 0$ . In the functional form,  $p_1$  determines the level of auditing for the

Figure 4: Percentage Change in Business Income Ranked by Reported Business Income



*Sources:* Auten and Langetieg (2020) *Notes:* This graph is retrieved directly from Auten and Langetieg(2020). The percentage change in business income induces the the true business income after taking into account the underreported income. The returns lower than 500\$ are excluded in their computations.

interception,  $(p(0) = 1/(1 + p_1))$ , while  $p_2$  targets the curvature of the probability function. If  $p_2 = 0$ , it implies that the probability of a business being audited is the same across different

<sup>28</sup>[Cagetti and De Nardi \(2006\)](#) use the definition of self-employed active business owners as the one who is self-employed, has an active management role, and own or share ownership in any privately held businesses.

sizes of firms. I target  $p_1$  and  $p_2$  to match the percentage rate of tax avoidance for the 80-90 percentile of reported business income relative to tax avoidance rate of the 60-80 percentiles, and the ratio of the tax avoidance rate of 95-99 percentile to 0-40 percentile, respectively. These ratios corresponds to 0.6, and 0.2 in the data, shown in Figure 4. The last parameter, the fixed cost of tax avoidance  $\kappa$ , targets the 0.3% net tax gap to output ratio, derived from IRS Federal Compliance Research.

It is of significance to highlight that the calibration procedure suggests that (i) the mean of entrepreneurial ability ( $\lambda_z$ ) exceeds that of labor productivity ( $\lambda_\epsilon$ ), (ii) the persistence of remaining at the same level of ability is greater in labor productivity ( $\rho_\epsilon$ ) than in entrepreneurial ability ( $\rho_z$ ), (iii) the standard deviation of innovations for entrepreneurial ability ( $\sigma_{\epsilon_z}$ ) surpasses that of innovations for labor productivity ( $\sigma_{\epsilon_\epsilon}$ ). These findings imply that being a business owner involves a higher degree of risk when contrasted with the role of a worker, thereby aligning with the notion that business ownership carries high risk within real-world context. Additionally, the calibrated borrowing constraints parameter indicates that a business owner can borrow up to 46.7% beyond her asset level, a value consistent with estimates by [Evans and Jovanovic \(1989\)](#).

**Benchmark Economy** Table 4 describes the moments targeted in the model and their corresponding counterparts in the US economy. The model replicates key features of the US economy in 1985, including the share of production of pass-through entities, share of self-employed pass-through business owners, and the debt-to-equity ratio of pass-through entities. The model also closely matches the exit rate, after-tax return to capital and relative income of pass-throughs relative to worker. Furthermore, it's noteworthy that, while the model doesn't explicitly target the median wealth ratio of pass-through business owners compared to workers or the capital-output ratio, it perfectly replicates these values as observed in empirical data.<sup>29</sup>

In terms of tax avoidance targets, the model generates precise counterparts when compared to empirical data. Notably, the model accurately reflects the net tax-gap to output ratio of 0.3%, a value estimated through IRS Compliance Research. The model also perfectly matches both the extensive and intensive margin of tax avoidance. For example, the model aligns with the data in exhibiting the reported income distribution of the 0-40 percentile as lower than that of the 40-60 percentile. Additionally, the model shows that the top 1% and top 0.1% of reported business income do not engage in significant tax avoidance, primarily due to the substantial costs associated with such activities. The model also computes the

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<sup>29</sup>Specifically, the model indicates a relative median wealth ratio of pass-through business owners at 4.0, which aligns precisely with the actual data. [Di Nola et al. \(2021\)](#). Moreover, the model's capital-output ratio is at 2.7, which is within the range of data estimates, [Guner et al. \(2008\)](#) and [Cagetti and De Nardi \(2006\)](#).

Table 4: Model Fit

Target	Data	Model Fit	Source
Return to capital(%)	5.16	5.14	<a href="#">Gomme et al. (2011)</a>
Exit Rate(%)	0.14	0.13	<a href="#">Quadrini (1999)</a>
Share of Production from PT(%)	22.4	22.4	IRS & NIPA
Share of self-employed PT Owners(%)	6.6	6.5	SCF 1989
Relative Income of PT to Worker	1.4 – 1.9	1.8	<a href="#">Quadrini (1999)</a>
Tax Revenue to Output Ratio(%)	24.6	24.6	OECD Data
Debt to Equity Ratio(%)	0.39	0.38	Flow of Funds
Pension to Mean Income	0.4	0.4	<a href="#">Kotlikoff et al. (1999)</a>
Net Tax Gap to Output Ratio	0.3	0.3	IRS
Tax Avoidance Ratio (80-90 to 60-80)	0.6	0.6	<a href="#">Auten and Langetieg (2020)</a>
Tax Avoidance Ratio (95-99 to 0-40)	0.2	0.2	<a href="#">Auten and Langetieg (2020)</a>

*Notes:* Table 4 illustrates the moments targeted with their counterparts. *Return to capital* stands for the after-tax average returns to capital, and *Exit Rate* refers to the business owners exit rate. *Share of production from PT* stands for the share of production from pass-through entities, and *Share of self-employed PT Owners* refers to the percentage of self-employed active business pass-through owners in the economy. *Relative Income of PT to Worker* refers to the average income of pass-through entity business owners relative to the average income of the workers.

relative tax avoidance within the 80-90 percentile of reported business income, relative to the 60-80 percentile. Moreover, the relative tax avoidance of the 95-99 percentile of reported business income, relative to the 0-40 percentile replicates the data.<sup>30</sup> These ratios indicate that medium-sized businesses exhibit a greater degree of involvement in tax avoidance practices compared to larger businesses, while businesses within the top 95-99 percentile engage in less tax avoidance than the smallest businesses, aligning with the observed data.

## 6 Quantitative Findings

In this section, I will introduce tax changes to the benchmark economy to align the corporate tax and income tax rates with the 2015 levels. To analyze the impact of each tax reform, I will separately adjust the corporate tax and income tax rates and assess their quantitative effects. Furthermore, I will examine the effect of rise in the tax avoidance on output reallocation by matching the relevant data moment. To assess the role of regulatory changes in enhancing financial intermediaries, which have influenced borrowing constraints for pass-through businesses, I will consider changes in their borrowing capacity relative to 1985 economy.

<sup>30</sup>It is important to note that the model does not fully replicate the absolute value of tax avoidance due to the presence of underreported income percentiles in the data, particularly within the range of \$500 to \$30,000 in business income.

## 6.1 Changes in Tax Structure

**Corporate Tax** Column II of Table 5 presents the stationary equilibrium of the economy with the 2015 corporate tax level. In the benchmark economy, the corporate tax rate was initially 18.6%, but it is reduced to 14.5% in 2015. The lower corporate tax rate leads to a reallocation of output towards C-corporations, resulting in a decrease in the production share of pass-through entities from 22.4% to 21.2%. This outcome aligns with intuition, as a lower corporate tax rate implies a higher after-tax return on capital. Consequently, unproductive pass-through business owners are incentivized to transition into workers, thereby reducing the presence of pass-through entities in the economy.

However, the corporate tax cut has two opposing effects on capital accumulation. On one hand, the lower tax rate increases the return on capital after tax, incentivizing individuals to accumulate more capital, which contributes to a rise in capital accumulation. On the other hand, due to the decline in pass-through owners, capital accumulation decreases as the marginal return of savings for business owners is higher. Overall, capital accumulation and output increase by 2.2% and 0.6% respectively. The rise in the production is primarily driven by the growth in output from C-corporations, which see a 2.3% increase, while the production of pass-through entities decreases by 4.3% relative to the benchmark economy.<sup>31</sup>

**Tax Progressivity** Column III of Table 5 presents the counterfactual outcomes considering the progressivity of tax in 2015.<sup>32</sup> The findings indicate that the decrease in tax progressivity explains 16.8% of the observed change in the output share of pass-through entities in the data. The primary mechanism driving this reallocation is the increase in the marginal benefit for incumbent business owners as the distortionary effects of tax progressivity on factor demands of pass-through entities are alleviated. This leads to a relatively larger increase in factor investments for potentially productive and larger pass-through entities compared to small and unproductive ones. Consequently, both larger and smaller incumbent pass-through businesses experience a rise in their share of production. Another contributing factor is the emergence of new pass-through business owners. With lower tax progressivity, the value of being a business owner increases, attracting workers with relatively higher entrepreneurial productivity to choose pass-through entities as their preferred option. This channel accounts for an approximate 0.37 percentage point increase in the share of pass-through business owners in the non-retired population.

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<sup>31</sup>For more detail see Table A.4.

<sup>32</sup>In particular, the progressivity parameter ( $\tau_y$ ) is implemented by 0.095 for the 2015 level (Dyrda and Pugsley (2020))



Table 5: Change in Taxation

	Benchmark	Only Corporate Tax	Only Tax Progressivity	Both Tax Changes
Capital used by pass-through entities(%)	15.5	14.4	19.0	18.4
Production from pass-through entities(%)	22.4	21.2	25.9	25.3
$\frac{\Delta Model}{\Delta Data}$ ( %)		-0.6	16.8	14.1
Interest Rate(%)	5.14	5.23	4.80	4.85
Output Change(%)		0.6	2.5	3.6
PT. entities in the non-retired pop.( %)	6.5	6.3	7.2	7.1
Debt to Equity Ratio	0.38	0.39	0.41	0.41
Government Revenue to Output Ratio ( %)	24.6	24.0	23.9	23.4
Net Tax Gap to Output Ratio ( %)	0.3	0.3	0.2	0.2
Resource Allocated to Tax Avoidance (Relative to Output)(%)	0.20	0.18	0.11	0.09

*Notes:* Table 5 reports four different stationary equilibrium in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where the only corporate tax rate decreased the 2015 level, 14.5%. Column III shows the stationary equilibrium with the change of tax progressivity only, 0.095 in 2015. The last column illustrates the combination of both tax changes that happened in 2015. The economic variable  $\frac{\Delta Model}{\Delta Data}$  stands for the change in model in the output share of pass-through entities relative to change in the output share of pass-through entities in the US observed between 1985 and 2015. *PT. entities in the non-retired pop.* stands for the percentage share of pass-through entities in the non-retired population.

Similar to the corporate tax, the progressive tax on households and pass-through entities also has distortionary effects on output. The decline in progressivity leads to a 2.5% increase in overall production in the economy. However, unlike the corporate tax, this rise is driven by pass-through entities rather than C-corporations. Specifically, pass-through entities experience an 18.4% increase in output, while C-corporations see a slight decline of 1.8%. This is attributed to the reduction in distortions for pass-through entities resulting from the decline in progressivity, leading to a reallocation of labor, output, and capital towards the pass-through sector. Another important implication of these findings is the observed decline in the average marginal product of capital. This decline can be attributed to two factors: the entry of new businesses into the pass-through sector with relatively lower productivity compared to incumbent pass-through owners, and the increase in capital investments by incumbent pass-through entities in response to the decrease in tax progressivity. Although the entry of less productive businesses may bring down the overall average marginal product of capital in the pass-through sector, it is worth noting that even with this decline, the average marginal product of capital in pass-through entities remains higher than that in C-corporations. This suggests that pass-through entities are not investing optimally due to financial constraints, which limit their ability to fully leverage their capital resources.

The reduction in tax progressivity not only affects output and production allocation but

also has significant implications for government revenue and tax avoidance. As expected, the decrease in tax progressivity leads to a decrease in the government revenue collected from households. This decline in revenue is a direct consequence of the lower tax burden on pass-through entities and the corresponding increase in output. Consequently, the government revenue-to-output ratio decreases to 23.9%. Another crucial result of the decline in tax progressivity is the substantial reduction in the net tax gap and the resources allocated to tax avoidance. Specifically, the net tax gap decreases by 42.4%, indicating a more effective tax collection and enforcement mechanism. Moreover, the resources allocated to tax avoidance decline by 42.4%, reflecting a lower cost of tax avoidance for pass-through business owners. With decreasing progressivity, the opportunity cost of avoiding taxes become more significant, discouraging non-compliant behavior.

**Tax Progressivity & Corporate Tax Changes** The combination of the two tax rates introduces two distinct forces that influence the economy. While both taxes have a distorting effect on output and capital accumulation, they exert opposite impacts on the share of production from pass-through entities. In this case, the influence of the progressivity parameter ( $\tau_y$ ) outweighs that of the corporate tax ( $\tau_c$ ), resulting in a model that explains 14.1% of the changes in the output share of pass-through entities since 1985. The combined effect leads to a more significant production gain of 3.6% compared to the individual effects of each tax rate alone. This outcome arises from the mitigation of the distortionary effects of both the corporate tax and tax progressivity on workers and pass-through entities.

**The Role of Tax Avoidance** Column III of Table 6 depicts the equilibrium with 2015 net tax gap to output ratio. A decrease in the cost of tax avoidance results in an increased opportunity cost for business owners who were not previously avoiding taxes. Consequently, these owners begin to engage in tax avoidance by allocating resources towards it. Similarly, business owners who were already avoiding taxes intensify their avoidance activities in this environment. However, the rise in tax avoidance prompts business owners to reduce their capital investments due to the increased probability of being caught. As a result, they choose to operate smaller businesses compared to the benchmark economy, which implies lower productivity for pass-through entities. On the other hand, the increase in misreporting among pass-through entities enables them to pay less in taxes and invest more in their businesses. Additionally, the rise in tax avoidance allows unproductive individuals to become business owners, leading to an increase in the share of pass-through entities to 6.8%. Overall, the increase in tax avoidance results in lower government revenue, a higher allocation of resources towards tax avoidance, and a slightly higher gain in output relative

Table 6: Change in Tax Avoidance

	Benchmark	Only Tax Changes	Only Tax Avoidance	Both Tax Avoidance and Tax Changes
Capital used by pass-through entities(%)	15.5	18.4	15.8	18.7
Production from pass-through entities(%)	22.4	25.3	23.0	26.0
$\frac{\Delta Model}{\Delta Data}$ ( %)		14.1	2.9	17.3
Interest Rate(%)	5.14	4.85	5.07	4.84
Output Change(%)		3.6	0.1	3.1
PT. entities in the non-retired pop.( %)	6.5	7.1	6.8	7.4
Debt to Equity Ratio	0.38	0.41	0.39	0.40
Government Revenue to Output Ratio ( %)	24.6	23.4	24.4	23.1
Net Tax Gap to Output Ratio ( %)	0.3	0.2	0.6	0.6
Resource Allocated to Tax Avoidance (Relative to Output)(%)	0.20	0.09	0.33	0.31

*Notes:* Table 6 reports four different stationary equilibrium in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where both tax rates pertains to 2015 level. Column III shows the stationary equilibrium with the change of the variable cost of tax avoidance parameter,  $B$  from 1 to 0.64, match the net tax gap to output ratio to 0.6%. The last column illustrates the combination of both tax changes and tax avoidance to the 2015 level by changing  $B$  to 0.45. The economic variable  $\frac{\Delta Model}{\Delta Data}$  stands for the change in model in the output share of pass-through entities relative to change in the output share of pass-through entities in the US observed between 1985 and 2015. *PT. entities in the non-retired pop.* stands for the percentage share of pass-through entities in the non-retired population.

to the benchmark economy.

The combined impact of tax changes and tax avoidance accounts for 17.3% of the observed output reallocation in the US. Interestingly, while tax changes and tax avoidance individually contribute to production gains, their combination leads to a lower output gain compared to tax changes alone. This outcome is driven by the fact that as the cost of tax avoidance becomes cheaper, business owners prioritize increasing their avoidance activities rather than investing in their businesses, which leads to a higher allocation of resources towards tax avoidance relative to output. Furthermore, pass-through entities reduce their capital investments and keep their firms smaller in order to avoid detection by the government.

## 6.2 Borrowing Constraints

Highly productive potential pass-through business owners face challenges due to financial constraints. However, the easing of borrowing constraints enables pass-through entities to become more actively involved in their business operations, leading to an expansion of their firm size and increased production. The debt-to-equity ratio serves as a useful measure to assess the financial borrowing capacity of pass-through entities. Figure B.15 presents

the debt-to-equity ratio of both the corporate and non-corporate sectors, providing insights into the extent to which these entities rely on borrowed funds and loans compared to their equity. Between 1985 and 2015, the debt-to-equity ratio of non-corporate businesses in the

Table 7: Change in Borrowing Constraints

	Benchmark	Capacity to Borrow %10 More	Capacity to Borrow %20 More	Capacity to Borrow to Match Data
Capital used by pass-through entities(%)	15.5	17.2	18.8	17.4
Production from pass-through entities(%)	22.4	24.3	26.0	24.5
$\frac{\Delta Model}{\Delta Data}$ ( %)		9.1	17.3	10.1
Interest Rate(%)	5.14	5.13	5.12	5.13
Output Change(%)		0.3	0.4	0.3
PT. entities in the non-retired pop.( %)	6.5	6.9	7.3	6.9
Debt to Equity Ratio	0.38	0.48	0.57	0.50
Government Revenue to Output Ratio ( %)	24.6	24.8	25.0	24.8
Net Tax Gap to Output Ratio ( %)	0.3	0.3	0.3	0.3
Resource Allocated to Tax Avoidance (Relative to Output)(%)	0.20	0.19	0.18	0.19

*Notes:* Table 7 reports four different stationary equilibria in each column. The benchmark economy in column I shows the results in which the borrowing limit is calibrated to 1985 pass-through entities' debt-to equity ratio. Column II and III indicate the new stationary equilibria where the capacity to borrow is increased by 10% and 20% more relative to benchmark economy. Column IV illustrates stationary equilibrium in which borrowing limit is calibrated to 2015 pass-through entities' debt-to equity ratio, 0.50. The economic variable  $\frac{\Delta Model}{\Delta Data}$  stands for the change in model in the output share of pass-through entities relative to change in the output share of pass-through entities in the US observed between 1985 and 2015. *PT. entities in the non-retired pop.* stands for the percentage share of pass-through entities in the non-retired population.

US increased from 37% to 49%. Similarly, the debt-to-equity ratio of pass-through entities, including S-corporations, rose from 39.2% to 50.3%.<sup>33</sup> This increase can be attributed to improvements in financial intermediaries and easier access to financial institutions due to regulatory amendments. These regulatory changes include provisions that allow holding safe-harbor debt stock, certain types of loan agreements, and the expansion of shareholders in S-corporations. The emergence of limited liability companies (LLCs) has also facilitated access to financial institutions through unlimited shareholders. Furthermore, the introduction of lending funds and business loan programs specifically for small businesses in the 2000s has aided in overcoming financial constraints. These regulatory reforms collectively indicate that pass-through business owners face relatively fewer constraints in 2015 compared to 1985, as they can borrow more easily.

<sup>33</sup>I calculated the debt-to-equity ratio of pass-through entities by weighting the debt and equity of S-corporations from the IRS balance sheets of S-corporations and C-corporations as a measure, which can be found in the appendix.

To capture the change in the debt-to-equity ratio observed in the data, I conduct three experiments in which the capacity to borrow for business owners is increased by 10% and 20% relative to the benchmark economy, as shown in Column II and III of Table 7, respectively. In Column IV, I calibrate the borrowing limit to match the debt-to-equity ratio observed in 2015.

Focusing on column IV, the relaxation of borrowing constraints for pass-through business owners leads to a significant increase in their share of production, which aligns with the observed reallocation of output towards pass-through entities in the data, amounting to approximately 10%. This change is substantial because it enables pass-through business owners to overcome financial constraints and allocate more capital and labor towards their production activities. As a result, the average marginal product of capital decreases. Another important factor is the presence of workers with relatively higher entrepreneurial ability who face capital constraints. By allowing them to borrow more, they are encouraged to become pass-through business owners, resulting in a 0.4 percentage point increase in the overall share of pass-through business owners in the economy.

**Combination of Tax Changes with Borrowing Constraints** The increase in borrowing capacity for pass-through entities, coupled with the decrease in tax progressivity, mitigates both the distortionary effects of taxation and financial frictions. Table 8 provides a separate analysis of each channel, with tax changes presented in column II and borrowing changes in column III.<sup>34</sup>

Column IV demonstrates the stationary equilibrium by considering the combined impact of tax changes and an increase in borrowing capacity. The impact of both taxation and the relaxation of borrowing constraints on the production share of pass-through entities is significant. When these two effects are combined, they account for more than one-fifth of the observed reallocation of output in the US. This finding is not surprising, as it reflects the transition of relatively productive but financially constrained workers and less productive but distorted workers into business owners, resulting in an increase in the share of production from pass-through entities. In fact, this particular channel contributes to a 2.2 percentage point rise in the share of business owners among the non-retired population. Another driving force is the increase in investment by incumbent business owners. As these two forces occur simultaneously, both financially constrained and distorted incumbent business owners boost their capital and labor investments. When these two channels are combined, the output share of pass-through entities experiences a more than 40% increase.

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<sup>34</sup>The borrowing limit in Column III is set to the level that is calibrated to the economy in Column IV.

Table 8: Change in Taxation with Borrowing Constraints

	Benchmark	Only Tax Changes	Only Borrowing Changes	Both Tax and Borrowing Changes
Capital used by pass-through entities(%)	15.5	18.4	17.0	19.7
Production from pass-through entities(%)	22.4	25.3	24.1	26.8
$\frac{\Delta Model}{\Delta Data}$ ( %)		14.1	8.7	21.2
Interest Rate(%)	5.14	4.85	5.13	4.86
Output Change(%)		3.6	0.3	3.8
PT. entities in the non-retired pop.( %)	6.5	7.1	6.9	7.3
Debt to Equity Ratio	0.38	0.41	0.47	0.50
Government Revenue to Output Ratio ( %)	24.6	23.4	24.8	23.5
Net Tax Gap to Output Ratio ( %)	0.3	0.2	0.3	0.2
Resource Allocated to Tax Avoidance (Relative to Output)(%)	0.20	0.09	0.19	0.09

*Notes:* Table 8 reports four different stationary equilibria in each column. The benchmark economy in column I shows the results in which the borrowing limit is calibrated to 1985 pass-through entities' debt-to equity ratio. Column II indicates the new stationary equilibrium where the tax changes take place. Column III shows the stationary equilibrium in which borrowing limit is calibrated to 2015 pass-through entities' debt-to equity ratio, 0.50. Column IV illustrates the stationary equilibrium where the borrowing limit is calibrated to 2015 pass-through entities' debt-to equity ratio under the 2015 tax rates. The economic variable  $\frac{\Delta Model}{\Delta Data}$  stands for the change in model in the output share of pass-through entities relative to change in the output share of pass-through entities in the US observed between 1985 and 2015. *PT. entities in the non-retired pop.* stands for the percentage share of pass-through entities in the non-retired population.

### 6.3 The Role of Overhead Costs

The tax changes and the increase in borrowing capacity since 1985 can account for approximately one-fifth of the observed changes in the reallocation of output in the US. Here, I discuss the role of regulatory changes, mimicked by the overhead costs that pass-through business owners are subject to, on the reallocation of output. I find that this channel can contribute to a considerable reallocation of output toward pass-through entities.

The regulatory changes implemented in the US aimed to facilitate the establishment and operation of pass-through businesses. These changes included the elimination of the five-year waiting period for the reelection of S corporations without IRS consent under the 1996 Small Business Act. Furthermore, the IRS implemented measures to address the costly implications of invalid terminations and late elections of S-corporations for business owners. They began waiving null terminations and accepting late elections if there was a reasonable cause for the failure, provided tax filers applied for grant relief. Another aspect of regulatory improvements for pass-through business owners includes greater flexibility in ownership and simplified retirement plans.<sup>35</sup> Essentially, the cost of start-up procedure relative to gross national income and the required time of starting a business declined by 10% from 2013

<sup>35</sup>See Small Business Job Protection Act of 1996.

Table 9: Change in Overhead Costs

	Benchmark	15% fall in overhead costs, $c_f$	30% fall in overhead costs, $c_f$
Capital used by pass-through entities(%)	15.5	16.4	16.8
Production from pass-through entities(%)	22.4	23.5	24.0
$\frac{\Delta Model}{\Delta Data}$ (%)		5.3	7.7
Interest Rate(%)	5.14	5.08	5.08
Output Change(%)		0.1	0.3
PT. entities in the non-retired pop.(%)	6.5	7.0	7.2
Debt to Equity Ratio	0.38	0.39	0.39
Government Revenue to Output Ratio(%)	24.6	24.7	24.8
Tax Gap to Output Ratio(%)	0.3	0.3	0.3
Resource Allocated to Tax Avoidance (Relative to Output)(%)	0.20	0.17	0.17

Notes: Table 9 reports three different stationary equilibria in each column. The benchmark economy in column I shows the results in which there is no reduction in overhead cost. Column II and III indicate the new stationary equilibrium where there is a decline in overhead costs by 15% and 30%, respectively. The economic variable  $\frac{\Delta Model}{\Delta Data}$  stands for the change in model in the output share of pass-through entities relative to change in the output share of pass-through entities in the US observed between 1985 and 2015 *PT. entities in the non-retired pop.* stands for the percentage share of pass-through entities in the non-retired population.

through 2015.<sup>36</sup> Hence, these regulatory changes can be viewed as comprehensive measures. To assess their significance, I conducted an experiment that involved reducing the overhead costs of pass-through entities by 15% and 30%. Table 9 presents the results of the stationary equilibria for these two different levels of overhead costs.

The reduction in overhead costs can account for 5.3% and 7.7% of the observed reallocation of output towards pass-through entities for the respective percentage reductions mentioned earlier. As the threshold for individuals to decide to become pass-through entity owners decreases, the share of pass-through entities increases by 0.5 and 0.7 percentage points, respectively. Another contributing factor to the increase in pass-through production is the rise in investments from incumbent businesses. With the decline in overhead costs, business owners experience an increase in their after-tax income, leading to higher savings. This, in turn, facilitates capital accumulation in the economy and allows for increased capital investments. However, the impact of these changes on aggregate variables in the economy is minimal. Total production sees a marginal increase of 0.1% and 0.3%, while the after-tax return to capital decreases slightly in both scenarios. Additionally, the decrease in overhead costs results in higher government revenue due to the increased tax payments from pass-through entities.

<sup>36</sup>The data starts from 2013. For more information see World Bank, Doing Business project.



## 6.4 All Changes

Column II of Table 10 reflects the combined effects of changes in taxes, tax avoidance, and an increase in borrowing constraints. These channels account for over one-fourth of the observed reallocation of output in the US. Moreover, with higher capital accumulation and increased investment in pass-through entities, output experiences a 3.4% increase compared to the benchmark economy. These changes, however, are accompanied by a decline in the revenue collected by the government. On one hand, the decrease in tax rates and the

Table 10: Change in All Channels

	Benchmark	Change in All Channels	Change in All & 30% Fall in Overhead Costs
Capital used by pass-through entities(%)	15.5	20.3	21.2
Production from pass-through entities(%)	22.4	27.8	29.0
$\frac{\Delta Model}{\Delta Data}$ ( %)		26.0	31.7
Interest Rate(%)	5.14	4.84	4.81
Output Change(%)		3.4	3.7
PT. entities in the non-retired pop.( %)	6.5	7.7	8.1
Debt to Equity Ratio	0.38	0.50	0.50
Government Revenue to Output Ratio(%)	24.6	23.2	23.2
Tax Gap to Output Ratio(%)	0.3	0.6	0.6
Resource Allocated to Tax Avoidance (Relative to Output)(%)	0.20	0.32	0.33

*Notes:* Table 10 reports three different stationary equilibria in each column. The benchmark economy in column I shows the results in which there is no reduction in overhead cost. Column II and III indicate the new stationary equilibrium where there is a decline in overhead costs by 15% and 30%, respectively. The economic variable  $\frac{\Delta Model}{\Delta Data}$  stands for the change in model in the output share of pass-through entities relative to change in the output share of pass-through entities in the US observed between 1985 and 2015 *PT. entities in the non-retired pop.* stands for the percentage share of pass-through entities in the non-retired population.

increase in misreporting lead to a reduction in overall revenue. On the other hand, the rise in borrowing constraints has a positive impact on revenue, but it is outweighed by the former effect. Consequently, the overall revenue collected by the government in the economy declines significantly. If the decline in overhead costs by 30% is also considered, it can account for 31.7% of the observed output reallocation in the data.

## 7 Discussion

In this section, I analyze how the reallocation of output among legal forms of organizations changes under two different economic scenarios: done where depreciated capital is not fully

deductible, and another where debt is deductible. Lastly, I evaluate the effect of tax changes on the reallocation of output under the counterfactual economy where the tax revenue to output ratio is the same as in the 1985 US economy.

## 7.1 Deductibility of Depreciation

The benchmark model assumes that all depreciated capital is fully deductible. However, in reality, there are certain limitations on the deductibility of depreciated capital as specified in IRS tax code Section 179.<sup>37</sup> Based on the balance sheets of pass-through entities, I estimated

Table 11: Change in Taxation under Deductibility of Depreciated Capital,  $\phi_d = 0.77$

	Benchmark	Changes in Taxes	Changes in Tax and Borrowing Limit	With Tax Avoidance
Capital used by pass-through entities(%)	14.8	17.9	19.1	19.9
Production from pass-through entities(%)	22.5	25.8	27.2	28.6
$\frac{\Delta Model}{\Delta Data}$ ( %)		15.9	22.6	29.3
Interest Rate(%)	5.13	4.82	4.85	4.79
Output Change(%)		3.8	4.2	3.5
PT. entities in the non-retired pop.( %)	6.5	7.2	7.3	8.0
Debt to Equity Ratio	0.39	0.41	0.50	0.50
Government Revenue to Output Ratio	24.6	23.5	23.6	23.3
Tax Gap to Output Ratio	0.3	0.1	0.1	0.6
Resource Allocated to Tax Avoidance(%)	0.19	0.08	0.08	0.30

*Notes:* Table 11 reports four different stationary equilibria in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where the both corporate tax and tax progressivity mimic the 2015 level, 14.5%, and 0.095, respectively. Column III shows the stationary equilibrium in which borrowing limit is calibrated to 2015 pass-through entities' debt-to equity ratio with tax changes. Column IV illustrates the stationary equilibrium where all changes take place. The economic variable  $\frac{\Delta Model}{\Delta Data}$  stands for the change in model in the output share of pass-through entities relative to change in the output share of pass-through entities in the US observed between 1985 and 2015. *PT. entities in the non-retired pop.* stands for the percentage share of pass-through entities in the non-retired population.

that 77% of the depreciated capital is tax-deductible.<sup>38</sup> Taking this into account, I recalibrated the economy to reflect this assumption, replicating the tax levels and deductibility of depreciated capital from 1985.

Table 11 presents the results for the baseline economy and the economies with the observed changes in the US. In Column IV, it is shown that the combined effect of all changes accounts for 29.3% of the reallocation of output observed in the US. Furthermore, compared

<sup>37</sup>The depreciation limit for cars, for example, cannot be higher than \$4,100 for the first tax year of the recovery period and \$6,200 for each later tax year. For more information see Publication 917.

<sup>38</sup>The estimation can be found in the Appendix D.

to the baseline model, the output gain in this economy is slightly higher. This increase in output is 3% higher compared to the scenario where all depreciated capital is fully deductible. This result is intuitive, as the decrease in deductibility leads to an increased tax burden on pass-through business owners. Consequently, with the decline in tax rates, the change in the average tax rate becomes more significant, resulting in a higher demand for factors of production by pass-through entities and a larger share of production from them.

## 7.2 Deductibility of Debt

The benchmark model assumes that debt is not tax-deductible. However, according to the IRS tax code, there are circumstances under which interest paid on debt can be tax deductible.<sup>39</sup> Based on the balance sheets of pass-through entities, I estimated that 97% of the debt is tax-deductible.<sup>40</sup> Taking this into account, I recalibrated the economy to reflect this assumption, mimicking the tax levels where 97% of the debt is deductible, as it was in 1985.

Table 12: Change in Taxation under Deductibility of Debt,  $\phi_d = 0.97$

	Benchmark	Changes in Taxes	Changes in Tax and Borrowing Limit	With Tax Avoidance
Capital used by pass-through entities(%)	16.8	18.4	20.5	20.7
Production from pass-through entities(%)	22.4	24.2	26.2	26.7
$\frac{\Delta Model}{\Delta Data}$ (%)		8.7	18.3	20.7
Interest Rate(%)	5.16	4.91	4.90	4.88
Output Change(%)		3.1	3.6	3.2
PT. entities in the non-retired pop.(%)	6.5	6.9	7.2	7.5
Debt to Output Ratio	0.39	0.39	0.50	0.50
Government Revenue to Output Ratio	24.3	22.9	23.3	22.6
Tax Gap to Output Ratio	0.3	0.2	0.2	0.6
Resource Allocated to Tax Avoidance(%)	0.17	0.10	0.09	0.30

*Notes:* Table 12 reports four different stationary equilibria in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where the both corporate tax and tax progressivity mimic the 2015 level, 14.5%, and 0.095, respectively. Column III shows the stationary equilibrium in which borrowing limit is calibrated to 2015 pass-through entities' debt-to equity ratio with tax changes. Column IV illustrates the stationary equilibrium where all changes take place. The economic variable  $\frac{\Delta Model}{\Delta Data}$  stands for the change in model in the output share of pass-through entities relative to change in the output share of pass-through entities in the US observed between 1985 and 2015. *PT. entities in the non-retired pop.* stands for the percentage share of pass-through entities in the non-retired population.

<sup>39</sup>For more details see IRS Topic No 55.

<sup>40</sup>The estimation can be found in the Appendix D.

The findings reveal that tax changes alone explain only 8.7% of the observed reallocation of output in the US when debt deductibility is taken into account. However, when changes in borrowing constraints and tax avoidance are considered in addition to tax changes, these factors account for over one-fifth of the shift in output reallocation. It is worth noting that this percentage is 6% lower than in the benchmark model. The reason for this difference is that allowing business owners to deduct their debts results in a higher presence of unproductive business owners compared to the main model. This can be observed through the share of capital used by pass-through entities, where in the main model it accounts for 15.5% of the total capital in the economy, whereas in this economy it represents 16.8% of the capital, generating 22.4% of the output.

### 7.3 Government Revenue Neutrality

The effect of tax changes on the US economy lowers government tax revenue, so to circumvent this channel due to tax changes, I evaluate a counterfactual economy where government revenue and government revenue to output ratio mimic the 1985 level by adjusting the average tax rate ( $\lambda_y$ ) of households in the economy. Table 13 expresses the equilibrium results in the case of neutral government revenue.

Table 13: Change in Taxation with Revenue Neutrality

	Benchmark	Tax Changes	Revenue Neutrality	Revenue Output Ratio Neutrality
Capital used by pass-through entities(%)	15.5	18.4	18.1	17.3
Production from pass-through entities(%)	22.4	25.3	25.1	24.2
$\frac{\Delta Model}{\Delta Data}$ ( %)		14.1	13.0	8.2
Interest Rate(%)	5.14	4.85	4.89	5.02
Output Change(%)		3.6	3.3	2.7
PT. entities in the non-retired pop.( %)	6.5	7.1	7.1	6.6
Debt to Equity Ratio	0.38	0.41	0.41	0.41
Government Revenue to Output Ratio(%)	24.6	23.4	23.8	24.6
Tax Gap to Output Ratio(%)	0.3	0.2	0.2	0.2
Resource Allocated to Tax Avoidance (Relative to Output)(%)	0.20	0.09	0.11	0.13

*Notes:* Table 13 reports three different stationary equilibria in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where the both corporate tax and tax progressivity mitigate the 2015 level, 14.5%, and 0.095, respectively. Column III illustrates the combination of both tax changes happened in 2015 at the revenue neutralized level. The economic variable  $\frac{\Delta Model}{\Delta Data}$  stands for the change in model in the output share of pass-through entities relative to change in the output share of pass-through entities in the US observed between 1985 and 2015. *Av. income of PT. entities to worker ratio* refers to the average income of pass-through entity owners relative to worker average income while *PT. entities in the non-retired pop.* stands for the percentage share of pass-through entities in the non-retired population.

Adjusting government revenue relative to output decreases the reallocation of output

towards pass-through entities to 8.2%. This decline is primarily driven by the decision of relatively small business owners to transition into workers, resulting in a reduction of the share of business owners by approximately 0.5 percentage points. Additionally, there is a decrease in both aggregate production and capital accumulation within the economy. This can be attributed to the fact that the increased average tax rate affects both workers and pass-through owners, leading to reduced savings and decreased investment in their respective businesses.

## 8 Policy Experiment: Introducing a Wealth Tax

Recent studies have brought attention to the substantial increase in wealth inequality within the United States, sparking normative controversies among economists and policy-makers regarding the appropriate taxation of ultra-wealthy households. [Guvenen et al. \(2019\)](#) have shed light on the potential of wealth taxes to significantly enhance welfare and alleviate wealth inequality. On the other hand, [Rotberg and Steinberg \(2021\)](#) find that the presence of offshore tax evasion might result in only marginal or even declining increases in tax revenues, accompanied by persistent inequality and welfare losses.

In this section, I use the model economy to explore the implications of a wealth tax on the wealthiest top 5% of households, taking into account the challenges posed by tax avoidance for pass-through entities. A primary motivation for conducting this examination stems from the fact that pass-through business owners contribute disproportionately to the concentration of wealth in the United States. As a result, I introduce a proportional wealth tax set at 1% and 3%, applicable to all wealth levels above a designated threshold, for individuals falling within the top 5% wealth bracket. Table [14](#) presents the 2015 economy in Column I, encompassing all changes that occurred in the US while Column II and Column III shows the stationary equilibria of implementing a wealth tax targeted at the top 5% of the wealthiest households, at rates of 1% and 3%, respectively.

The results suggest that 3% marginal wealth tax on the top 5% wealthiest households leads to a 1.7% decrease in the aggregate output in the economy. This is driven by the fact that the wealth tax distorts capital accumulation and increases the rental rate of capital, implying to the decline in the factor demands for the corporate sector and pass-through businesses. However, the taxation on the wealthiest individuals increases the share of pass-throughs, thus increasing their production share in the economy. This outcome is driven by the substantial distortion caused by the wealth tax in the savings decisions of wealthy workers and by being able to avoid their tax payments out of their business income, causing some workers to transition into business ownership. Nonetheless, the rise in the pass-throughs leads

Table 14: Wealth Tax on Top 5%

	2015 Economy	$\tau_w = 1\%$	$\tau_w = 3\%$
Production from pass-through entities(%)	27.8	28.0	28.2
Interest Rate(%)	4.84	5.07	5.16
Output	100	98.7	98.3
PT. entities in the non-retired pop.( %)	7.7	7.8	7.8
Government Revenue	100	98.4	97.8
Government Revenue to Output Ratio(%)	23.2	23.1	23.1
Tax Gap	100	110.3	111.2
Tax Gap to Output Ratio(%)	0.61	0.69	0.70
Resource Allocated to Tax Avoidance	100	110.9	110.9
Resource Allocated to Tax Avoidance (Relative to Output)(%)	0.38	0.42	0.42

*Notes:* Table 14 reports three different stationary equilibria in each column. The benchmark economy in column I shows the stationary equilibrium where net-tax gap, debt-to equity ratio, and tax structures imitate 2015 economy. Column II and III indicate the new stationary equilibria where wealth tax is implemented by 1% and 3% on the wealthiest 5% of the households.

to a decline in the productivity of pass-throughs, as well as reduced factor demands from pass-through business owners, leading them to operate relatively smaller-scale businesses.

Tax avoidance channel also impacts pass-throughs' productivity. With the presence of wealth taxation on top, incumbent business owners increase their resources on the tax avoidance activities and reduces their production levels. With a lower level of production, therefore, their likelihood of being detected decreases. Additionally, new business owners, switched from workers, contribute to the rise in tax avoidance activities. Therefore, resource allocated to tax avoidance activities rises by 10.9% relative to the benchmark economy, and its ratio relative to output increases to 0.42%. Moreover, the higher level of tax avoidance rises the ratio of the net tax gap to output to 0.7% and the net tax gap relative to the benchmark economy increased by 11.2%, relative to the benchmark economy.

Introducing wealth tax does not generate additional government revenue in the stationary equilibrium. Instead, 3% marginal wealth tax on top 5% decreases the government revenue by 2.2% as [Guner et al. \(2023\)](#). Wealthiest households decrease their savings in response to the introduction of marginal wealth tax and increases their consumption for today which reduces the capital-labor ratio for C-corporations. Due to general equilibrium effects, the wage rate in the economy falls and this causes a reduction in revenue collected from workers by 2.2%. Moreover, wealthiest business owners increases their tax avoidance activities with a lower rate

of capital investments due to the rise in the cost of capital which reduces their probability of detection. Although there were new business owners, the revenue collected from pass-throughs falls by 1.9%. Altogether, these factors lead to a decrease in the government's overall revenues.

## 9 Conclusion

I document a striking feature of the US economy that there has been a reallocation of output towards pass-through entities, accompanied by a sharp fall in the output of C-corporations since the 1980s. This reallocation has resulted in a one-fourth decrease in the share of output attributed to C-corporations, while the share of pass-through entities has doubled. To examine the underlying forces driving this output reallocation, I develop a dynamic growth model with an occupation choice and entrepreneurial risk, in which a pass-through business owner can avoid taxes. Producing the same goods from pass-through entities and C-corporations, the model replicates the crucial features of the US, including the share of pass-through entities, the share of production of pass-through entities, debt-to-equity ratio based on the tax levels observed in 1985. My quantitative results suggest that the change in tax level in 2015 accounts for the 14.1% change in the output share of pass-through entities in the US. This reallocation process is primarily driven by two influential forces: the emergence of new pass-through business owners, and a notable increase in production from both large and small firms.

The impact of tax avoidance on the observed reallocation of output in the US is found to be relatively modest, explaining only 3% of the overall shift. However, when combined with tax changes, the collective effect accounts for a more substantial 17.3% of the output reallocation. It is worth noting that while tax changes and tax avoidance can individually contribute to increased production, their combined impact is lower than the effect achieved solely through tax changes. This suggests that tax policy adjustments play a more dominant role in aggregate output but tax avoidance mitigates this gain. Furthermore, the presence of borrowing constraints plays a quantitatively significant role in shaping the production levels and output share of pass-through entities. The model demonstrates that the relaxation of borrowing constraints, which replicates changes observed in the US economy, contributes to approximately 10.1% of the reallocation solely through this channel. This underscores the importance of considering financial constraints when analyzing the dynamics of business formation and output distribution.

To assess the impact of regulatory changes, I analyze a scenario where overhead costs for pass-through entities decline. The results indicate that a 30% reduction in overhead costs can

account for approximately 7% of the observed output reallocation in the US. Additionally, I examine the effects of variations in the deductibility of depreciation and debt. The findings show that a lower rate of deductibility of depreciated capital leads to a higher reallocation of output across legal forms after tax changes, while a higher rate of debt deductibility results in a lower percentage rate of reallocation.

The combination of tax changes, tax avoidance, relaxation of borrowing constraints, and regulatory adjustments collectively account for more than one-fourth of the observed change in the output share of pass-through entities. Altogether, this raises another question: What factors could have contributed to this change apart from tax-related factors, tax avoidance, and borrowing capacity?

One potential explanation for these dynamics lies in the distinct responses of different sectors to these changes. While I document an overall increase in the gross output of pass-through entities across sectors, it aligns with the findings presented in [Dyrda and Pugsley \(2023\)](#), which suggest that the shift in organizational form is a widespread phenomenon spanning various industries and geographic regions. However, it is essential to note that this shift in output was not uniform across sectors. During this period of structural transformation within the U.S. economy, there was a notable increase in the share of the services sector, rising from 58.5% to 67.2%, as illustrated in [Figure B.13](#). In parallel with this shift, the rise in pass-through entities was particularly pronounced within the service sector. For instance, the gross output share of pass-throughs in wholesale and retail trade surged from 18% to over 40%, while the transportation and public utility sector witnessed an increase from 5% to nearly 40%. Meanwhile, the service sector experienced a substantial increase from 40% to 60% within its respective industries. Remarkably, approximately 70% of the shift in gross output can be attributed to the service sector, while in manufacturing and agriculture, the contributions are 29% and 1%, respectively. Further analysis presented in [Appendix D](#) indicates that if we maintain sectoral shares at the 1985 levels, 57.1% of the shift can be attributed to the service sector, with 41.4% to manufacturing and 1.5% to agriculture. [Smith et al. \(2019a\)](#) provide compelling evidence that pass-throughs owned by the top 0.1% primarily operated as single-establishment entities in professional services or health services. For instance, their research reveals that a typical firm owned by the top 0.1% is a business with \$20 million in sales and 100 employees, akin to a large law firm or beverage distributor. These findings indicate the complementary effect of structural changes in contributing to the rise of pass-through entities.

The surge in productivity growth within the pass-through sector can also be attributed to the rise in the pass-throughs. As highlighted by [Barro and Wheaton \(2020\)](#), the total factor productivity (TFP) between 1995 and 2004 exhibited an unusually high growth rate



of 2% annually, with the increase in the productivity of pass-throughs contributing at a rate of 0.77% per year. They assert that this phenomenon is driven by the innovation of limited liability companies, which, in turn, alters various other types of legal forms. Additionally, [Dyrda and Pugsley \(2019\)](#) provide substantial evidence illustrating a notable increase in the average size of pass-through entities. Specifically, mean size of partnerships experienced a rise from 8.4 to 18.4, S-corporations increased from 10.7 to 12.0, and sole proprietors rose from 3.9 to 5.5 during the period from 1980-1984 to 2005-2009. Conversely, mean size of C-corporations decreased from 23.1 to 19.1 during the same period. Furthermore, I document that, in [Table A.3](#), the share of firms with an employment size exceeding 500 employees increased from 0.88% to 2.47% between 1989 and 2016. These changes demonstrate that changes in the distribution of pass-through entities, their average size, and their productivity levels can substantially enhance the economic activities within the pass-through sector. I leave these and other issues for further research.

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# A Tables

Table A.1: Examined Schedule C Tax Returns by Income Bracket

Income Bracket(\$)	Examined Tax Return(%)
A. Tax Year 1990	
0-31.875K	1.36
31.875K-127.5K	1.86
127.5K+	3.38
B. Tax Year 1995	
0-27.325K	5.85
27.325K-109.3K	3.08
109.3K+	3.47
B. Tax Year 2000	
0-24.175K	2.43
24.175K-96.7K	0.93
96.7K+	1.48
B. Tax Year 2005	
0-21.325K	3.68
21.325K-85.3K	2.21
85.3K+	3.65
B. Tax Year 2010	
0-19.1K	1.2
19.1K-76.4K	2.5
76.4K-152.8K	4.7
152.8K+	3.3

*Sources:* Internal Revenue Service Table 9A: Examination Coverage and author's calculation. *Notes:* Income Brackets are converted to 1999 US dollars.

Table A.2: IRS costs relative to Government Revenue over Time

Year	1985	1990	1995	2000	2005	2010	2015
IRS Operating Cost (%)	0.49	0.53	0.55	0.41	0.48	0.57	0.35
IRS Examination Cost(%)	0.24	0.23	0.18	0.12	0.19	0.22	0.12

*Sources:* Internal Revenue Service Table 9A: Examination Coverage and author's calculation.

Table A.3: Firm Size Distribution for Pass Throughs (Owner's Age 25-65)

	1989	2016
Employment size 0-9	81.63	80.47
Employment size 10-19	7.08	7.16
Employment size 20-99	6.18	7.16
Employment size 100-499	4.24	2.73
Employment size 500+	0.88	2.47

*Sources:* SCF 1989 and SCF 2016

Table A.4: Additional Results for Tax Changes

	Benchmark	Corporate Tax	Tax Progressivity	Both Taxes
Capital in C	3.81	3.95	3.85	4.00
Capital in PT	0.70	0.66	0.90	0.90
Labor in C	0.71	0.72	0.685	0.689
Labor in PT	0.14	0.13	0.166	0.162
Output in C	1.30	1.33	1.276	1.299
Output in PT	0.376	0.36	0.445	0.44
Aggregate Capital	4.51	4.61	4.75	4.91
Aggregate Labor	0.857	0.858	0.851	0.852
Aggregate Output	1.679	1.689	1.721	1.739
Net Tax Gap	0.0057	0.0054	0.0030	0.0027
Resource Allocated to Tax Avoidance	0.0039	0.0036	0.0022	0.0020

*Notes:* Table A.4 reports four different stationary equilibrium in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where the only corporate tax rate decreased the 2015 level, 14.5%. Column III shows the stationary equilibrium with the change of tax progressivity only, 0.095 in 2015. The last column illustrates the combination of both tax changes that happened in 2015. C stands for C-corporations while PT stands for pass-through entities.

Table A.5: Additional Results for Tax Avoidance

	Benchmark	Tax Changes	Tax Avoidance	Both Changes
Capital in C	3.81	4.00	3.81	3.955
Capital in PT	0.70	0.90	0.715	0.909
Labor in C	0.71	0.689	0.705	0.679
Labor in PT	0.14	0.162	0.15	0.169
Output in C	1.30	1.299	1.294	1.281
Output in PT	0.376	0.44	0.386	0.45
Aggregate Capital	4.51	4.91	4.53	4.864
Aggregate Labor	0.857	0.852	0.854	0.849
Aggregate Output	1.679	1.739	1.68	1.731
Net Tax Gap	0.0057	0.0027	0.0109	0.0105
Resource Allocated to Tax Avoidance	0.0039	0.0020	0.0065	0.0065

*Notes:* Table A.5 reports four different stationary equilibrium in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where both tax rates pertains to 2015 level. Column III shows the stationary equilibrium with the change of the variable cost of tax avoidance parameter,  $B$  from 1 to 0.64, match the net tax gap to output ratio to 0.6%. The last column illustrates the combination of both tax changes and tax avoidance to the 2015 level by changing  $B$  to 0.45. C stands for C-corporations while PT stands for pass-through entities.

Table A.6: Additional Results for Borrowing Constraints

	Benchmark	10% Rise	20% Rise	Capacity to Borrow to Match Data
Capital in C	3.81	3.73	3.63	3.72
Capital in PT	0.70	0.77	0.84	0.78
Labor in C	0.71	0.697	0.684	0.696
Labor in PT	0.14	0.157	0.168	0.158
Output in C	1.30	1.275	1.248	1.273
Output in PT	0.376	0.409	0.439	0.412
Aggregate Capital	4.51	4.50	4.48	4.50
Aggregate Labor	0.857	0.854	0.852	0.854
Aggregate Output	1.679	1.684	1.686	1.685
Net Tax Gap	0.0057	0.0055	0.0053	0.0056
Resource Allocated to Tax Avoidance	0.0039	0.0037	0.0036	0.0037

*Notes:* Table A.6 reports four different stationary equilibria in each column. The benchmark economy in column I shows the results in which the borrowing limit is calibrated to 1985 pass-through entities' debt-to equity ratio. Column II and III indicate the new stationary equilibria where the capacity to borrow is increased by 10% and 20% more relative to benchmark economy. Column IV illustrates stationary equilibrium in which borrowing limit is calibrated to 2015 pass-through entities' debt-to equity ratio, 0.50. C stands for C-corporations while PT stands for pass-through entities.

Table A.7: Additional Results for Tax and Borrowing Constraints

	Benchmark	Tax Changes	Borrowing Changes	Both Tax and Borrowing Changes
Capital in C	3.81	4.00	3.74	3.93
Capital in PT	0.70	0.90	0.77	0.966
Labor in C	0.71	0.689	0.70	0.679
Labor in PT	0.14	0.162	0.156	0.172
Output in C	1.30	1.299	1.278	1.277
Output in PT	0.376	0.44	0.406	0.466
Aggregate Capital	4.51	4.91	4.51	4.896
Aggregate Labor	0.857	0.852	0.854	0.85
Aggregate Output	1.679	1.739	1.68	1.743
Net Tax Gap	0.0057	0.0027	0.0055	0.0026
Resource Allocated to Tax Avoidance	0.0039	0.0020	0.0037	0.0019

*Notes:* Table A.7 reports four different stationary equilibria in each column. The benchmark economy in column I shows the results in which the borrowing limit is calibrated to 1985 pass-through entities' debt-to equity ratio. Column II indicates the new stationary equilibrium where the tax changes take place. Column III shows the stationary equilibrium in which borrowing limit is calibrated to 2015 pass-through entities' debt-to equity ratio, 0.50. Column IV illustrates the stationary equilibrium where the borrowing limit is calibrated to 2015 pass-through entities' debt-to equity ratio under the 2015 tax rates. C stands for C-corporations while PT stands for pass-through entities.

Table A.8: Additional Results for Overhead Costs

	Benchmark	15% fall in Overhead Costs	30% fall in Overhead Costs
Capital in C	3.81	3.763	3.759
Capital in PT	0.70	0.74	0.757
Labor in C	0.71	0.703	0.698
Labor in PT	0.14	0.151	0.154
Output in C	1.30	1.286	1.279
Output in PT	0.376	0.395	0.404
Aggregate Capital	4.51	4.503	4.517
Aggregate Labor	0.857	0.854	0.852
Aggregate Output	1.679	1.681	1.684
Net Tax Gap	0.0057	0.0051	0.0052
Resource Allocated to Tax Avoidance	0.0039	0.0034	0.0034

*Notes:* Table A.8 reports three different stationary equilibria in each column. The benchmark economy in column I shows the results in which there is no reduction in overhead cost. Column II and III indicate the new stationary equilibrium where there is a decline in overhead costs by 15% and 30%, respectively. C stands for C-corporations while PT stands for pass-through entities.



Table A.9: Additional Results for All Channels

	Benchmark	Change in All	Change in All 30% Fall in Overhead Costs
Capital in C	3.81	3.873	3.83
Capital in PT	0.70	0.988	1.03
Labor in C	0.71	0.665	0.654
Labor in PT	0.14	0.182	0.189
Output in C	1.30	1.254	1.236
Output in PT	0.376	0.483	0.504
Aggregate Capital	4.51	4.86	4.859
Aggregate Labor	0.857	0.846	0.844
Aggregate Output	1.679	1.737	1.740
Net Tax Gap	0.0057	0.0107	0.0113
Resource Allocated to Tax Avoidance	0.0039	0.0066	0.0070

*Notes:* Table A.9 reports three different stationary equilibria in each column. The benchmark economy in column I shows the results in which there is no reduction in overhead cost. Column II and III indicate the new stationary equilibrium where there is a decline in overhead costs by 15% and 30%, respectively. C stands for C-corporations while PT stands for pass-through entities.

Table A.10: Additional Results for Depreciation

	Benchmark	Tax Changes	Tax Changes & Borrowing Changes	With Tax Avoidance
Capital in C	3.81	4.00	3.955	3.84
Capital in PT	0.663	0.87	0.933	0.956
Labor in C	0.712	0.686	0.674	0.658
Labor in PT	0.145	0.165	0.175	0.186
Output in C	1.302	1.294	1.274	1.242
Output in PT	0.377	0.449	0.476	0.497
Aggregate Capital	4.474	4.869	4.888	4.796
Aggregate Labor	0.857	0.851	0.849	0.844
Aggregate Output	1.679	1.743	1.75	1.739
Net Tax Gap	0.0055	0.0024	0.0025	0.0105
Resource Allocated to Tax Avoidance	0.0037	0.0017	0.0018	0.0063

*Notes:* Table A.10 reports four different stationary equilibria in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where the both corporate tax and tax progressivity mimic the 2015 level, 14.5%, and 0.095, respectively. Column III shows the stationary equilibrium in which borrowing limit is calibrated to 2015 pass-through entities' debt-to-equity ratio with tax changes. Column IV illustrates the stationary equilibrium where all changes take place. C stands for C-corporations while PT stands for pass-through entities.

Table A.11: Additional Results for Debt

	Benchmark	Tax Changes	Tax Changes & Borrowing Changes	With Tax Avoidance
Capital in C	3.804	4.028	3.94	3.91
Capital in PT	0.769	0.91	1.016	1.017
Labor in C	0.714	0.699	0.683	0.674
Labor in PT	0.144	0.155	0.168	0.175
Output in C	1.303	1.313	1.284	1.269
Output in PT	0.376	0.418	0.455	0.463
Aggregate Capital	4.573	4.938	4.956	4.926
Aggregate Labor	0.858	0.854	0.852	0.849
Aggregate Output	1.679	1.731	1.739	1.733
Net Tax Gap	0.0050	0.0029	0.0028	0.0106
Resource Allocated to Tax Avoidance	0.0033	0.0021	0.0020	0.0062

*Notes:* Table A.11 reports four different stationary equilibria in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where the both corporate tax and tax progressivity mimic the 2015 level, 14.5%, and 0.095, respectively. Column III shows the stationary equilibrium in which borrowing limit is calibrated to 2015 pass-through entities' debt-to-equity ratio with tax changes. Column IV illustrates the stationary equilibrium where all changes take place. C stands for C-corporations while PT stands for pass-through entities.

Table A.12: Additional Results for Revenue Neutrality

	Benchmark	Tax Changes	Revenue Neutrality	Revenue Output Ratio Neutrality
Capital in C	3.81	4.00	3.995	3.977
Capital in PT	0.70	0.90	0.882	0.83
Labor in C	0.71	0.689	0.691	0.699
Labor in PT	0.14	0.162	0.161	0.156
Output in C	1.30	1.299	1.30	1.307
Output in PT	0.376	0.44	0.435	0.417
Aggregate Capital	4.51	4.91	4.877	4.808
Aggregate Labor	0.857	0.852	0.852	0.855
Aggregate Output	1.679	1.739	1.735	1.724
Net Tax Gap	0.0057	0.0027	0.0030	0.0035
Resource Allocated to Tax Avoidance	0.0039	0.0020	0.0022	0.0026

*Notes:* Table A.12 reports three different stationary equilibria in each column. The benchmark economy in column I shows the results in which corporate tax( $\tau_c$ ) and tax progressivity( $\tau_y$ ) are equal to 18.6% and 0.149, respectively. Column II indicates the new stationary equilibrium where the both corporate tax and tax progressivity mitigate the 2015 level, 14.5%, and 0.095, respectively at 1985 government revenue level. Column III illustrates the combination of both tax changes happened in 2015 where revenue output ratio is equal to 1985 level.

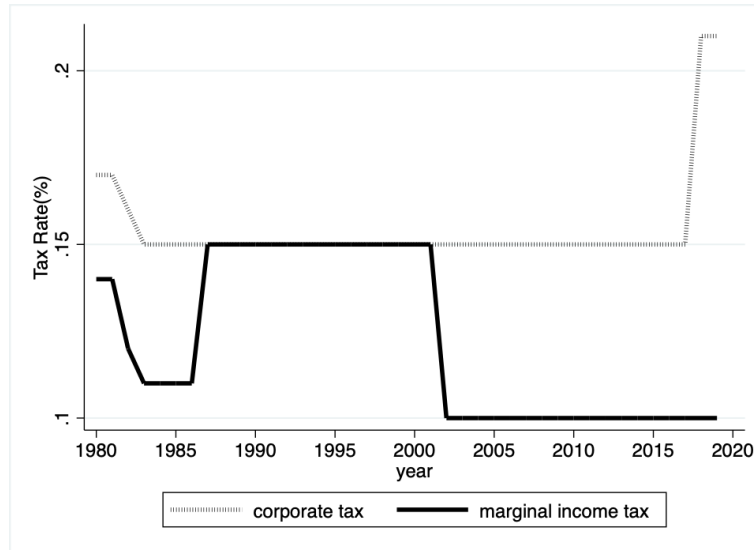
Table A.13: Additional Results for Wealth Tax

	2015 US Economy	$\tau_w = 1\%$	$\tau_w = 3\%$
Capital in C	3.873	3.72	3.67
Capital in PT	0.988	0.956	0.951
Labor in C	0.665	0.662	0.661
Labor in PT	0.182	0.184	0.185
Output in C	1.254	1.233	1.225
Output in PT	0.483	0.481	0.482
Aggregate Capital	4.86	4.68	4.62
Aggregate Labor	0.846	0.845	0.845
Aggregate Output	1.737	1.714	1.70
Net Tax Gap	0.0107	0.0118	0.0119
Resource Allocated to Tax Avoidance	0.0066	0.0073	0.0072

*Notes:* Table A.13 reports three different stationary equilibria in each column. The benchmark economy in column I shows the stationary equilibrium where net-tax gap, debt-to equity ratio, and tax structures imitate 2015 economy. Column II and III indicate the new stationary equilibria where wealth tax is implemented by 1% and 3% on the wealthiest 5% of the households.

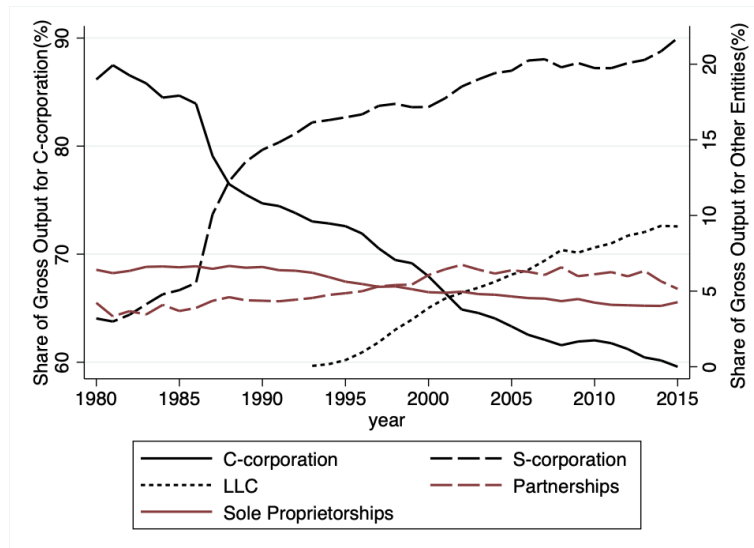
## B Figures

Figure B.1: Marginal Tax Rates for the Bottom Bracket



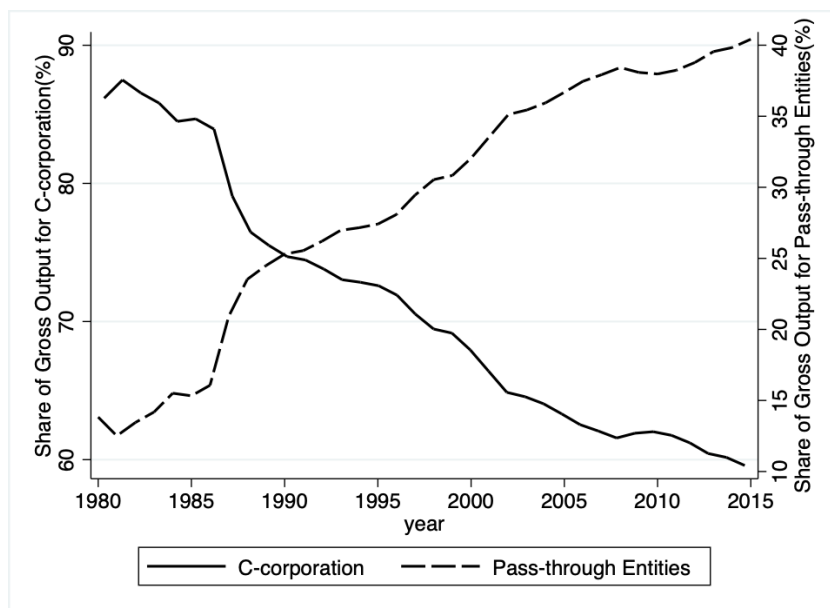
Sources: SOI Tax Stats – Historical Table 23 & 24

Figure B.2: Share of Gross Output for Business Structures



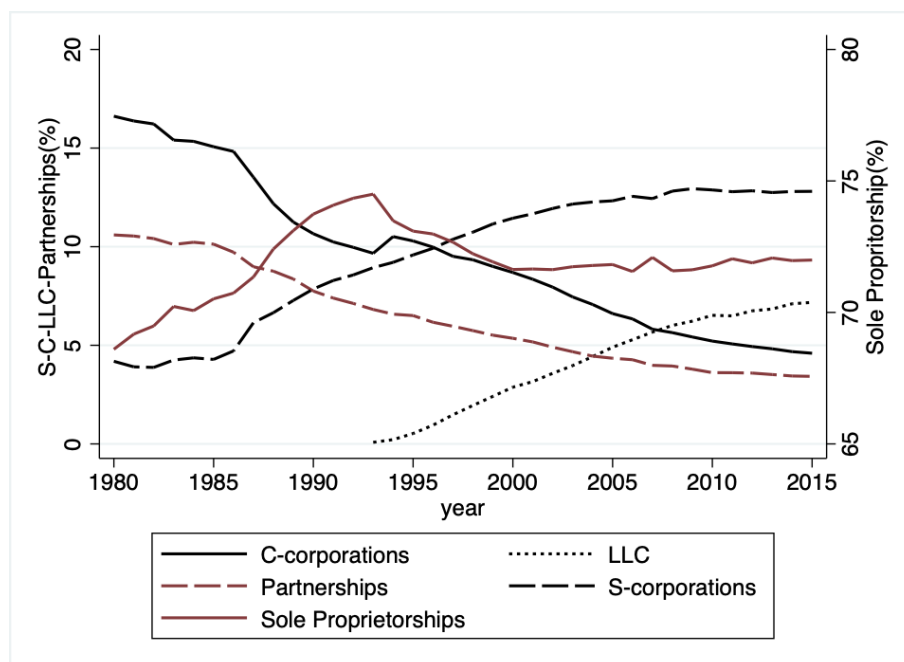
Sources: Internal Revenue Service and author's calculation. Notes: Gross output are calculated from sum of business receipts for different form of businesses. Regulated investment companies (1120-RIC) and Real Estate Investment Trusts(1120-REIT) are excluded.

Figure B.3: Share of Gross Output for Business Structures



*Sources:* Internal Revenue Service and author's calculation. *Notes:* Gross output is calculated as the sum of business receipts for different forms of businesses. Regulated investment companies (1120-RIC) and Real Estate Investment Trusts(1120-REIT) are excluded.

Figure B.4: Share of Businesses



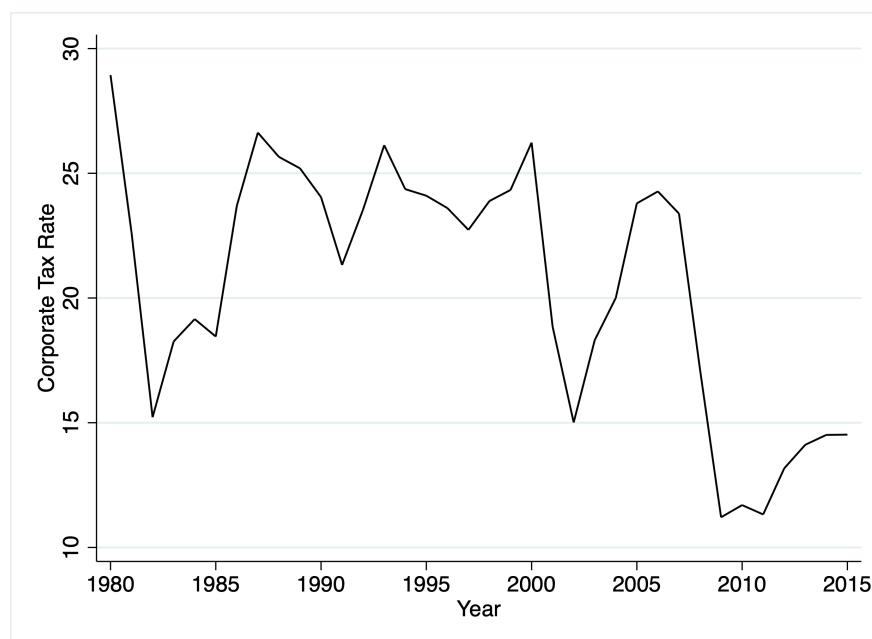
*Sources:* Internal Revenue Service and author's calculation. *Notes:* Share of businesses are calculated from the number of tax returns in the US.

Figure B.5: Share of Gross Value Added of Business Structures Relative to GDP



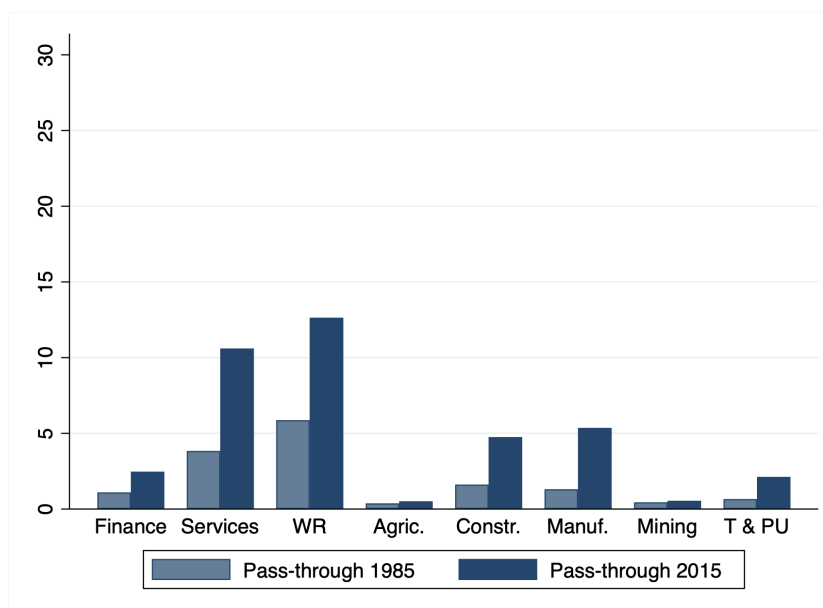
*Sources:* NIPA, IRS SOI and author's calculation *Notes:* Figure B.5 shows gross value added of C-corporations and pass-through entities.

Figure B.6: Corporate Tax Rate in The US



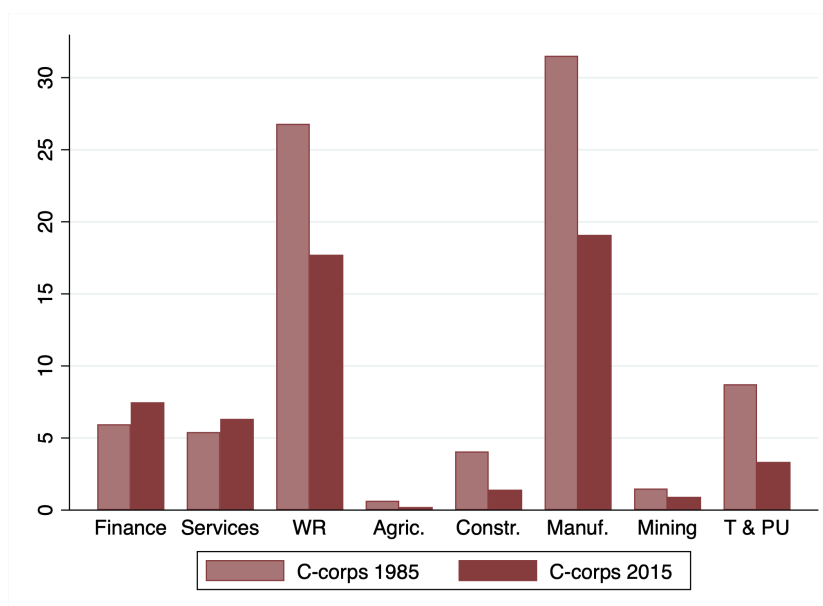
*Sources:* NIPA and author's calculation *Notes:* In order to estimate the corporate tax rates, I follow [McGrattan and Prescott \(2005\)](#). Federal Reserve Bank profits are subtracted since they are taxed at 100 percent. Therefore, the ratio is equal to NIPA profit tax liability (Table 1.16) less Federal Reserve Bank profits (Table 6.16) to the NIPA corporate before-tax profits (Table 1.16) less Federal Reserve Bank profits.

Figure B.7: Share of Sectoral Gross Output of Pass-through Entities Relative to Gross Output



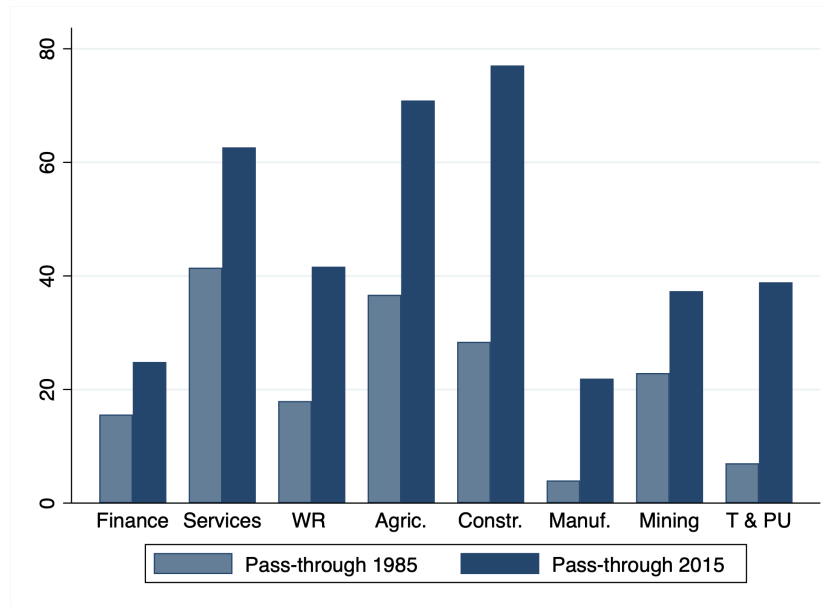
*Sources:* Internal Revenue Service and author's calculation. *Notes:* WR stands for Wholesale and Retailsale Trade, Agric. stands for Agriculture, Constr stands for Construction, Manuf. stands for Manufacturing and T& PU stands for Transportation and Public Utilities.

Figure B.8: Share of Sectoral Gross Output of C-corporations Relative to Gross Output



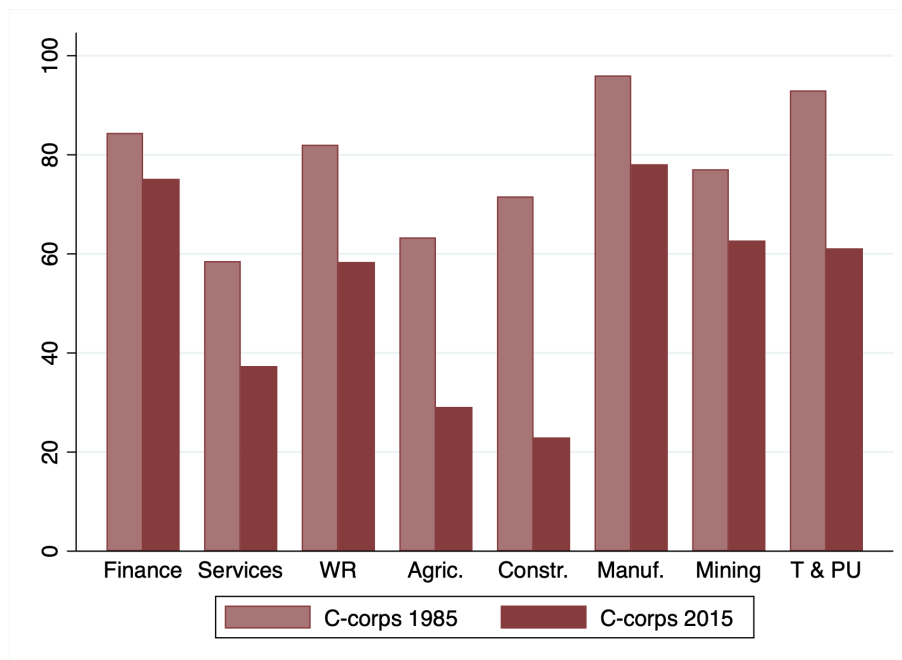
*Sources:* Internal Revenue Service and author's calculation. *Notes:* WR stands for Wholesale and Retailsale Trade, Agric. stands for Agriculture, Constr stands for Construction, Manuf. stands for Manufacturing and T& PU stands for Transportation and Public Utilities.

Figure B.9: Share of Sectoral Gross Output of Pass-through Entities Relative to Industry Gross Output



*Sources:* Internal Revenue Service and author's calculation. *Notes:* WR stands for Wholesale and Retail Trade, Agric. stands for Agriculture, Constr stands for Construction, Manuf. stands for Manufacturing and T & PU stands for Transportation and Public Utilities.

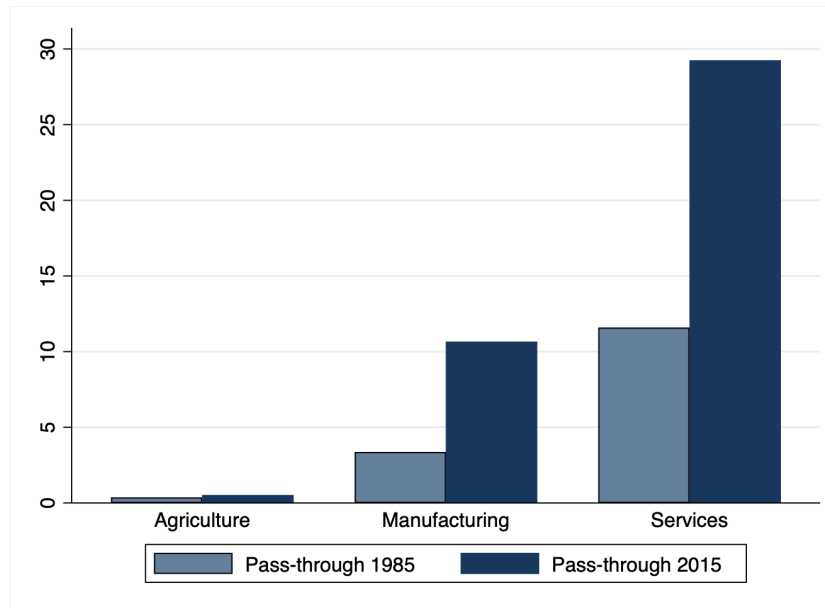
Figure B.10: Share of Sectoral Gross Output of C-corporations Relative to Gross Output



*Sources:* Internal Revenue Service and author's calculation. *Notes:* WR stands for Wholesale and Retail Trade, Agric. stands for Agriculture, Constr stands for Construction, Manuf. stands for Manufacturing and T & PU stands for Transportation and Public Utilities.

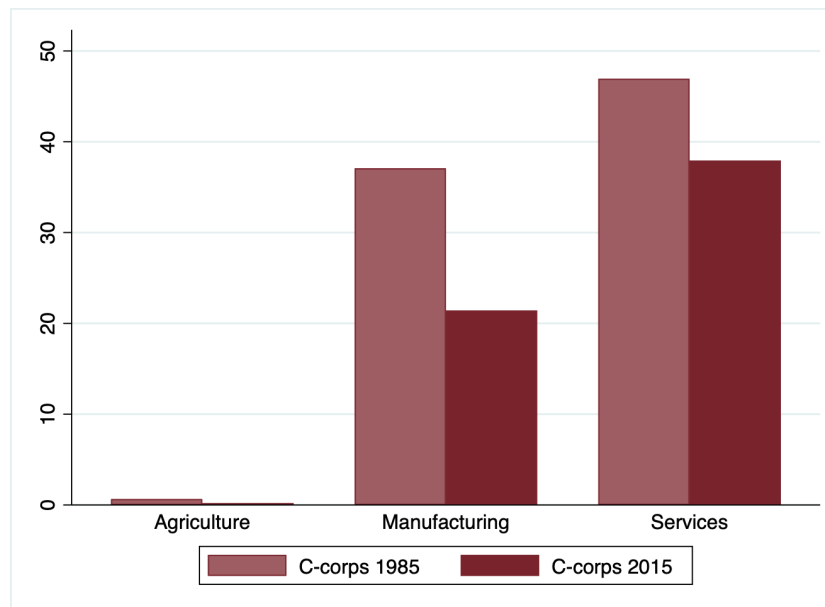


Figure B.11: Gross Output Across Three Sectors for Pass-throughs



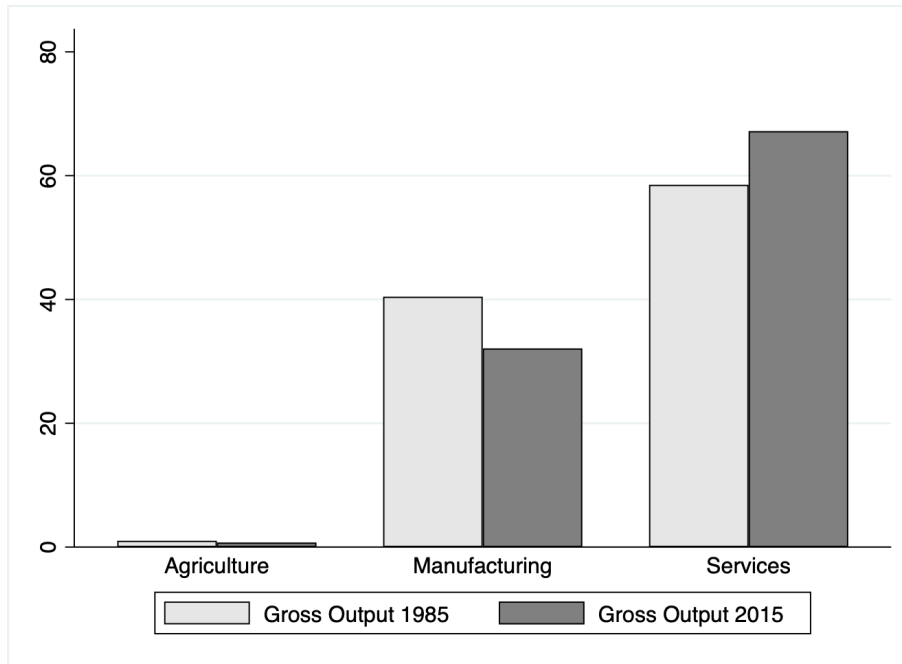
*Sources:* Internal Revenue Service and author's calculation. *Notes:* I define sectors as: agriculture includes farms, fishing, forestry; manufacturing includes construction, manufacturing, and mining; and services includes all other industries (i.e. wholesale, finance, service, trade, transportation, etc.)

Figure B.12: Gross Output Across Three Sectors for C-corporations



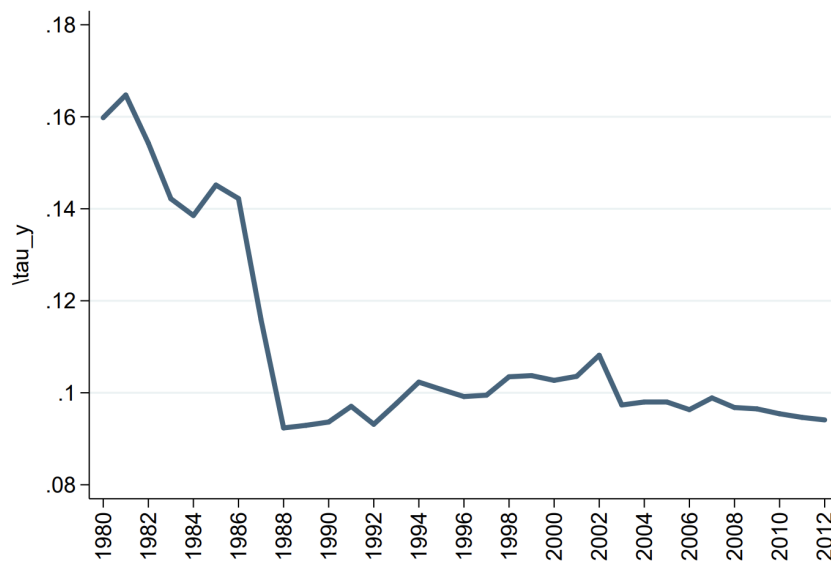
*Sources:* Internal Revenue Service and author's calculation. *Notes:* I define sectors as: agriculture includes farms, fishing, forestry; manufacturing includes construction, manufacturing, and mining; and services includes all other industries (i.e. wholesale, finance, service, trade, transportation, etc.)

Figure B.13: Gross Output Across Three Sectors



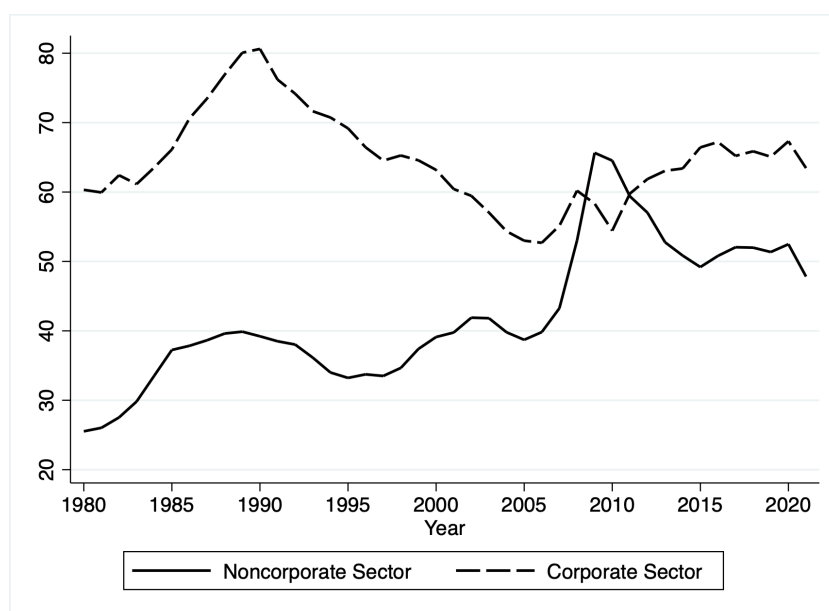
*Sources:* Internal Revenue Service and author's calculation. *Notes:* I define sectors as: agriculture includes farms, fishing, forestry; manufacturing includes construction, manufacturing, and mining; and services includes all other industries (i.e. wholesale, finance, service, trade, transportation, etc.)

Figure B.14: Progressivity of Income Tax Parameter



*Sources:* Dyrda and Pugsley(2018). *Notes:* The figure is retrieved from Dyrda and Pugsley's paper.

Figure B.15: Corporate and Non-corporate Sector's Debt to Equity Ratio



*Sources:* Board of Governors of the Federal Reserve System. *Notes:* Corporate Sector's debt-to equity ratio is based on historical costs.

## C Stationary Recursive Competitive Equilibrium

Let the vector  $q = (a, z, \epsilon)$  consists of state variables. A stationary competitive equilibrium (SRCE) consists of

- set of government policies  $\{\tau_c, T(\cdot), G, p, \kappa\}$
- set of prices  $\{w, r\}$
- decision rules for young business owners  $\{g_a(q), c^e(q), d^e(q), g_n(q), g_k(q), \phi(q)\}$ ,
- decision rules for workers  $\{h_a(q), c_w(q), d_w(q)\}$ ,
- decision rules for retired agents  $\{o_a(q), c_o(q)\}$ ,
- profit functions of business owners  $\hat{\pi}(q)$  and  $\pi(q)$ ,
- value functions  $V(q), V^e(q), V^w(q), W_r(q)$
- labor demand and capital demand for corporate sector  $\{K_c, N_c\}$  and
- distribution of households  $\mu = (\mu_w^*, \mu_e^*, \mu_o^*)$  where  $\mu_e^* = (\mu_e^{*nd}, \mu_e^{*nd})$  with its law of motion function  $H(\mu^*)$  such that

**i)** Given prices and government policies, decision rules for occupation choice for business owners, decision rules for workers, decision rules for old agents, and value functions solve the individuals' problem given by (3), (4), (7), (10) and (11).

**ii)** Given prices and government policies, decision rules for corporate sector solves its problem given by (13).

**iii)** Labor market clears.

$$\int_q \epsilon d\mu_w(q) = L_c + \int_q g_n(q) d\mu_e(q) + \int_q \mathbf{1}_{\phi > 0} (\kappa + C(\phi^*(q)) * f(q)) d\mu_e(q)$$

iv) Capital market clears.

$$\int_q ad\mu_w(q) + \int_q ad\mu_e(q) + \int_q ad\mu_o(q) = K_c + \int_q g_k(q)d\mu_e(q)$$

The labor market-clearing condition (iii) indicates that the left-hand side is aggregate labor in efficiency unit supplied by workers, and the right-hand side is the aggregate demand for labor by C-corporation and pass-through entities. The capital market clearing condition(iv)'s left-hand side is equal to the aggregate capital supply in the economy. The first term is the capital supply of workers, and second and third terms are the capital supply of young and old business owners in pass-through entities, respectively. The last term is capital supply of retired individuals. The right-hand side of (iv) consists of aggregate capital demand by C-corporation and pass-through entities.

v) Corporate sector makes zero profits and prices are competitive:

$$w = (1 - \alpha)\frac{K_c^\alpha}{L_c} \text{ and } r = (1 - \tau_c)[\alpha(\frac{K_c}{L_c})^{\alpha-1} - \delta]$$

vi) Government budget is balanced.

$$\begin{aligned} G = & \tau_c \frac{r}{1 - \tau_c} K_c + \int_q T(w\epsilon)d\mu_w(q) + (1 - \psi_o) \int_q (1 + r)ad\mu_o(q) - \int_q pd\mu_o(q) \\ & + \int_q T(\tilde{\pi}(z, a, \phi^*(q)))d\mu_e(q) + \int_q \mathbf{1}_{\phi > 0} \zeta[T(\tilde{\pi}(z, a, 0)) - T(\tilde{\pi}(z, a, \phi^*(q)))]d\mu_e^d(q) \end{aligned}$$

(vii) The distribution is stationary:

$$H(\mu^*) = \mu^* \text{ where the law of motion function is } H(\mu) = \mu'$$

## D Estimation Procedure

### Gross Value Added of Pass-Through Entities

I compute the gross value added using the data from NIPA, following Smith et al. (2021). The corporate sector's gross value added is obtained from NIPA Table 1.14 "*Gross Value Added of Corporate Business (line 1).*" while the non-corporate sector's is estimated using

*"National Income: Sole Proprietorships and Partnerships"* and *"Consumption of Fixed Capital: Sole Proprietorships and Partnerships"*. One limitation of NIPA is that C-corporations and S-corporations are not distinguished. To divide the gross value added, I take the business receipts of S-corporations and C-corporations from IRS SOI and calculate their weights. The business receipts in corporate sector is:

$$\text{Business Receipts in Corporations} = \text{C-corp's Business Receipts} + \text{S-corp's Business Receipts}$$

Using business receipts in corporate sector, I calculate the S-corporation's weight

$$w_S = \frac{\text{Business Receipts in S-corporations}}{\text{Business Receipts in Corporations}}$$

Then using this weight, I calculated the gross value added of S-corporations from NIPA as below:

$$\text{Gross Value Added of S-corporations} = (w_S) \times \text{Gross Value Added of Corporate Sector}$$

Then, I calculate the gross value added of pass-through entities as follows:

$$\text{Gross Value Added (VA) of PT} = \text{Gross VA of S-corp's} + \text{Gross VA of Non-corporate Sector}$$

The ratio of gross value added of PT and C-corporations to GDP is shown in Figure [B.5](#). However, the sum of the ratios are not equal to 1 due to other components in the National Income calculation, such as other private businesses (tax-exempt cooperatives), government enterprises, general government, rest of the world, households, and institutions. Therefore, I calculate the total gross output as the summation of gross value added of C-corporations and pass-through entities as in Figure [1](#).

## Debt-to-Equity Ratio for Pass-through Entities

In order to calculate the S-corporations debt, I calculated the ratio of S-corporations debt relative to corporations using Corporation Income Tax Returns for 1985 from Statistics of Income. The total debt is defined as the sum of accounts payable, mortgages, notes, bonds payable in less than 1 year, loans from shareholders, mortgages, notes, bonds payable in 1 year or more, following Board of Governors of Federal Reserve System Data.

$$\text{Debt in Corporation} = ((1 - w_S) \times \text{C-corporations' Debt}) + (w_S \times \text{S-corporations' Debt})$$

Similarly, I estimated the weight of equity using Corporation Income Tax Returns for 1985 from Statistics of Income.

$$\text{Equity in Corporation} = ((1 - v_S) \times \text{C-corporations' Equity}) + (v_S \times \text{S-corporations' Equity})$$

After finding  $v_S$  and  $w_s$  I assumed that the ratio found in SOI Data equals to ratio in Board of Governors of Federal Reserve System Data. The debt of S-corporations, then, calculated as:

$$\text{Debt in Pass-Through Entities} = w_S \times \text{Corporate Sector's Debt} + \text{Non-corporate Sector's Debt}$$

Likewise, the equity of pass-through entities equals to

$$\text{Pass-Through Entities' Equity} = v_S \times \text{Corporate Sector's Equity} + \text{Non-corporate Sector's Equity}$$

## Deductibility of Depreciated Capital

The balance sheet of the pass-through entities includes deduction from depreciation. Taking the ratio of deduction in depreciation relative to gross output equals

$$\hat{\delta}_{data} = \frac{\text{Deduction in Depreciation}}{\text{Gross Output}} = \frac{\phi_d \delta k}{\frac{\text{Gross Output}}{\text{Value Added}} \times \text{Value Added}} = \frac{\phi_d \delta}{\frac{\text{Gross Output}}{\text{Value Added}}} \times \left(\frac{K}{Y}\right)_{PT}$$

In the data, this ratio is equal to  $\hat{\delta}_{1985} = 0.048$ .

In 1985, according to NIPA, gross output to value added ratio is equal to

$$\frac{\text{Gross Output}}{\text{Value Added}} = 1.79$$

From the model,  $\delta = 0.06$

Capital-output ratio for pass-through entities under 1985 tax levels:

$$\left(\frac{K}{Y}\right)_{1985} = 1.85$$

This gives the deductibility of depreciated capital parameter to:

$$\phi_{d1985} = 77.4\%$$

## Deductibility of Debt

The balance sheet of the pass-through entities includes deduction from interest paid. Taking the ratio of deduction in interest paid relative to gross output equals

$$\hat{\sigma}_{data} = \frac{\text{Deduction in Debt}}{\text{Gross Output}} = \frac{\phi_r r \max\{k - a, 0\}}{\frac{\text{Gross Output}}{\text{Value Added}} \times \text{Value Added}} = \frac{\phi_r * r * \text{Total Debt of PT}}{\frac{\text{Gross Output}}{\text{Value Added}} \times \text{Value Added}}$$

In the data, this ratio is equal to  $\hat{\sigma}_{1985} = 0.0387$ .

In 1985, according to balance sheets of pass-through entities

$$\frac{\text{Total Debt}}{\text{Value Added}} = \frac{974.718}{707.12} = 1.3784$$

In 1985, according to NIPA, gross output to value added ratio is equal to

$$\frac{\text{Gross Output}}{\text{Value Added}} = 1.79$$

This gives the deductibility of debt parameter to:

$$\phi_{r1985} = \frac{0.039 * 1.79}{0.052 * 1.38} = 97.3\%$$

## Analysis on The Gross Output Shift Across Sectors

Between 1985 and 2015, the share of gross output of pass-throughs increased from 15.3% to 40.4%. In the same period, the share of service sector rose from 58.5% to 67.2%. Let the share of service sector,  $s_i$  for year  $i$ . To estimate the counterfactual share of gross output, I use the following equation:

$$\text{Counterfactual PT Share in Service Sector} = s_{1985} \times \text{Share of PT in Service Sector in 2015}$$

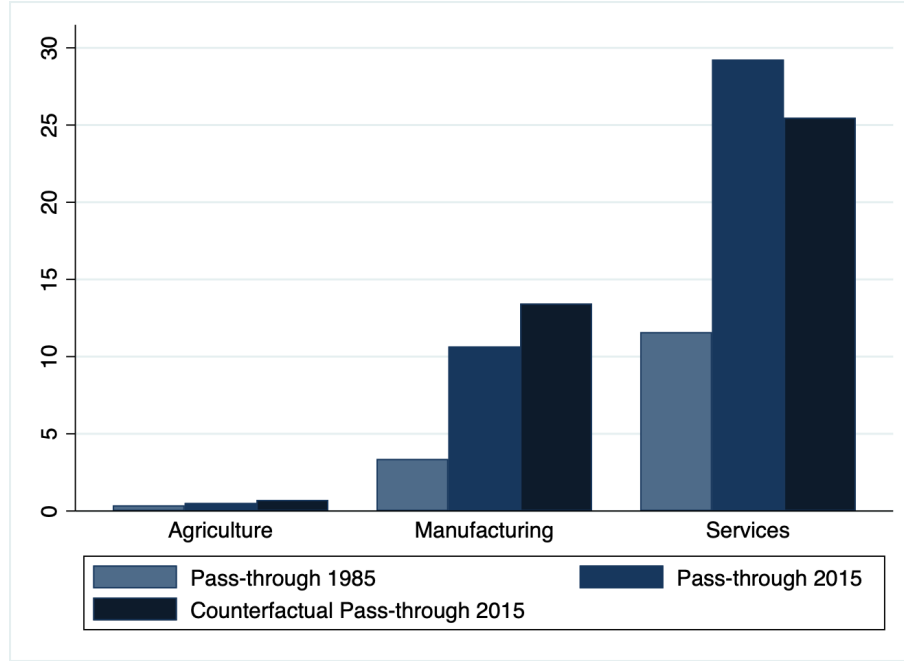
$$\text{Counterfactual PT Share in Service Sector} = 58.5\% \times 44\% = 25.5\%$$

Following the same logic, counterfactual PT share of manufacturing sector is 13.4% and that of agricultural sector is 0.7%. This makes the overall pass-through gross output to 39.6% which is 0.8% lower than the actual gross output. Decomposing the share of service sector in the output shift among legal forms as below

$$\Delta \text{ in PT share in Service} = \frac{\text{Counterfactual PT Share in 2015 in Service} - \text{Actual PT Share in 1985 in Service}}{\text{Counterfactual PT Share in 2015} - \text{Actual PT Share in 1985}}$$



Figure D.1: Counterfactual Gross Output for Pass-throughs



*Sources:* Internal Revenue Service and author's calculation. *Notes:* I define sectors as: agriculture includes farms, fishing, forestry; manufacturing includes construction, manufacturing, and mining; and services includes all other industries (i.e. wholesale, finance, service, trade, transportation, etc.)

$$\Delta \text{ in PT share in Service} = \frac{25.5 - 11.6}{39.6 - 15.4} = 57.1\%$$

In a similar manner, fixing 1985 sector level, the shift in manufacturing sector in pass-throughs accounts for 41.4% of the all shift from C-corporations to pass-throughs. The counterfactual shares imply that share of manufacturing sector increased by 294%, from 3.4% to 13.4%, that of agriculture rose by 94% from 0.37% to 0.72%, and service sector increased by 119% from 11.6% to 25.5%.

## E Major Changes in the US Tax Law

### 1986 Tax Reform Act

This act resulted in significant changes to the tax rates for various income groups and corporations. It reduced the highest tax rate on ordinary income from 50% to 28%, while simultaneously increasing the bottom tax rate from 11% to 15%. Additionally, the number of tax brackets was streamlined, decreasing from 16 to 5 in 1987 and eventually down to 2 in 1988 for single individuals. Other tax brackets for different groups are shown in Figure

## E.5.

Furthermore, the act had notable implications for corporations. The top corporate marginal tax rate was reduced from 50% to 34%. It also brought about the elimination of the investment tax credit and the extension of capital cost recovery periods. Moreover, the act included provisions to gradually introduce the deductibility of health insurance costs for self-employed individuals. In addition to these changes, the act introduced a new low-income housing tax credit and further phased in the deductibility of health insurance costs for self-employed individuals.

## **Omnibus Budget Reconciliation Act of 1990**

The main driving force behind the act was to reduce the deficit, as mentioned in Romer and Romer (2009). One of the significant changes implemented by the act was an increase in the top marginal tax rate to 31%.

Several adjustments were made to the payroll tax rates, including raising the cap on taxable wages for Hospital Insurance (Medicare) from \$53,400 to \$125,000. Additionally, the act extended social security taxes to state and local employees who did not have other pension coverage and imposed a 0.2 percent unemployment insurance surtax. (“Major Enacted Tax Legislation, 1990-1009,” n.d.).

The act also focused on extending expiring provisions, such as tax credits for research and exploration, low-income housing, business energy, targeted jobs, and orphan drugs. It also included tax exemptions for mortgage revenues and issued bonds, as well as exclusions for employer-provided legal and educational assistance. Moreover, the act extended the 25 percent health insurance deduction for self-employed individuals and introduced new energy producer tax benefits, including extensions for non-conventional fuels credit, tax incentives for ethanol production, and amendments to percentage depletion. A specific credit was created to support small businesses in accommodating disabled persons. (“Major Enacted Tax Legislation, 1990-1009,” n.d.).

Furthermore, the act provided extensions for various aspects, such as the targeted jobs credit, mortgage revenue bonds exemption, qualified small issue bond exemption, energy investment credit for geothermal property, deduction for health insurance costs of self-employed individuals, employer-provided group legal services, and exclusion for amounts received under qualified group legal services plans. An important requirement introduced by the act was for S corporations to make estimated tax payments for certain taxes.

## **Omnibus Budget Reconciliation Act of 1993**

There were important tax changes in this act. Individual income tax rates were raised, introducing new higher tax brackets of 36 percent and 39.6 percent. Additionally, the itemized deduction limitation and the personal exemption phase-out, which were initially legislated in OBRA 1990, were permanently extended. Also, the corporate tax rate was increased to 35 percent, but this rate applied only to income exceeding \$10 million. (“Major Enacted Tax Legislation, 1990-1009,” n.d.).

Furthermore, the cap on the Hospital Insurance (HI) tax base, previously set at \$135,000 in 1993, was completely repealed, resulting in the HI tax being applicable to all income. There was an expansion of Social Security benefit taxation. The taxable portion of Social Security benefits increased from 50 percent to 85 percent for individuals with modified AGI above \$44,000 for joint returns and \$34,000 for single returns. (“Major Enacted Tax Legislation, 1990-1009,” n.d.).

To generate additional revenue, there was an increase in motor fuels tax by 4.3 cents per gallon, and the existing motor fuels tax of 2.5 cents per gallon was extended. The deduction for business meals and entertainment expenses was reduced. Furthermore, the Earned Income Tax Credit (EITC) was expanded to cover single workers with no children earning \$9,000 or less. (“Major Enacted Tax Legislation, 1990-1009,” n.d.).

## **Small Business Job Protection Act of 1996**

The act led to an increase in small business expensing, raising the limit for qualified depreciable property from \$17,500 to \$25,000, allowing for immediate write-off. It also introduced a Social Security tax credit, which applies to the Social Security taxes paid in relation to employee cash tips. (“Major Enacted Tax Legislation, 1990-1009,” n.d.).

As part of the act’s provisions, there were simplifications made to pension-related matters. These included allowing contributions to a spousal IRA for a non-working spouse, effectively doubling the potential maximum contributions from \$2,000 to \$4,000 for eligible participants. The act also streamlined distributions from small business pension plans and tightened nondiscrimination provisions. Furthermore, the special aggregation rules that applied to self-employed individual plans were eliminated, and there was a reform of miscellaneous pension rules affecting state and local, special job-status, or professional individuals. (“Major Enacted Tax Legislation, 1990-1009,” n.d.).

The act brings about several changes to S corporation regulations, expanding the number of allowable shareholders from 35 to 75. According to Congress Report, some specific amendments for S corps are below:

*(Sec. 1302) Permits an electing small business trust as a shareholder.*

*(Sec. 1304) Permits financial institutions to hold safe harbor debt.*

*Revises S corporation provisions concerning: (1) the post-death qualification period; (2) the rules relating to inadvertent terminations and invalid elections; (3) an agreement to terminate the taxable year; (4) the post-termination transition period; and (5) the treatment of distributions during loss years.*

*(Sec. 1310) Provides: (1) subject to exception, for the application of Subchapter C rules to an S corporation and its shareholders; (2) for the elimination certain earnings and profits; (3) for the carryover of disallowed losses and deductions under at-risk rules; and (4) adjustments to the basis of inherited S stock to reflect certain items of income.*

*(Sec. 1314) Makes applicable to S corporations the rules applicable to individuals with respect to real property subdivided for sale.*

*(Sec. 1316) Permits certain tax-exempt organizations to become S corporation shareholders.*

*(Sec. 1421) Establishes a simple retirement account matching plan for employees of businesses with 100 or fewer employees. Permits a simple plan under a 401(k) plan.*

*(Sec. 1426) Permits 401(k) plans for tax-exempt organizations.*

## **Health Insurance Portability and Accountability Act of 1996**

The act raises the deduction available for medical insurance expenses for self-employed individuals. Furthermore, the act introduces medical savings accounts, which are similar to Individual Retirement Accounts (IRAs). These accounts allow tax-advantaged accumulation of assets to cover potential medical expenses for employees enrolled in an employer-sponsored high deductible plan (with a minimum deductible, such as \$1,500) of a small employer, as well as self-employed individuals, regardless of the size of the entity they work for. Individual contributions to the medical savings accounts are deductible within certain limits, considered above-the-line deductions in determining Adjusted Gross Income (AGI). Additionally, employer contributions to these accounts are excluded from gross income. (“Major Enacted Tax Legislation, 1990-1009,” n.d.).

## **Taxpayer Relief Act of 1997**

The act brought about a decrease in capital gains tax rates, reducing them from 28 percent and 15 percent to 20 percent and 10 percent, respectively. The act also made several changes to the Alternative Minimum Tax (AMT) regulations. It eliminated the AMT for small businesses, defined as those with an average of less than \$7.5 million in gross receipts over

the previous three years. Additionally, it modified the depreciation adjustment used in the AMT calculation and removed the AMT installment method adjustment for farmers. (“Major Enacted Tax Legislation, 1990-1999,” n.d.). This act also stressed that until July 1, 1998, any taxpayer who was required to adopt the electronic fund transfer system after July 1, 1997, and chose not to use it, will not be subject to penalties. Also, it alters the rules for allocating basis when distributing partnership property. It also removed the condition that inventory must have significantly increased in value to trigger ordinary income in relation to sales and exchanges of partnership interests. Some simplification relating to electing large partnerships, according to law:

*Establishes special rules for large partnerships (100 or more partners) which: (1) take into account separately a partner’s distributive share of specified items for purposes of determining the income tax of a partner; (2) compute the taxable income of a large partnership in the same manner as in the case of an individual, subject to stated exceptions; and (3) provide for the treatment of partnerships holding oil and gas properties.*

*Title XV: Pensions and Employee Benefits - Subtitle A: Simplification -Treats matching contributions for self-employed individuals the same as matching contributions for employees.*

## **Economic Growth and Tax Relief Reconciliation Act of 2001**

The act implemented reductions in individual income tax rates. By the year 2006, it introduced a new 10 percent rate applicable to the first \$12,000 of income for a married couple (\$10,000 for a single head of household and \$6,000 for an individual). After this threshold, the rate of 15 percent takes effect. Additionally, it lowered the 28 percent rate to 25 percent, the 31 percent rate to 28 percent, the 36 percent rate to 33 percent, and the 39.6 percent rate to 35 percent. (“Major Enacted Tax Legislation, 2000-2009,” n.d.)

There were also increases in the contribution limits for retirement savings. The annual contribution limits for Individual Retirement Accounts (IRA) were raised from \$2,000 to \$5,000, and for 401(k) plans, the limits increased from \$10,000 to \$15,000. Moreover, individuals aged 50 and older were allowed to make larger catch-up contributions. The act permitted the introduction of Roth 401(k)s starting in 2006. Additionally, it established a temporary credit for retirement savings for households earning \$50,000 or less. (“Major Enacted Tax Legislation, 200-2009,” n.d.)

For closely held businesses, the act expanded the permissible number of partners or shareholders that can qualify for an extension of estate tax payments. The act also made revisions to the requirements related to plan loans for subchapter S owners, partners, and sole proprietors.

## **Job Creation and Worker Assistance Act of 2002**

This act expanded the depreciation allowances, allowing for an additional first-year depreciation or expensing equal to 30 percent of the adjusted basis of qualified property.

Regarding S corporations, any income resulting from the discharge of indebtedness that is excluded from the S corporation's income will not be considered as income for any shareholder. Consequently, it will not increase the basis of any shareholder's stock in the corporation. Also, changes were made to the requirements for the nonaccrual experience method of accounting. This method is now only applicable for amounts to be received for the performance of qualified services (such as health, law, engineering, architecture, accounting, actuarial science, performing arts, or consulting) and for services provided by certain small businesses.

## **Jobs and Growth Tax Relief Reconciliation Act of 2003**

This act indicate that capital gains were subject to taxation with a rate of 15 percent for most gains and 5 percent for gains of moderate-income taxpayers from 2003 to 2007. In 2008, the rates changed to 15 percent and 0 percent, respectively, and then reverted to the previous law in 2009. Similarly, dividends were taxed with a rate structure of 15 percent for most taxpayers and 5 percent for moderate-income taxpayers from 2003 to 2007. The rates changed to 15 percent and 0 percent in 2008 and then returned to the previous law in 2009.

Regarding certain properties acquired after September 10, 2001, and before September 11, 2004, with the original use commencing after May 5, 2003, the special allowance was revised. The bonus was increased from 30 percent to 50 percent, and the placed-in-service date was extended through January 1, 2005 (and in certain cases, through 2006).

Additionally, the expensing allowance was increased from \$25,000 to \$100,000 for the years 2003 through 2005. The phaseout limit was raised from \$200,000 to \$400,000 for the same period. Furthermore, off-the-shelf computer software placed in service during 2003 through 2005 was included as qualifying property for the expensing allowance. The act provided for inflation adjustments to these provisions. ("Major Enacted Tax Legislation, 200-2009," n.d.)

## **American Jobs Creation Act of 2004**

This act numbers of business incentives and simplifications. Some of these from the law are as follows

*(Sec. 102) Allows a tax deduction of nine percent of the lesser of a taxpayer's quali-*

qualified production activities income or taxable income for the taxable year, beginning in 2010. Phases in the deduction at the rate of three percent in 2005 and 2006 and six percent for 2007, 2008, and 2009. Limits the amount of the deduction to 50 percent of W-2 wages (reportable gross employee wages) paid in a taxable year.<sup>41</sup> Also it sets forth special rules and definitions for qualified production activities income of pass-through entities and agricultural and horticultural cooperatives, and allows the tax deduction for qualified production activities income for purposes of computing alternative minimum taxable income.

(Sec. 201) Extends for two additional years (until 2008): (1) the increased expensing (full deduction of expenses in the taxable year in which the expenses are incurred) of small business assets (up to \$100,000); (2) the increase (to \$400,000) in the cost limitation for small business assets eligible for expensing; (3) the inflation adjustments for the increased expensing amount and the cost limitation amount; and (4) the eligibility period for the expensing of certain computer software.

(Sec. 231) Allows a taxpayer election to treat members of a family as one shareholder for purposes of determining the number of shareholders in an S corporation.

(Sec. 232) Increases the allowable number of S corporation shareholders from 75 to 100.

(Sec. 233) Allows an individual retirement account (IRA), including a Roth IRA, to be a shareholder of a bank that is an S corporation. Exempts, under certain circumstances, the sale of bank stock held by an IRA from rules against prohibited retirement plan transactions.

(Sec. 234) Permits a disregard of unexercised powers of appointment for determining potential current beneficiaries of an electing small business trust (ESBT). Extends from 60 days to one year the period during which an ESBT can dispose of S corporation stock after an ineligible shareholder becomes a potential current beneficiary.

(Sec. 235) Allows a carryover of disallowed losses on S corporation stock resulting from transfers of such stock to a spouse incident to divorce.

(Sec. 236) Allows beneficiaries of a qualified subchapter S trust to deduct certain losses under the at-risk and passive loss rules when such trust sells S corporation stock.

(Sec. 237) Excludes certain interest and dividend income on assets held by a bank S corporation from passive investment income for purposes of applying the excess net passive

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<sup>41</sup>Defines "qualified production activities income" as the excess (if any) of domestic production gross receipts over the sum of the cost of goods sold allocable to such receipts, other deductions, expenses, or losses directly allocable to such receipts, and a ratable portion of other deductions, expenses, and losses that are not directly allocable to such receipts or another class of income. Includes within the definition of domestic production gross receipts qualifying production property (i.e., tangible personal property, any computer software, and certain sound recordings), any qualified film produced by the taxpayer, electricity, natural gas, or potable water produced by the taxpayer in the United States, construction performed in the United States, or engineering or architectural services for projects in the United States, but excludes the sale of certain food and beverages sold at retail and the transmission or distribution of electricity, natural gas, or potable water.

*income rules.*

*(Sec. 238) Allows the waiver of inadvertent invalid qualified subchapter S subsidiary elections and terminations made after December 31, 2004.*

*(Sec. 239) Expands the authority of the Secretary of the Treasury to require informational returns for qualified subchapter S subsidiaries.*

*(Sec. 240) Permits an employee stock ownership plan (ESOP) maintained by an S corporation to make distributions for repayments of loans used to purchase employer securities without incurring tax penalties. Makes this change effective for distributions made after December 31, 1997.*

*(Sec. 338) Allows small business refiners: (1) a current year tax deduction for up to 75 percent of the capital costs incurred in complying with Environmental Protection Agency sulfur regulations; and (2) a business tax credit (five cents per gallon) for the production of low sulfur diesel fuel.*

*(Sec. 340) Allows an additional \$10 million in capital expenditures under the qualified small-issue bond program for bonds issued after September 30, 2009.*

*(Sec. 341) Allows a business tax credit for producing oil and gas from marginal wells.*

*(Sec. 405) Modifies attribution rules for stock ownership through partnerships to provide that stock owned, directly or indirectly, by or for a partnership shall be considered as being owned proportionately by its partners, for purposes of determining deemed-paid foreign tax credits of domestic corporations that own ten percent or more of the voting stock of a foreign corporation.*

## **Energy Policy Act of 2005**

Energy infrastructure tax incentives were extended and modified to include various provisions. The credit for producing electricity from renewable resources was extended through 2007, and the issuance of clean renewable energy bonds was allowed until 2007. Additionally, a credit was provided for production from advance nuclear power facilities and investments in clean coal facilities. For certain electric transmission property, a 15-year cost recovery period for depreciation was allowed. Moreover, taxpayers were given the option to carry back net operating losses from transmission property and pollution control investment for a 5-year period. (“Major Enacted Tax Legislation, 200-2009,” n.d.)

In terms of domestic fossil fuel security, several measures were taken. The business tax credit for producing fuel from a nonconventional source was expanded to include coke or coke gas. Temporary 50 percent expensing was allowed for equipment used in refining liquid fuels. The depreciation of natural gas distribution lines was assigned a 15-year cost recovery



period. Additionally, the amortization of geological and geophysical expenditures for the exploration of oil and gas within the U.S. was permitted over 24 months.

## **Tax Increase Prevention and Reconciliation Act of 2005**

The act indicate that the increased expensing allowance for depreciable business property was prolonged from \$25,000 to \$100,000. The threshold amount used to determine reductions to the expensing allowance was also raised. Additionally, the period during which a taxpayer could revoke an election to expense depreciable business property was extended through 2009.

Also, the reductions in capital gains and dividends tax rates (5 percent for taxpayers in the 15 percent bracket and 15 percent for others) that were introduced by JGTRRA (2003) were extended through 2010. The act also made the inflation adjustment to the exclusion amount for foreign earned income to 2006 from 2008. Furthermore, certain exemptions for income of controlled foreign companies were extended through 2008. (“Major Enacted Tax Legislation, 200-2009,” n.d.)

## **Economic Stimulus Act of 2008**

The act introduced a one-time rebate that equals the lesser of an individual’s net income tax liability and \$600, or for joint filers, \$1,200. It also ensured that individuals with earnings, Social Security, and veteran’s benefits above \$3,000 receive a minimum tax rebate of \$300, while joint filers receive \$600. Additional rebates of \$300 were provided per qualified child. The rebate amount was gradually reduced by 5 percent of Adjusted Gross Income (AGI) above \$75,000 for individual filers and \$150,000 for married joint filers.

In 2008, the expensing allowance for depreciable business assets was increased to \$250,000, and the maximum investment phase-out threshold for this allowance was raised to \$800,000. Also, the amount of the adjusted basis of certain depreciable property, such as equipment and computer software, that may be claimed as a deductible expense in 2008, was increased to 50% from the previous 30%. (“Major Enacted Tax Legislation, 200-2009,” n.d.)

## **2008 Public Law 110-343**

**Division A: Emergency Economic Stabilization** This stabilization program allowed the Secretary of the Treasury to create the Troubled Asset Relief Program (TARP) for the purpose of acquiring troubled assets from financial institutions. The program will be governed by terms, conditions, policies, and procedures developed by the Secretary. Addi-

tionally, it prohibits certain employers whose assets have been acquired under the Troubled Asset Relief Program (TARP) from claiming a tax deduction for compensations or other benefits exceeding \$500,000 given to their executives or highly compensated employees. Employers participating in TARP and their executives are subject to tax penalties for excess parachute payments.

**Division B: Energy Improvement and Extension Act of 2008** This act states that energy-related measures were prolonged and amended, covering incentives for renewable energy sources, carbon mitigation, coal provisions, and domestic fuel security. The tax credit for producing electricity from wind and refined coal facilities was extended until 2009, and for other facilities such as closed and open-loop biomass, solar energy, small irrigation power, landfill gas, trash combustion, and hydropower, the tax credit was extended until 2010. Certain rules and definitions for refined coal, trash and biomass facilities, and hydropower production were also modified. (“Major Enacted Tax Legislation, 200-2009,” n.d.)

**Division C: Tax Extenders and Alternative Minimum Tax Relief** This amendment extended the business tax provisions and modifies the Internal Revenue Code provisions concerning the tax deduction for domestic film and television productions. The changes include expanding the income base for the deduction to encompass compensation for services provided in the United States by actors, production personnel, directors, and producers, along with any copyrights, trademarks, or other intangibles related to a film production. Additionally, partners or S corporation shareholders who possess a minimum 20% interest in a film project are now eligible for the deduction. (“Major Enacted Tax Legislation, 200-2009,” n.d.)

Extension of Business Tax Provisions (Sec. 502) Amends Internal Revenue Code provisions relating to the tax deduction for domestic film and television productions to: (1) include within the income base for such deduction compensation for services performed in the United States by actors, production personnel, directors, and producers and any copyrights, trademarks, or other intangibles with respect to a film production; and (2) allow a deduction for partners or S corporation shareholders who own at least a 20% interest in a film project. (“Major Enacted Tax Legislation, 200-2009,” n.d.)

## **American Recovery and Reinvestment Act of 2009**

This act enacted that individual income tax relief measures were implemented, including the creation of the Making Work Pay Credit and the American Opportunity Tax Credit. The Earned Income Tax Credit (EITC) rate for families with three or more children was

increased to 45 percent, and the phaseout range for married couples was raised by \$5,000 above that for single/head of household filers. The threshold for determining the refundable child tax credit was lowered to \$3,000 in 2009 and 2010. The first-time homebuyer credit was transformed into a refundable credit. Unemployment compensation received by each unemployed worker in 2009 was exempted up to \$2,400. Additionally, an above-the-line deduction was allowed for sales tax on new cars purchased in 2009.

For the Alternative Minimum Tax (AMT), the tax exemption was increased to \$46,700 for single filers and \$70,950 for married filers and extended through 2009. The allowance of personal nonrefundable credits against the AMT was also extended through 2009.

The act also extended various business tax provisions through 2009, including the increased Section 179 expensing, the 50 percent bonus depreciation on qualifying investments made in 2009, and the net operating loss carry-back period for small businesses, which was extended from two to five years. The Work Opportunity Tax Credit and the New Markets Tax Credit were expanded. Businesses were allowed to defer income when buying back or exchanging their debt at a discount in 2009 and 2010. Furthermore, \$25 billion was allocated for recovery zone bonds to be issued in 2009 or 2010.

Additionally, various energy conservation and renewable energy provisions were extended and modified. Also, funds were appropriated for the Small Business Administration (SBA) for salaries and expenses, the Office of the Inspector General, the Surety Bond Guarantees Revolving Fund, and direct loans and loan guarantees. Certain small business taxpayers had their estimated tax payments reduced in 2009. A tax exemption was allowed for certain net recognized built-in gains of S corporations in 2009 and 2010.

## **Patient Protection and Affordable Care Act of 2010 and Health Care and Education Reconciliation Act of 2010**

Individual premium assistance credits and cost-sharing subsidies were introduced. The act imposed an additional 0.9 percent hospital insurance tax on high-income taxpayers, starting from 2013. It also imposed a 3.8 percent additional Medicare contribution tax on net investment income above a certain threshold, also beginning in 2013.

The act also allowed for the exclusion of employer-provided health insurance for an employee's child under the age of 27. A small business tax credit was established for small employers, allowing them to receive a general business tax credit for nonelective contributions to purchase health insurance for their employees starting in 2010. However, after 2013, this credit only applies to insurance purchased through state health exchanges. Additionally, a penalty was put in place for large employers who do not offer affordable minimum essen-

tial coverage to full-time employees, starting in 2014. Small employers were permitted to offer reimbursement for premiums for a health plan purchased on an exchange as a qualified benefit under a cafeteria plan, starting in 2014.

## **Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010**

This act extended 0/15 percent rate structure for long-term capital gains and qualified dividends. Additionally, several provisions were extended through 2012. This includes the additional depreciation allowance for business and investment property, the 100 percent expensing allowance for business and investment property, and the election to accelerate the AMT and research tax credits instead of using bonus depreciation.

The increased expensing allowance for depreciable business and investment property, set at \$125,000, and the adjusted gross income threshold for calculating reductions in this allowance, set at \$500,000, were both extended through 2012. An inflation adjustment was also permitted for these increased amounts beginning in 2012. The designation of certain computer software as depreciable property for the purpose of this allowance was also extended through 2012.

## **Small Business Jobs Act of 2010**

This act made crucial provisions for small businesses. The selected important provisions from the law are as follows:

*(Sec. 1111) Amends the Small Business Act to increase temporarily (until January 1, 2011) to 90% the maximum Small Business Administration (SBA) participation in a loan on a deferred basis under the section 7(a) (general small business loans) guaranteed loan program. Reduces SBA participation in a loan on a deferred basis, after December 31, 2010, from 90% back to: (1) 75% of a loan balance exceeding \$150,000; and (2) 85% of a loan balance equal to or less than \$150,000.*

*Raises from \$1.5 million to \$4.5 million (through December 31, 2010, after which only to \$3.75 million) the ceiling on the total amount outstanding and committed (by participation or otherwise) to the borrower from the business loan and investment fund. Raises from \$2 million to \$5 million the maximum gross loan amount.*

*Raises from \$1.5 million to \$5 million the maximum loan amounts for the section 504 (state and local development company) program.*

*Increases from \$35,000 to \$50,000 the maximum amount of a microloan (to a start-up, newly-established, and growing small business) under the Microloan program. Increases*

from \$3.5 million to \$5 million the maximum total amount of loans to one intermediary participating in the Microloan program.

(Sec. 1114) Amends the American Recovery and Reinvestment Act of 2009 to extend through December 31, 2010: (1) the reduction or elimination of certain fees related to SBA loan guarantees; and (2) the Economic Stimulus Lending Program to guarantee up to 90% of qualifying small business loans made by eligible lenders.

(Sec. 1115) Amends the Small Business Investment Act of 1958 to apply single-business investment limits to SBA-recognized new markets venture capital companies of 10% of the sum of a company's regulatory capital plus the total amount of leverage projected in the participation agreement.

(Sec. 1116) Directs the SBA Administrator to establish for prospective borrowers an alternative small business size standard that uses maximum tangible net worth and average net income as an alternative to the use of industry standards.

(Sec. 1117) Directs the SBA Administrator, upon pool assembler request, if the amount of the guaranteed portion of any loan under the section 7(a) general small business loan program is more than \$500,000, to divide the loan guarantee into increments of \$500,000 and 1 increment of any remaining amount less than \$500,000, in order to permit the maximum amount of any loan in a pool to be not more than \$500,000. Allows increments of loan guarantees to different borrowers that are so divided to be included in the same pool.

*Small Business Access to Capital-* (Sec. 1122) Amends the Small Business Investment Act of 1958 regarding the local development business loan program to allow a small business borrower to refinance a previous business debt: (1) that was incurred at least two years before the loan application; (2) that is a commercial loan; (3) that is not guaranteed by a federal agency; (4) whose proceeds were used to acquire a fixed asset for the business's benefit; (5) that is collateralized by fixed assets; and (6) for which the borrower has been current on all payments for at least one year. Allows the Administrator to provide financing under such program for a project that does not involve small business expansion, if the borrower meets certain job creation or retention goals. Prescribes an alternate job retention goal for which a borrower may qualify.

*Promoting Entrepreneurship -* (Sec. 2031) Increases from \$5,000 to \$10,000 (reduced by the excess over \$60,000 in such expenditures) the allowed deduction for start-up expenditures in taxable year 2010.

*Promoting Small Business Fairness -* (Sec. 2041) Limits the penalty for failure to disclose a reportable transaction on a tax return or statement to 75% of the decrease in tax resulting from such transaction. Sets a minimum penalty of \$10,000 (\$5,000 in the case of a natural person).

*(Sec. 2042) Revises special rules for the health insurance costs of self-employed individuals to allow a deduction from self-employment income (ordinarily disallowed) for such costs in computing 2010 self-employment taxes.*

There were also additional small business provisions, including establishment of the Small Business Lending Fund Program and small business export promotion initiatives.

## **American Taxpayer Relief Act of 2012**

This act permanently extends the Economic Growth and Tax Relief Reconciliation Act of 2001 provisions for individual taxpayers whose taxable income is at or below a threshold amount of \$400,000 (or \$450,000 for married couples filing jointly). Also, it permanently extends the Jobs and Growth Tax Relief Reconciliation Act of 2003 provisions for individual taxpayers whose taxable income is at or below a threshold amount of \$400,000 (or \$450,000 for married couples filing jointly). These provisions include the reduction in tax rates for capital gains and dividend income. However, the capital gains tax rate will increase from 15% to 20% for taxpayers whose taxable income exceeds the \$400,000 threshold amount.

The act extends individual tax extenders through 2013, which include provisions like the above-the-line deduction for teacher expenses, the above-the-line deduction for qualified tuition and related higher education expenses, and the itemized deduction for state and local sales taxes.

Additionally, the act extends business tax extenders through 2013, encompassing measures such as the tax credit for research and experimentation expenses, the new markets tax credit, the work opportunity tax credit, the increase in section 179 expensing amounts and threshold limits, and the 50 percent bonus depreciation for 2012.

Table E.1: Federal Corporate Income Tax Rates

Year	Taxable Income Brackets	Tax Rates
1993-2017	First \$50,000	15
	50,000–75,000	25
	75,000–100,000	34
	100,000–335,000	39
	335,000–10,000,000	34
	10,000,000–15,000,000	35
	15,000,000–18,333,333	38
	Over \$18,333,333	35
1988-1992	First \$50,000	15
	50,000–75,000	25
	75,000–100,000	34
	100,000–335,000	39
	Over \$335,000	34
1987	First \$25,000	15
	25,000–50,000	16.5
	50,000–75,000	27.5
	75,000–100,000	37
	100,000–335,000	42.5
	335,000–1,000,000	40
	1,000,000–1,405,000	42.5
	Over \$1,405,000	40
1984-1986	First \$25,000	15
	25,000–50,000	18
	50,000–75,000	30
	75,000–100,000	40
	100,000–1,000,000	46
	1,000,000–1,405,000	51
	Over \$1,405,000	46

*Sources:* Tax Foundation 2021. Historical U.S. Federal Corporate Income Tax Rates & Brackets, 1909-2020 *Notes:* This table is retrieved from Tax Foundation.

Figure E.1: Tax Brackets(1986-1988)

Nominal			1988								
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal		Tax Brackets	Marginal		Tax Brackets	Marginal		Tax Brackets	Marginal		Tax Brackets
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$29,750	15.0%	\$0	\$14,875	15.0%	\$0	\$17,850	15.0%	\$0	\$23,900
28.0%	\$29,750	-	28.0%	\$14,875	-	28.0%	\$17,850	-	28.0%	\$23,900	-

(a) A 33% "rate bubble" applied between \$71,900 and \$149,250 for married filing jointly, between \$35,950 and \$113,300 for married filing separately, between \$43,150 and \$89,560 for singles, and between \$61,650 and \$123,790 for heads of households, the purpose being to recapture the revenue that upper-income taxpayers had saved by applying the 15% rate.

Note: Last law to change rates was the Tax Reform Act of 1986.

Nominal			1987								
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
11.0%	\$0	\$3,000	11.0%	\$0	\$1,500	11.0%	\$0	\$1,800	11.0%	\$0	\$2,500
15.0%	\$3,000	\$28,000	15.0%	\$1,500	\$14,000	15.0%	\$1,800	\$16,800	15.0%	\$2,500	\$23,000
28.0%	\$28,000	\$45,000	28.0%	\$14,000	\$22,500	28.0%	\$16,800	\$27,000	28.0%	\$23,000	\$38,000
35.0%	\$45,000	\$90,000	35.0%	\$22,500	\$45,000	35.0%	\$27,000	\$54,000	35.0%	\$38,000	\$80,000
38.5%	\$90,000	-	38.5%	\$45,000	-	38.5%	\$54,000	-	38.5%	\$80,000	-

Note: Last law to change rates was the Tax Reform Act of 1986.

Nominal			1986								
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
0.0%	\$0	\$3,670	0.0%	\$0	\$1,835	0.0%	\$0	\$2,480	0.0%	\$0	\$2,480
11.0%	\$3,670	\$5,940	11.0%	\$1,835	\$2,970	11.0%	\$2,480	\$3,670	11.0%	\$2,480	\$4,750
12.0%	\$5,940	\$8,200	12.0%	\$2,970	\$4,100	12.0%	\$3,670	\$4,750	12.0%	\$4,750	\$7,010
14.0%	\$8,200	\$12,840	14.0%	\$4,100	\$6,420	14.0%	\$4,750	\$7,010	14.0%	\$7,010	\$9,390
16.0%	\$12,840	\$17,270	16.0%	\$6,420	\$8,635	15.0%	\$7,010	\$9,170	17.0%	\$9,390	\$12,730
18.0%	\$17,270	\$21,800	18.0%	\$8,635	\$10,900	16.0%	\$9,170	\$11,650	18.0%	\$12,730	\$16,190
22.0%	\$21,800	\$26,550	22.0%	\$10,900	\$13,275	18.0%	\$11,650	\$13,920	20.0%	\$16,190	\$19,640
25.0%	\$26,550	\$32,270	25.0%	\$13,275	\$16,135	20.0%	\$13,920	\$16,190	24.0%	\$19,640	\$25,360
28.0%	\$32,270	\$37,980	28.0%	\$16,135	\$18,990	23.0%	\$16,190	\$19,640	28.0%	\$25,360	\$31,080
33.0%	\$37,980	\$49,420	33.0%	\$18,990	\$24,710	26.0%	\$19,640	\$25,360	32.0%	\$31,080	\$36,800
38.0%	\$49,420	\$64,750	38.0%	\$24,710	\$32,375	30.0%	\$25,360	\$31,080	35.0%	\$36,800	\$48,240
42.0%	\$64,750	\$92,370	42.0%	\$32,375	\$46,185	34.0%	\$31,080	\$36,800	42.0%	\$48,240	\$65,390
45.0%	\$92,370	\$118,050	45.0%	\$46,185	\$59,025	38.0%	\$36,800	\$44,780	45.0%	\$65,390	\$88,270
49.0%	\$118,050	\$175,250	49.0%	\$59,025	\$87,625	42.0%	\$44,780	\$59,670	48.0%	\$88,270	\$116,870
50.0%	\$175,250	-	50.0%	\$87,625	-	48.0%	\$59,670	\$88,270	50.0%	\$116,870	-
						50.0%	\$88,270	-			

Note: Last law to change rates was the Tax Reform Act of 1984.

Sources: Tax Foundation 2013. Federal Individual Income Tax Rates History, October 17, 2013 Notes: This figure is retrieved from Tax Foundation.



Figure E.2: Tax Brackets(1989-1993)

Nominal			1993		
Married Filing Jointly			Married Filing Separately		
Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$36,900	15.0%	\$0	\$18,450
28.0%	\$36,900	\$89,150	28.0%	\$18,450	\$44,575
31.0%	\$89,150	\$140,000	31.0%	\$44,575	\$70,000
36.0%	\$140,000	\$250,000	36.0%	\$70,000	\$125,000
39.6%	\$250,000	-	39.6%	\$125,000	-

Note: Last law to change rates was the Omnibus Budget Reconciliation Act of 1993.

Nominal			1992		
Married Filing Jointly			Married Filing Separately		
Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$35,800	15.0%	\$0	\$17,900
28.0%	\$35,800	\$86,500	28.0%	\$17,900	\$43,250
31.0%	\$86,500	-	31.0%	\$43,250	-

Note: Last law to change rates was the Omnibus Budget Reconciliation Act of 1990.

Nominal			1991		
Married Filing Jointly			Married Filing Separately		
Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$34,000	15.0%	\$0	\$17,000
28.0%	\$34,000	\$82,150	28.0%	\$17,000	\$41,075
31.0%	\$82,150	-	31.0%	\$41,075	-

Note: Last law to change rates was the Omnibus Budget Reconciliation Act of 1990.

Nominal			1990		
Married Filing Jointly			Married Filing Separately		
Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$32,450	15.0%	\$0	\$16,225
28.0%	\$32,450	-	28.0%	\$16,225	-

(a) A 33% "rate bubble" applied between \$78,400 and \$162,770 for married filing jointly, between \$39,200 and \$123,570 for married filing separately, between \$47,050 and \$97,620 for singles, and between \$67,200 and \$134,930 for heads of households, the purpose being to recapture the revenue that upper-income taxpayers had saved by applying the 15% rate.

Note: Last law to change rates was the Tax Reform Act of 1986.

Nominal			1989		
Married Filing Jointly			Married Filing Separately		
Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$30,950	15.0%	\$0	\$15,475
28.0%	\$30,950	-	28.0%	\$15,475	-

(a) A 33% "rate bubble" applied between \$74,850 and \$155,320 for married filing jointly, between \$37,425 and \$117,895 for married filing separately, between \$44,900 and \$93,130 for singles, and between \$64,200 and \$128,810 for heads of households, the purpose being to recapture the revenue that upper-income taxpayers had saved by applying the 15% rate.

Note: Last law to change rates was the Tax Reform Act of 1986.

Sources: Tax Foundation 2013. Federal Individual Income Tax Rates History, October 17, 2013 Notes: This figure is retrieved from Tax Foundation.

Figure E.3: Tax Brackets(1994-1998)

Nominal			1998								
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$42,350	15.0%	\$0	\$21,175	15.0%	\$0	\$25,350	15.0%	\$0	\$33,950
28.0%	\$42,350	\$102,300	28.0%	\$21,175	\$51,150	28.0%	\$25,350	\$61,400	28.0%	\$33,950	\$87,700
31.0%	\$102,300	\$155,950	31.0%	\$51,150	\$77,975	31.0%	\$61,400	\$128,100	31.0%	\$87,700	\$142,000
36.0%	\$155,950	\$278,450	36.0%	\$77,975	\$139,225	36.0%	\$128,100	\$278,450	36.0%	\$142,000	\$278,450
39.6%	\$278,450	-	39.6%	\$139,225	-	39.6%	\$278,450	-	39.6%	\$278,450	-

Note: Last law to change rates was the Omnibus Budget Reconciliation Act of 1993.

Nominal			1997								
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$41,200	15.0%	\$0	\$20,600	15.0%	\$0	\$24,650	15.0%	\$0	\$33,050
28.0%	\$41,200	\$99,600	28.0%	\$20,600	\$49,800	28.0%	\$24,650	\$59,750	28.0%	\$33,050	\$85,350
31.0%	\$99,600	\$151,750	31.0%	\$49,800	\$75,875	31.0%	\$59,750	\$124,650	31.0%	\$85,350	\$138,200
36.0%	\$151,750	\$271,050	36.0%	\$75,875	\$135,525	36.0%	\$124,650	\$271,050	36.0%	\$138,200	\$271,050
39.6%	\$271,050	-	39.6%	\$135,525	-	39.6%	\$271,050	-	39.6%	\$271,050	-

Note: Last law to change rates was the Omnibus Budget Reconciliation Act of 1993.

Nominal			1996								
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$40,100	15.0%	\$0	\$20,050	15.0%	\$0	\$24,000	15.0%	\$0	\$32,150
28.0%	\$40,100	\$96,900	28.0%	\$20,050	\$48,450	28.0%	\$24,000	\$58,150	28.0%	\$32,150	\$83,050
31.0%	\$96,900	\$147,700	31.0%	\$48,450	\$73,850	31.0%	\$58,150	\$121,300	31.0%	\$83,050	\$134,500
36.0%	\$147,700	\$263,750	36.0%	\$73,850	\$131,875	36.0%	\$121,300	\$263,750	36.0%	\$134,500	\$263,750
39.6%	\$263,750	-	39.6%	\$131,875	-	39.6%	\$263,750	-	39.6%	\$263,750	-

Note: Last law to change rates was the Omnibus Budget Reconciliation Act of 1993.

Nominal			1995								
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$39,000	15.0%	\$0	\$19,500	15.0%	\$0	\$23,350	15.0%	\$0	\$31,250
28.0%	\$39,000	\$94,250	28.0%	\$19,500	\$47,125	28.0%	\$23,350	\$56,550	28.0%	\$31,250	\$80,750
31.0%	\$94,250	\$143,600	31.0%	\$47,125	\$71,800	31.0%	\$56,550	\$117,950	31.0%	\$80,750	\$130,800
36.0%	\$143,600	\$256,500	36.0%	\$71,800	\$128,250	36.0%	\$117,950	\$256,500	36.0%	\$130,800	\$256,500
39.6%	\$256,500	-	39.6%	\$128,250	-	39.6%	\$256,500	-	39.6%	\$256,500	-

Note: Last law to change rates was the Omnibus Budget Reconciliation Act of 1993.

Nominal			1994								
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$38,000	15.0%	\$0	\$19,000	15.0%	\$0	\$22,750	15.0%	\$0	\$30,500
28.0%	\$38,000	\$91,850	28.0%	\$19,000	\$45,925	28.0%	\$22,750	\$55,100	28.0%	\$30,500	\$78,700
31.0%	\$91,850	\$140,000	31.0%	\$45,925	\$70,000	31.0%	\$55,100	\$115,000	31.0%	\$78,700	\$127,500
36.0%	\$140,000	\$250,000	36.0%	\$70,000	\$125,000	36.0%	\$115,000	\$250,000	36.0%	\$127,500	\$250,000
39.6%	\$250,000	-	39.6%	\$125,000	-	39.6%	\$250,000	-	39.6%	\$250,000	-

Note: Last law to change rates was the Omnibus Budget Reconciliation Act of 1993.

Sources: Tax Foundation 2013. Federal Individual Income Tax Rates History, October 17, 2013 Notes: This figure is retrieved from Tax Foundation.

Figure E.4: Tax Brackets(2001-2003)

Nominal			2003			Single			Head of Household		
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
10.0%	\$0	\$14,000	10.0%	\$0	\$7,000	10.0%	\$0	\$7,000	10.0%	\$0	\$10,000
15.0%	\$14,000	\$56,800	15.0%	\$7,000	\$23,725	15.0%	\$7,000	\$28,400	15.0%	\$10,000	\$38,050
25.0%	\$56,800	\$114,650	25.0%	\$23,725	\$57,325	25.0%	\$28,400	\$68,800	25.0%	\$38,050	\$98,250
28.0%	\$114,650	\$174,700	28.0%	\$57,325	\$87,350	28.0%	\$68,800	\$143,500	28.0%	\$98,250	\$159,100
33.0%	\$174,700	\$311,950	33.0%	\$87,350	\$155,975	33.0%	\$143,500	\$311,950	33.0%	\$159,100	\$311,950
35.0%	\$311,950	-	35.0%	\$155,975	-	35.0%	\$311,950	-	35.0%	\$311,950	-

Note: Last law to change rates was the Jobs and Growth Tax Relief Reconciliation Act of 2003.

Nominal			2002			Single			Head of Household		
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
10.0%	\$0	\$12,000	10.0%	\$0	\$6,000	10.0%	\$0	\$6,000	10.0%	\$0	\$10,000
15.0%	\$12,000	\$46,700	15.0%	\$6,000	\$23,350	15.0%	\$6,000	\$27,950	15.0%	\$10,000	\$37,450
27.0%	\$46,700	\$112,850	27.0%	\$23,350	\$56,425	27.0%	\$27,950	\$67,700	27.0%	\$37,450	\$96,700
30.0%	\$112,850	\$171,950	30.0%	\$56,425	\$85,975	30.0%	\$67,700	\$141,250	30.0%	\$96,700	\$156,600
35.0%	\$171,950	\$307,050	35.0%	\$85,975	\$153,525	35.0%	\$141,250	\$307,050	35.0%	\$156,600	\$307,050
38.6%	\$307,050	-	38.6%	\$153,525	-	38.6%	\$307,050	-	38.6%	\$307,050	-

Note: Last law to change rates was the Economic Growth and Tax Relief Reconciliation Act of 2001.

Nominal			2001			Single			Head of Household		
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
15.0%	\$0	\$45,200	15.0%	\$0	\$22,600	15.0%	\$0	\$27,050	15.0%	\$0	\$36,250
27.5%	\$45,200	\$109,250	27.5%	\$22,600	\$54,625	27.5%	\$27,050	\$65,550	27.5%	\$36,250	\$93,650
30.5%	\$109,250	\$166,500	30.5%	\$54,625	\$83,250	30.5%	\$65,550	\$136,750	30.5%	\$93,650	\$151,650
35.5%	\$166,500	\$297,350	35.5%	\$83,250	\$148,675	35.5%	\$136,750	\$297,350	35.5%	\$151,650	\$297,350
39.1%	\$297,350	-	39.1%	\$148,675	-	39.1%	\$297,350	-	39.1%	\$297,350	-

Note: Last law to change rates was the Economic Growth and Tax Relief Reconciliation Act of 2001.

Sources: Tax Foundation 2013. Federal Individual Income Tax Rates History, October 17, 2013 Notes: This figure is retrieved from Tax Foundation.

Figure E.5: Tax Brackets(2011-2013)

Nominal						2013					
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
10.0%	\$0	\$17,850	10.0%	\$0	\$8,925	10.0%	\$0	\$8,925	10.0%	\$0	\$12,750
15.0%	\$17,850	\$72,500	15.0%	\$8,925	\$36,250	15.0%	\$8,925	\$36,250	15.0%	\$12,750	\$48,600
25.0%	\$72,500	\$146,400	25.0%	\$36,250	\$73,200	25.0%	\$36,250	\$87,850	25.0%	\$48,600	\$125,450
28.0%	\$146,400	\$223,050	28.0%	\$73,200	\$111,525	28.0%	\$87,850	\$183,250	28.0%	\$125,450	\$203,150
33.0%	\$223,050	\$398,350	33.0%	\$111,525	\$199,175	33.0%	\$183,250	\$398,350	33.0%	\$203,150	\$398,350
35.0%	\$398,350	\$450,000	35.0%	\$199,175	\$225,000	35.0%	\$398,350	\$400,000	35.0%	\$398,350	\$425,000
39.6%	\$450,000		39.6%	\$225,000		39.6%	\$400,000		39.6%	\$425,000	

Note: Last law to change rates was the American Taxpayer Relief Act of 2012.

Nominal						2012					
Married Filing Jointly			Married Filing Separately			Single			Head of Household		
Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets		Marginal	Tax Brackets	
Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over	Tax Rate	Over	But Not Over
10.0%	\$0	\$17,400	10.0%	\$0	\$8,700	10.0%	\$0	\$8,700	10.0%	\$0	\$12,400
15.0%	\$17,400	\$70,700	15.0%	\$8,700	\$35,350	15.0%	\$8,700	\$35,350	15.0%	\$12,400	\$47,350
25.0%	\$70,700	\$142,700	25.0%	\$35,350	\$71,350	25.0%	\$35,350	\$85,650	25.0%	\$47,350	\$122,300
28.0%	\$142,700	\$217,450	28.0%	\$71,350	\$108,725	28.0%	\$85,650	\$178,650	28.0%	\$122,300	\$198,050
33.0%	\$217,450	\$388,350	33.0%	\$108,725	\$194,175	33.0%	\$178,650	\$388,350	33.0%	\$198,050	\$388,350
35.0%	\$388,350	-	35.0%	\$194,175	-	35.0%	\$388,350	-	35.0%	\$388,350	-

Note: Last law to change rates was the Jobs and Growth Tax Relief Reconciliation Act of 2003.

Sources: Tax Foundation 2013. Federal Individual Income Tax Rates History, October 17, 2013 Notes: This figure is retrieved from Tax Foundation.

## F Algorithm

1-) I construct the grids for the state variables  $(a, z, \epsilon)$  and the decision for next periods' asset level  $(a')$ .

2-) Given parameters in the parametrization, I guess the capital-output ratio for corporate sector,  $\frac{K_c}{L_c}$ , and solve for implied wage and after-tax return to capital,  $w, r$ .

3-) Given prices  $(w, r)$  and government's tax policy  $(\lambda_y, \tau_y, \tau_c)$ , I solve for policy functions by value function iterations.

4-) Given initial distribution over idiosyncratic states,  $\mu$ , I iterate until convergence,  $H(\mu^*) = \mu^*$ .

5-) I compute the aggregate demand of labor from pass-through business owners and supply of efficient unit of labor from workers. Then, I compute the demand of labor from C-corporate sector,  $L_c^*$ .

6-) I compute the aggregate supply of capital, composed of supply of old retired individuals, supply of old pass-through business owners, supply of young business owners and supply of workers. Then, I compute the aggregate demand of capital for pass-through business owners to calculate  $K_c^*$  and capital-labor ratio.

7-) I iterate until  $r^*$  converges, i.e.  $|r + \delta - (1 - \tau_c)[\alpha \frac{K_c^*}{L_c^*}^{\alpha-1}]| < \epsilon$ . If the difference is higher than the tolerance level, adjust  $\frac{K_c}{L_c}$  and go back to step 2.