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Income Inequality and Tax Evasion: A Synthesis

Abstract

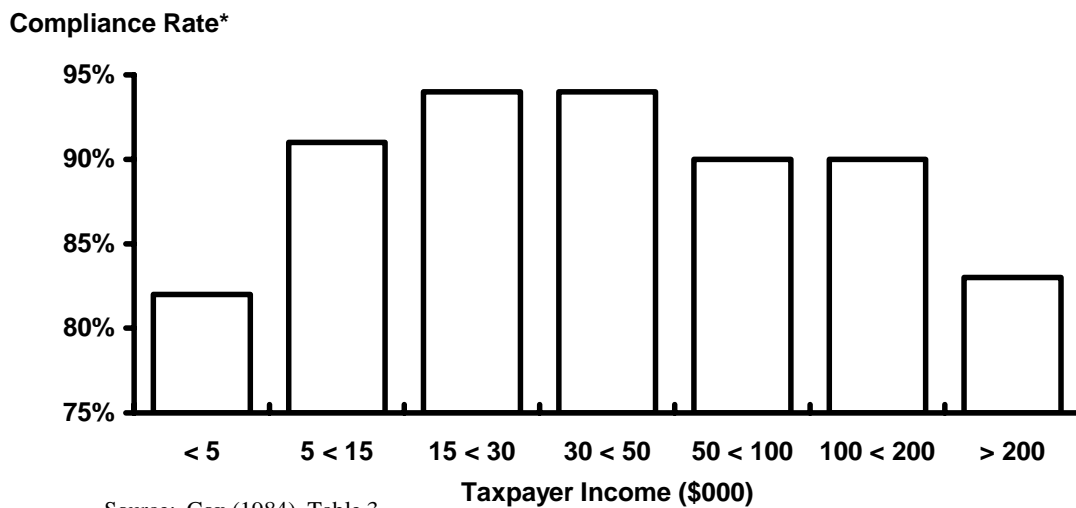
How income distribution influences tax evasion has been the subject of much speculation. Behavioral research suggests growing economic disparity contributes to taxpayer stress, thus increasing the propensity to evade. Economists point to the reduced visibility of transactions among low and high-income earners. This paper tests the hypothesis that rising income inequality contributes to tax evasion in the United States. Empirical analysis for the period 1947-99 finds a positive correlation between a measure of income inequality (Gini coefficient) and the underreporting rate for wage and salary income. This finding suggests that policies aimed at reducing income tax evasion may not achieve the desired outcome in an environment of increasing inequality and, depending on the remedy proposed, may have the opposite effect.

Income Inequality and Tax Evasion: A Synthesis

Introduction

A persistent and enigmatic phenomenon observed in the randomly audited returns of U.S. taxpayers is the relationship between the level of compliance and income displayed in Figure 1. Figure 1 shows that, in 1979, the least compliant taxpayers were in the lowest and highest income ranges. The middle group of taxpayers between \$15,000 and \$50,000 in income had the highest compliance rate. Cox (1984) remarks that this “curious pattern”, the inverted U-shaped distribution of compliance behavior, contradicts the orthodox view that evasion should increase with higher marginal tax rates (the U.S. has a progressive tax rate structure). This same phenomenon, henceforth referred to as the Cox Paradox, also appears in the 1976, 1982 and 1988 Taxpayer Compliance Measurement Program (TCMP) studies (Fratanduono, 1986; Christian, 1994).

Figure 1. U.S. Federal Income tax Compliance Rates by Taxpayer Income in 1979



Source: Cox (1984), Table 3.

*The compliance rate is the total reported tax liability divided by an estimate of the total correct tax liability.

Among economists, the Cox Paradox portrays the greater opportunities to evade available to taxpayers at the highest and lowest income levels (Roth, Scholz, and Witte, 1989). Middle-income taxpayers find it harder to evade, so the reasoning goes, since a larger share of their income derives from wages and salaries that employers report to the Internal Revenue Service (IRS). A casual glance at the data seems to support this view. In 1999, the percent of AGI from wages and salaries was 79 percent for taxpayers with AGI greater than zero but less than \$30,000, 82 percent for taxpayers between \$30,000 and \$50,000, and 65 percent for taxpayers with incomes of \$50,000 and higher.¹ These facts broadly conform to the pattern of data shown in Figure 1.

An alternative explanation for the Cox Paradox derives from research on the behavioral determinants of tax evasion. In contrast to expected utility (EU) theory (Allingham and Sandmo, 1972) that implies people pay taxes because they fear detection and its consequences, behaviorists have attempted to identify situational conditions that motivate taxpayers to evade. A main insight of this body of research posits taxpayer *stress* as

¹ IRS, Statistics of Income, *Individual Income Tax Returns 1999*, Publication 1304 (Rev. 10-2001), Table 1.4, “All Returns: Sources of Income, Adjustments, and Tax Items, by Size of Adjusted Gross Income.”

an evasion determinant (Elffers, 1991; Lewis, 1982; Wärneryd and Walerud, 1982). According to Elffers (1991), the two primary categories of taxpayer stress are financial strain and a growing dissatisfaction with the tax system. Financial strain refers to a deterioration of economic status. Taxpayers with meager financial resources may be tempted to evade if their household expenses exceed income. In a survey study of criminal behavior, Carroll (1989) notes that “the lack of money often motivates the search for an opportunity to commit a crime.”

Taxpayer dissatisfaction may arise from several sources: the perception of unfair treatment, the complexity and burden of the tax system, and the perception that the value of public goods and services received is less than taxes paid (exchange inequity). Several studies have noted an apparent inverse relationship between exchange inequity and support for taxation (Citrin, 1979; Alm, Bahl, and Murray, 1990; Scholz and Lubell, 1998). Lewis’s (1979) survey results indicating that wealthier people “have a greater antipathy towards taxation” suggests taxpayer dissatisfaction increases as the gap widens between the amount of taxes levied and the value of public goods received. Perhaps the most notorious recent example of this attitude is Leona Helmsley’s proclamation that “only the little people pay taxes.”

Thus, the two leading theoretical explanations for the Cox Paradox point to income inequality as a contributing factor, although for different reasons. Behavioral research suggests rising income inequality contributes to taxpayer stress and provides a motive to begin or increase evasion. While predicting the same outcome, economists would attribute the cause to reduced visibility of transactions as wage income declines as a percentage of total income. However, regardless of interpretation the observed result is the same: more inequality equates to more evasion. Yet, despite this apparent linkage, no empirical test of this hypothesis has been attempted.

This paper attempts to bridge this gap. The standard model of income tax evasion is extended to incorporate inequality as a determinant of income underreporting. Estimation of the revised model using time-series data on U.S. wage and salary underreporting for the period 1947-99 finds a statistically significant correlation between a measure of income inequality (Gini coefficient) and evasion. The implications of this and other findings for the design of policies to improve income tax compliance are discussed following the theoretical and empirical sections of the paper.

The remainder of the paper is organized as follows. The next section presents a brief review of the standard model of income tax evasion and discusses how growing income inequality may cause increased evasion activity. Section three describes the empirical model including a detailed description of data used. Section four presents the estimation results. The fifth and final section summarizes the study’s main findings and discusses the implications for tax administration.

THE EXPECTED UTILITY MODEL OF TAX EVASION: A PARADIGM LOST?

The standard EU model of reporting noncompliance (Allingham and Sandmo, 1972) portrays evasion as a strategic game between taxpayer and tax authority. Taxpayers decide how much of their income to report by taking into account the perceived risk of detection and the penalties imposed if found to evade. To counteract evasion, a tax authority may increase the audit rate, penalties, or both. Without such coercion, no one would pay taxes.

In mathematical form, a taxpayer’s expected utility from underreporting z dollars of income is

$$[1] \quad EU = (1 - p)u[y(1 - \tau) + \tau z] + pu[y(1 - \tau) - \Phi z]$$

Where p is the probability of detection (usually equated with the “audit” rate), τ is the marginal tax rate, y is annual total taxable income, Φ is the penalty per dollar evaded, and u represents the taxpayer’s utility of income function. If successful at avoiding detection, the taxpayer enjoys τz more income than if fully compliant. If audited, the taxpayer remits the tax deficiency (τz) plus an additional amount, Φz which represents the penalty for noncompliance. Equation 1 implies an inverse relationship between audit rates and

evasion. However, the available empirical evidence for this relationship is mixed (Roth, Scholz, and Witte, 1989). The influence of marginal tax rates, τ , on evasion also remains unclear despite considerable attention devoted to this topic (Andreoni, Erard, and Feinstein, 1998).

The predictive failings of equation 1 are well known. Specifically, the model grossly overpredicts observed levels of evasion and implies that taxpayers with equal incomes evade at the same rate regardless of source of income. In contrast, Christian (1994) using 1988 TCMP data finds that 60 percent of U.S. taxpayers do not understate their income. Erard and Feinstein (1994) suggest that moral influences, such as guilt and shame, may account for the unexpected high rate of voluntary compliance. Bernasconi (1998) counters that “unrealistically” high values of moral sentiments would be required to achieve observed levels of compliance. He proposes the high rate of compliance (relative to the level of enforcement activity) is the result of taxpayers overweighting the perceived likelihood of audit. However, this explanation ignores the deterrence effect of third-party reporting and the wide variation in reporting compliance among different categories of income reported in numerous empirical studies.

Transaction Visibility and Detection Probability.

Often forgotten in this debate is that for many taxpayers the audit rate bears little relationship to the probability of detection. This is evident from the wide range of reporting rates for different categories of income from randomly audited tax returns. For example, in the 1988 TCMP study, the IRS estimated that taxpayers who filed returns reported about 99 percent of all wage income versus only 67.7 percent of nonfarm proprietor income (IRS, 1996). The high rate of wage reporting compliance has been attributed to third party information reporting and withholding. After reviewing the empirical evidence from a number of studies, Roth, Scholz, and Witte (1989, p. 106-110) conclude that the available evidence “clearly supports the hypothesis that the higher probability of detection associated with more visible income sources is associated with greater compliance.” Recently, Rhoades (1999) proposed an extension of the standard EU model that allows detection probability to vary depending on each taxpayer’s mix of income.

Table 1 displays the percentage of income subject to information reporting by AGI category for Tax Year (TY) 1999. Table 1 shows about 81 percent of reported AGI is potentially matchable using data from information returns. This table provides further evidence that middle-income taxpayers, those reporting AGI between \$50,000 and \$100,000, have the highest percentage of matchable income (92 percent). This rate declines precipitously at higher levels of income. For taxpayers reporting AGI between \$100,000 and \$200,000, the potential “coverage” rate drops to 83 percent, and to only 53 percent for taxpayers reporting AGI over \$200,000. The low coverage rate among the wealthiest taxpayers is due to this group’s large share of investment income from capital gains, partnerships, and S-corporations.

TABLE 1
INCOME REPORTED ON TY99 INDIVIDUAL INCOME TAX RETURNS, BY TYPE OF INCOME AND BY SIZE OF ADJUSTED GROSS INCOME* (in Thousands of Dollars)

Category	Total	Under		
		\$50,000 or more	\$50,000 to under \$100,000	\$100,000 to under \$200,000
Number of returns	127,075,144	92,973,305	24,567,186	7,104,712
Share of returns	100.0%	73.2%	19.3%	5.6%
Income Types That Are Matchable				
Salaries and wages	\$4,132,473,459	\$1,490,065,834	\$1,344,399,827	\$667,101,195
Taxable interest	\$175,675,238	59,296,555	38,253,366	24,651,416
Dividends	\$132,465,523	26,942,203	27,086,657	23,803,233
State income tax refunds	\$17,976,205	3,324,634	5,892,429	3,377,941
Capital gains distributions	\$11,962,179	4,904,224	3,267,911	2,805,493
Taxable IRA distributions	\$87,140,915	26,170,459	28,313,254	19,214,816
Taxable pensions and annuities	\$304,310,715	139,329,986	102,599,020	43,560,565
Rents and royalties	\$79,965,496	24,562,474	19,367,945	14,044,533
Unemployment compensation	\$17,530,779	13,100,422	3,596,158	703,308
Taxable Social Security benefits	\$75,078,976	19,087,607	37,764,950	12,550,862
Gambling earnings	\$15,142,419	2,791,464	2,974,235	2,357,889
Income Types That Are Not Matchable				
Schedule C	\$259,078,407	92,674,515	61,151,278	48,241,713
Alimony received	\$5,455,497	2,798,449	1,632,082	618,139
Taxable net capital gains	\$540,642,691	35,404,332	45,885,929	63,001,683
Sales of property other than capital assets	\$14,827,297	5,745,575	2,297,977	1,971,235
Partnership and S-Corp net income	\$328,443,696	37,992,004	24,408,274	40,055,749
Estate & trust net income	\$12,067,997	1,265,007	1,111,822	1,698,006
Farm net income	\$24,645,239	12,674,094	6,180,931	2,874,941
Other income	\$31,298,002	9,021,955	4,793,585	4,760,222
Total amount of matchable income	5,049,721,904	1,809,575,862	1,613,515,752	814,171,251
Total amount of non-matchable income	1,216,458,826	197,575,931	147,461,878	163,221,688
Total Income	6,266,180,730	2,007,151,793	1,760,977,630	977,392,939
Percent of income that is matchable	80.6%	90.2%	91.6%	83.3%

Source: Calculated by author using data from Table 1 of Campbell and Parisi (2001).

* Net Income Plus Deficit Basis with losses added to income. This concept reflects the total amount that IRS must verify.

Table 1 shows that for taxpayers whose income is derived mainly from wages, interest, and dividends, the probability of detection (p) approaches unity.² For sole proprietors and others who have significant investment income, the detection rate *per return* is lower than 1.0 but certainly higher than the 0.20 percent “face-to-face” audit rate in the U.S. for tax year 1999. This is because nearly all taxpayers receive at least some portion of income from sources subject to third party reporting (e.g., interest, dividends, government transfer payments, etc.).

Economic Disparity, Compliance Opportunity Costs, and Tax Evasion

In evasion studies, it is standard practice to assume declining absolute risk aversion. In other words, as income increases, the more willing one becomes to put at risk a fixed dollar amount. From this it follows that low-income taxpayers should be more risk averse and less willing to evade than higher-income taxpayers, other relevant conditions held constant (Andreoni, Erard, and Feinstein, 1998; Crane and Nourzad, 1986). However, as Roth, Scholz, and Witte (1988, p. 116) point out, “other relevant conditions are not constant.” For example, a large unexpected medical expense increases the taxpayer’s opportunity cost of compliance. Taxpayers with little or no available savings might be tempted to “rob Peter (IRS) to pay Paul (hospital)” when confronted with such a situation. The following passage from a recent newspaper article captures the dilemma facing a new small business owner:

“There is much cash-flow pressure on owners of nascent businesses, and the quandaries can be painful: Pay suppliers late and they cut you off, pay the landlord late and risk eviction, pay employees late and they walk out. It often comes down to who is the least likely to squawk – and the IRS, which generally doesn’t know what you owe until you report it, is often the answer.”³

Such situations hardly are unusual, not only for business owners, but for many people from time to time. Not surprisingly, studies of criminal behavior have shown that an overriding factor in the decision to commit a crime is the lack of money (Carroll, 1989). Both Fajnzylber, Lederman, and Loayza (1998) and Ehrlich (1973) found a positive correlation between crime rates and income inequality and attribute the growing incidence of crime to a lack of economic opportunity. Witte and Woodbury (1985) report higher tax compliance in areas with low unemployment rates and poverty. In a study of tax return data for small corporations, Rice (1992) found firms whose profit margins fell below their industry median exhibited higher rates of noncompliance than firms with above average profits. Unfortunately, similar “balance sheet” information is not available for individual tax returns.

What this research suggests is individuals with limited financial resources have a higher propensity to evade due to their vulnerability to financial strain. Their need for money in the present outweighs the expected future costs of detection and punishment. In other words, such individuals have a high discount rate that favors present over future consumption.

However, financial strain is not the only factor that may affect compliance opportunity costs. The perception of an ever-increasing gap in the reciprocal relationship between taxpayer and government (exchange inequity) has been cited as a cause of taxpayer revolt (Citrin, 1979). In an iterative experimental study, Alm, McClelland, and Schulze (1992) found that an individual’s compliance rate in one round was positively correlated with the amount of public good received in the previous round. Scholz and Lubell (1998) observed that taxpayers who benefited from the Tax Reform Act (TRA) of 1986 exhibited an improved attitude toward compliance and the opposite response from those whose tax obligations increased under TRA 1986. These empirical findings support other theoretical work (Falkinger, 1988; Pommerehne, Hart, and

² However, taxpayers with no unmatched sources of income may have opportunities for evasion if they itemize or claim certain credits.

³ “The Right Thing” by Jeffrey L. Seglin, *The New York Times*, October 17, 1999.

Frey, 1994) that also link evasion activity to taxpayers' cost-benefit assessment of public sector goods and services.

Scholz and Lubell (1998) suggest that citizens' ability to adapt their attitudes to changes in public sector costs and benefits could lead to "an unexploitable strategy capable of maintaining cooperative solutions despite the conflict between collective benefits and individual incentives to free-ride." Such a goal becomes harder to achieve in a society with rising income inequality which, assuming no change in the level of government services, must rely more heavily on its wealthier citizens for an increasing share of tax revenues. This has been the case in the U.S. in recent years where the share of total federal income taxes paid by the top 5 percent of taxpayers rose from 43 percent to 54 percent between 1986 and 1998.⁴ During this same time, this group's share of total AGI also rose from 24 percent to 33 percent confirming a widening gap in pre-tax incomes between rich and poor.

Whether growing exchange inequity will induce taxpayers to initiate or increase evasion depends on several factors. First, if tax relief is available through the legislative process, then politically organized groups of taxpayers may pursue this course of action rather than risk the negative consequences associated with tax evasion. However, this approach has two drawbacks that limit its effectiveness. The first problem with legislated tax reduction is that it creates more complexity by introducing a raft of special interest provisions aimed at making the tax code more "fair." This has been a growing trend in the U.S. in recent years and has received much comment (see Graetz, 1999; Fox, 2001). Because of growing frustration with tax law complexity, this approach has only a limited time horizon before political pressure again builds for a new round of reform with uncertain consequences for the distribution of the tax burden. The second problem is that unless other sources of tax revenue are found to replace those lost to legislated tax reductions, the level of government services must be reduced. In the end, this means lower investment in infrastructure, education, and public health that eventually translates into lower long-term growth prospects for the economy as a whole. Rather than leading to an "unexploitable strategy," this self-feeding process, if not reversed, will threaten the social and economic systems that support a democratic society (Dovring, 1991).

A second factor is the effectiveness of the tax enforcement system. Clearly, the appeal of evasion is inversely related to the effectiveness of tax authorities at detecting and pursuing tax cheats. However, with limited budgetary resources the success of enforcement largely depends on the visibility of transactions (Roth, Scholz, and Witte, 1989). The theoretical models and empirical evidence point to reduced visibility with increasing concentration of income. Therefore, as a rule, tax enforcement effectiveness will erode with a shrinking middle class.

Third, the level of commitment to shared political ideals (social norms) has been cited as an important factor in determining willingness to comply with tax laws (Carroll, 1992). This statement seems sufficiently self-evident as to be almost tautological. The question for our analysis is: Does an environment of rising inequality support, or weaken, the fabric of shared social norms? The latter outcome seems more probable. Indeed, according to Nobel prize-winning economist Amartya Sen (1996) "...a perceived sense of inequity is a common ingredient of rebellion." Thus, growing economic disparity is likely to undermine the community-oriented values that promote an attitude of tax compliance.

Finally, the existence of an external threat to the nation's security may promote increased tax compliance despite rising inequality. The prospect of war, terrorism, or economic blackmail by an outside entity (nation, or other organized group) stirs the collective spirit to meet the challenge posed by the external threat. This situation may engender a heightened willingness to sacrifice for the good of the collective, at least until the crisis subsides. Conversely, the longer a nation goes without a credible external threat, the more difficult it

⁴ Campbell, David and Parisi, Michael, 2001, "Individual Income Tax Rates and Shares, 1998", *Statistics of Income Bulletin*, Spring 2001, vol. 20, no. 4, pp. 7-45.

becomes to maintain a sense of collective identity (Olson, 1982). Over time, and with growing inequality, the fading sense of group identity may lead greater numbers of taxpayers to view evasion as an acceptable response to a government seen as imposing a “confiscatory” tax burden on its citizens. The other alternative, i.e., reducing government expenditures on social and infrastructure needs, may provide short-term tax relief but at the cost of long-term economic and social viability.

The foregoing discussion suggests that income inequality should be seen as a determinant of tax evasion, primarily by its role in influencing compliance opportunity costs. A positive relationship is hypothesized between evasion and inequality.

Rewriting equation 1 in reduced form and introducing a variable (g) to represent income inequality we have:

$$[2] \quad e = f\left(\overset{-}{p}, \overset{-}{\Phi}, \overset{+}{y}, \overset{+}{\tau}, \overset{+}{g}\right)$$

In equation 2, e is a measure of evasion, p is the probability of detection including both the effect of audits and information reporting, Φ is the penalty rate, y is income and τ is the tax rate. The expected sign on each of the variables is adopted from previous theoretical and empirical studies (see Andreoni, Erard, and Feinstein (1998) for a recent review of this literature).

Other variables also may be relevant to include as predictors. For example, evasion may vary with economic and demographic factors other than income inequality. Possible candidate variables are: unemployment rate, bankruptcy rate, business failure rate, and dependency ratio (ratio of population to number of employed persons). The expected sign for these variables may be positive or negative and will depend on how each uniquely influences evasion propensity.

Assuming expression 2 is estimated with aggregate data, the appropriate regression equation is:

$$[3] \quad ER_t = \beta_0 + \beta_1 PD_t + \beta_2 FINE_t + \beta_3 LN(INCOME_t) + \beta_4 TR_t + \beta_5 GINI_t + \beta_6 OTHER_t + \varepsilon_t$$

Where ER_t is evasion rate at time t , PD_t is detection probability, $FINE_t$ is the penalty rate, $LN(INCOME_t)$ is the natural log of income, TR_t is the marginal tax rate, $GINI_t$ is the inequality measure (Gini coefficient), $OTHER_t$ are other factors that may affect the propensity to evade and ε_t is the error term.

The assumption of linearity is arbitrary and allows equation 3 to represent an average evasion rate for all individuals for a given time period. It is possible that the true functional form is not linear but contains interdependencies among variables. For example, an increase in inequality at time t causes evasion to increase that, in turn, raises inequality in time period $t+1$. These kinds of interdependencies seem not only plausible, but also likely to occur. For now, however, this additional theoretical refinement remains as a topic for future research.

EMPIRICAL ANALYSIS.

This section describes an empirical test of the extended model of income tax evasion (equation 3). The model is used to explain the variation in the underreporting rate for U.S. wage and salary income for the period 1947-1999. The decision to limit the analysis to wage and salary income underreporting was made for several reasons. First, although TCMP audits find low noncompliance rates (about one percent) for wage and salary income, this category still accounted for a significant share of underreported income by filers (\$19.9 billion or 9.2 percent of net misreported income in 1988) (IRS, 1996). When nonfilers are added, unreported wage income has averaged about four percent of total wages and salaries in recent years (see column D of Table A-1).

Second, wage and salary income is the single most frequently reported category of income on tax returns. Over 85 percent of all individual tax returns in 1999 reported at least some wage and salary income.⁵ Furthermore, analysis of wage and salary reporting noncompliance from the 1988 TCMP displays the same general pattern of noncompliance as for total income (Table 2). Table 2 shows taxpayers with \$50,000 to \$99,999 in wage income had the highest compliance rate and the smallest percentage of returns with underreported wage income.

TABLE 2

SELECTED COMPLIANCE MEASURES FOR 1988 WAGE AND SALARY INCOME

Corrected Wage Category	Number of Returns With Wage and Salary Income (Millions)	Reported Wage and Salary Income (\$ Billions)	Compliance Rate* (Percent)	Returns with Underreported Wage Income (Percent)
\$0-\$49,999	78.814	\$1,418.8	99.79%	4.5% [†]
\$50,000-\$99,999	8.543	\$550.0	99.88%	1.88% [‡]
\$100,000 and Over	1.334	\$268.6	99.68%	2.56% [‡]
Total	88.691	\$2,237.4	99.80%	4.22%

Source: Compiled by author from 1988 TCMP data for filers with wage and salary income.

N.B. Figures not adjusted for undetected income. The IRS estimates that for each \$1 of income detected by auditors without the aid of IRP documents, another \$2.28 went undetected (IRS, 1996).

*The compliance rate is the total reported tax liability divided by an estimate of the total correct tax liability. No entries are statistically significant at the 10% level.

[†]Statistically significant at the 1% level.

[‡]Statistically significant at the 10% level.

Third is the issue of reliability of the evasion measure. While most experts believe that randomly audited tax returns provide the most reliable measure of tax noncompliance (Andreoni, Erard, and Feinstein, 1998), the small number of observations from past TCMP studies limits the use of these data for time-series analysis. The U.S. Bureau of Economic Analysis (BEA) produces an alternative measure of misreported income. This measure, known as the AGI gap, is defined as the difference between BEA's estimate of AGI and taxpayer-reported AGI (Parker, 1987).

Although the total AGI gap has been used as a compliance measure in previous empirical research (Crane and Nourzad, 1986; Engel and Hines, 1998), its reliability as a measure of tax evasion is questionable. This is because a significant share of the total AGI gap is due to nonfarm proprietors' income that relies on data from individual tax returns.⁶ In contrast, the wage and salary component of the AGI gap (henceforth called the "wage gap") uses data reported by employers to the U.S. Bureau of Labor Statistics.

The wage gap is not an estimate of underreported wage and salary income, as it includes income earned by low-income individuals who are not required to file tax returns. This is because these so-called "legitimate nonfilers" are covered by BEA's personal income estimates, but not necessarily by IRS' AGI totals that

⁵ IRS, Statistics of Income, *Individual Income Tax Returns 1999*, Publication 1304 (Rev. 10-2001), Table 1.4 "1999 Individual Income Tax, All Returns: Sources of Income, Adjustments, and Tax Items, by Size of Adjusted Gross Income."

⁶ In 1999, approximately 55 percent of the AGI gap was due to nonfarm proprietors' income.

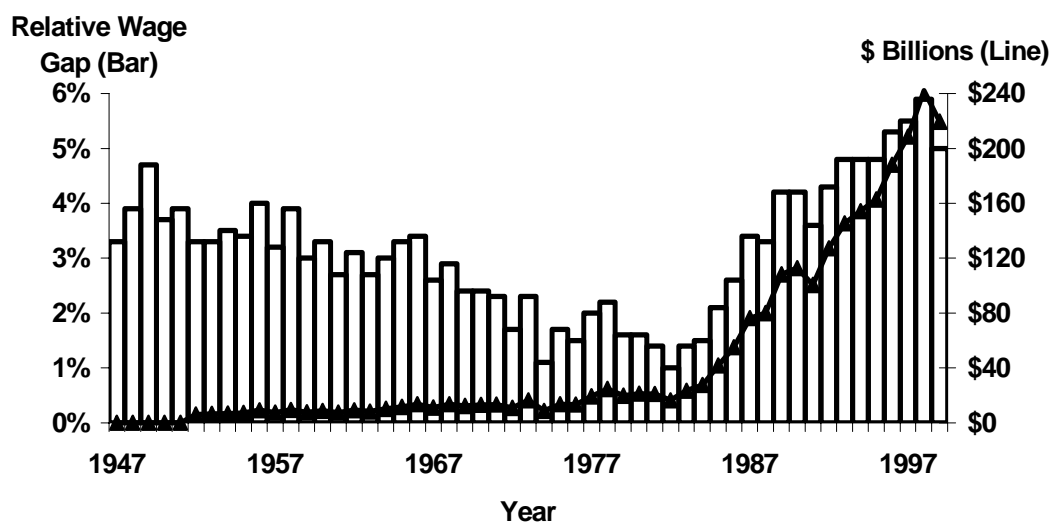
include only incomes reported on tax returns that are filed.⁷ The wage gap also reflects errors and omissions in the estimates of reconciliation items and the net effects of errors in BEA's personal income and IRS' AGI estimates. Despite these differences, however, the wage gap can provide an independent estimate of underreporting if adjusted for the variation due to low-income legitimate nonfilers. A adjustment of the wage gap is discussed in the following section.

Finally, using wage and salary income rather than total AGI simplifies and reduces the number of required predictor variables. Since wage income has been subject to information reporting (and withholding) for the entire period of study, the variable for detection probability may be defined simply as the audit rate.⁸ Also, research on the deterrence impact of penalties has found little significance between the size of penalties and compliance (Roth, Scholz, and Witte, 1989). The few empirical studies that have included a penalty predictor use assessed penalties (Crane and Nourzad, 1986; Engel and Hines, 1998). However, there is often little correspondence between the amount of penalties assessed and those actually collected. Moreover, identifying penalties specific to wage and salary underreporting versus other forms of evasion would be largely guesswork. Based on this reasoning the decision was made to drop the penalty rate variable from the analysis.

Description of the Data

BEA Wage Gap: The relative wage gap is the dependent variable in this study. The latest published estimates of the wage gap (Park, 2001) cover the period from 1959 to 1999. Upon written request, BEA will provide data beginning in 1947. Figure 2 displays the BEA wage gap in nominal dollars (line) and as a percent of BEA-adjusted wages (bar) for the period 1947 to 1999. From the late 1940s to the early 1950s, the relative wage gap decreased from about three percent of wages to one percent by 1982. In the subsequent 15 years, the relative wage gap ascended rapidly reaching an all-time high of five and one-half percent in 1997. In 1999, the nominal wage gap was estimated to be \$219.5 billion.

Figure 2. AGI Gap for Wage and Salary Income: 1947-1999



Source: Park (2001) and personal correspondence with Thae Park for data prior to

⁷ Some low-income individuals who are not required to file returns nevertheless file to claim refunds or the Earned Income Tax Credit (EITC). The incomes reported by these individuals are included in IRS' AGI totals.

⁸ The rationale for this assumption is given in a later section.

As previously mentioned, the wage gap is not an accurate measure of underreporting since BEA includes income from low-wage earners who are exempt from filing a tax return. In order to account for the presence of these legitimate nonfilers, the reported wage gap was adjusted using audit data for a sample of nonfilers from the 1988 TCMP study. The resulting “modified” wage gap is used in the remainder of this study. The methodology used to derive the modified wage gap is described in the Appendix.

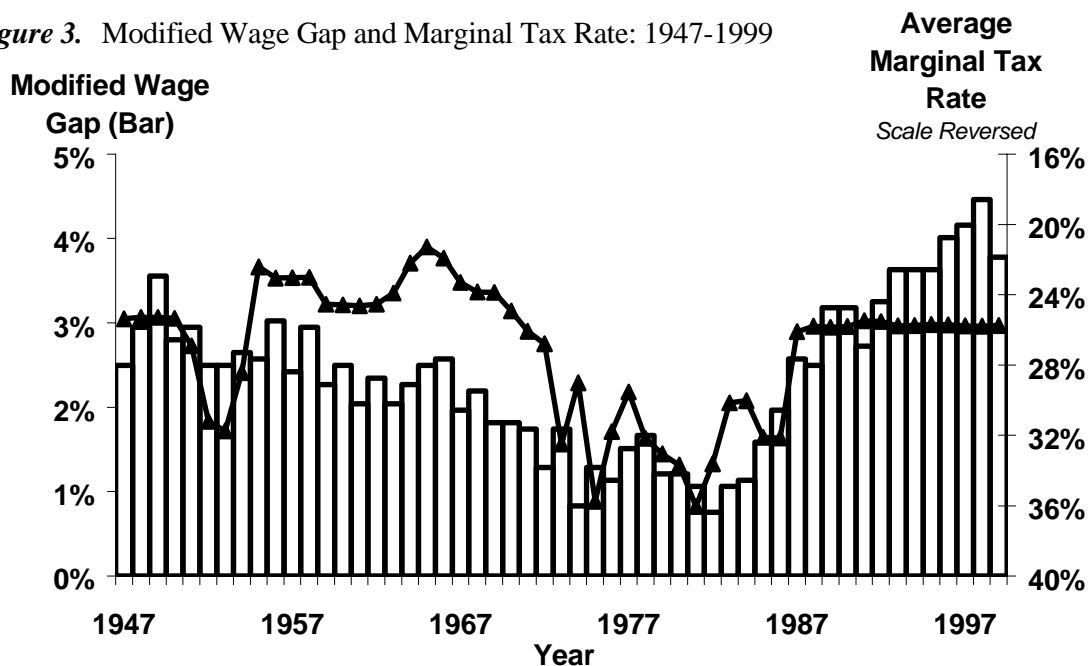
Average Marginal Tax Rate: Theoretical studies indicate that tax rates have an ambiguous effect on compliance, depending upon taxpayer attitudes toward risk, the structure of the penalty function, and other criteria (Andreoni, Erard, and Feinstein, 1998; Yitzaki, 1974). The results of empirical research are equally mixed. Clotfelter (1983) finds a positive correlation between marginal tax rates and evasion using 1979 TCMP data. Feinstein (1991), using pooled 1979 and 1982 TCMP data reports the opposite relationship.

The tax rate used in this study is a weighted average marginal tax rate on ordinary income (excluding Social Security and Medicare). The weights represent the share of total family income received by each quintile and the top five percent of families as reported by the U.S. Census Bureau. Historical average marginal tax rates range from a minimum of 21.3 percent in 1965 to a maximum of 36.1 percent in 1981. During the 1970s and early 1980s taxpayers experienced the phenomenon known as “bracket creep” as inflation pushed them into higher tax brackets although their real income may not have increased. For example, the average marginal income tax rate for the period 1947 to 1966 was 24.9 percent compared to 30.0 percent from 1967 to 1986. Bracket creep was eliminated with the passage of TRA 1986, which adjusted income tax brackets for inflation. From 1987 to 1999, the average marginal tax rate was 25.8 percent.

Figure 3 compares the historical trend for the modified wage gap and average marginal tax rate. The data indicate a significant negative correlation between the two variables ($r = -0.550$) during the 53-year study period from 1947 to 1999. In the years since 1987, the average marginal tax rate has remained relatively stable with only slight variation, mainly due to shifts in the distribution of income while the wage gap has continued to climb.

The negative correlation between the tax rate and underreporting of wage income may seem counterintuitive at first glance. However, higher marginal rates increase the amount withheld from paychecks. This may cause fewer taxpayers to be in a balance due status at the end of the year and, therefore, less reluctant to report their true total income. This would occur if the rate of withholding rises faster than the effective tax rate. There is some evidence that this took place. The average effective tax rate increased from 9.5 percent for the period 1950-66 to 9.9 percent for the period 1967-86, an increase of 4.2 percent (IRS, 2001, Table 8, p. 282). In contrast, the average marginal tax rates for the same time periods were 24.9 percent and 30.0 percent respectively, an increase of 20.5 percent. Therefore, taxpayer withholding of wages appears to have increased faster than the effective tax burden during this period.

Figure 3. Modified Wage Gap and Marginal Tax Rate: 1947-1999

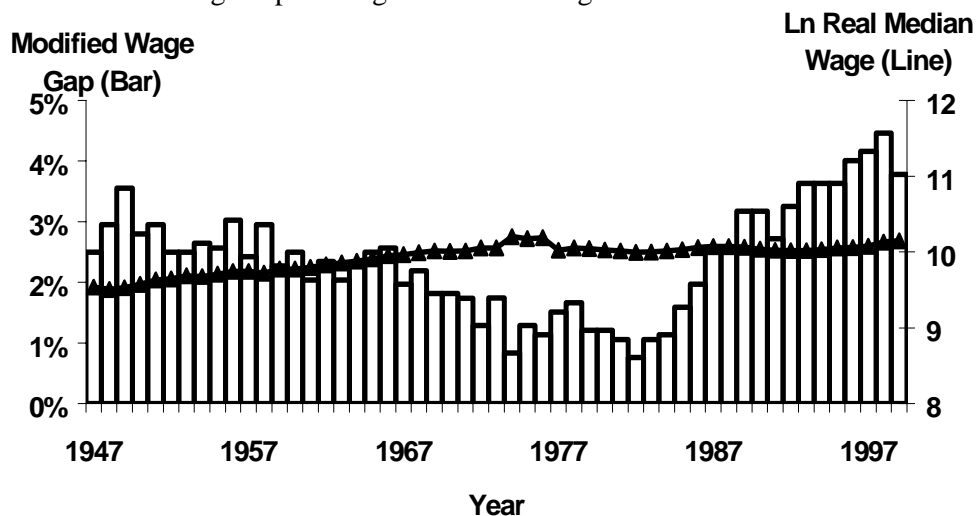


Source: Modified wage gap, see Appendix; Tax rate, IRS Publication 1304 (various issues); U.S. Census Bureau, [<http://www.census.gov/hhes/income/histinc/f01.htm> and [f02.htm](http://www.census.gov/hhes/income/histinc/f02.htm)].

The hypothesized enhanced compliance resulting from a change in balance due status has been explained in terms of prospect theory (Kahneman and Tversky, 1979). Taxpayers perceive a balance due as a loss, and become more willing to take a “risky” position when reporting income and deductions. Several studies have noted evidence of a positive correlation between balance due status and reporting noncompliance (Christian, 1994; Chang and Schultz, 1990). As an additional check, the correlation coefficient between the marginal tax rate and percent of returns with a balance due for the period 1947 to 1986 is -0.499 and significant at the one percent level. This may at least partly explain the negative correlation between tax rates and the relative wage gap, especially in the period before 1987. Consistent with theoretical studies, however, the expected sign for the tax rate variable is assumed indeterminate.

Wage and Salary Income: The income variable used in this analysis is real median wage and salary income. This variable is a weighted average of median wage and salary income for male and female workers reported in the Census Bureau’s March **Current Population Survey**. A natural log transformation of this variable is used in the estimated equation. Figure 4 superimposes a line graph of the natural log of real median wage and salary income on the modified wage gap. The correlation coefficient between the two variables is -0.217 indicating that as income increases the rate of underreporting falls, at least for the range of income in question (in this case from \$14,000 to \$26,000). While not statistically significant, the sign of this relationship is consistent with earlier work indicating that increases in true income lead to less than proportionate increases in the level of underreporting (Crane and Nourzad, 1986). A negative sign on this variable is anticipated for the estimated model.

Figure 4. Modified Wage Gap and Log Real Median Wages: 1947-1999



Source: Modified Wage Gap, see Appendix; Real median wage, Bureau of the Census, **Current Population Survey**, Historical Income Tables, Table P-53, <http://www.census.gov>.

Probability of Detection: Third-party reporting of income and withholding may influence evasion behavior by raising the taxpayer's perceived as much as the actual risk of detection. Taxpayers have little information by which to judge the efficacy of the tax authority's use of information documents. However, this uncertainty may work in the favor of IRS. According to Long and Swingen (1990), "If the taxpayer knows or even just thinks that the tax agency already has the information, they are less likely to deliberately cheat." In the only detailed study to date on the impact of information document matching on reporting noncompliance, Plumley (1996) found that the IRS' computerized document matching program had no statistically measurable impact on compliance during the period 1982 to 1991. This despite the fact that the number of information documents processed per return increased by nearly 60 percent (from five to eight) during this time period. Plumley concludes, "taxpayers apparently assumed that the matching was already in place, judging from the earlier compliance statistics."

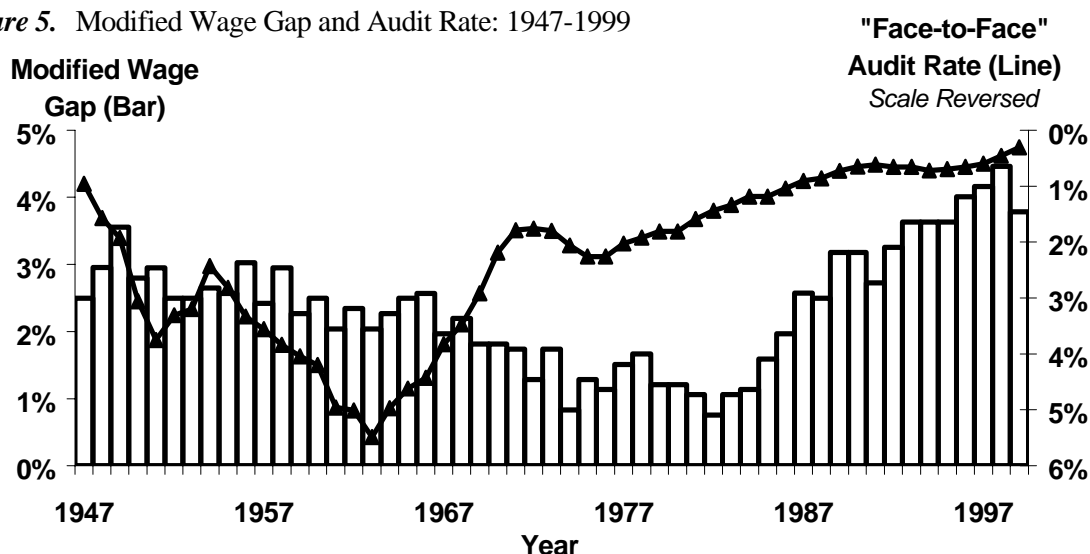
Following this earlier research, the present study assumes that the compliance effect of third-party reporting historically has resulted mainly from its presence, rather than from its effectiveness in identifying evasion.⁹ Therefore, this study assumes that variations in the wage gap due to detection probability from 1947 to the present may be attributed to changes in the audit rate. For this study, an audit is defined as the so-called district or "face-to-face" audit with adjustments as recommended by Engel and Hines (1998) for years before 1954. Although the IRS' definition of what constitutes an "audit" has changed over the years, the concept that receives the most media attention is the probability of the traditional "face-to-face" audit. Presumably, this is the information taxpayers have at hand when deciding whether to evade.

Researchers have noted the likely endogeneity of audit rates and evasion, especially in studies of evasion by individuals. Several alternative approaches have been proposed to address this issue (Plumley, 1996; Dubin, Graetz, and Wilde, 1990). However, at the national level the number of audits performed appears largely due to budgetary constraints rather than to the incidence of noncompliance. If this were not the case,

⁹ This does not imply that computerized matching of information documents is not an effective enforcement tool. However, the ability of the IRS to fully exploit automated technology must be placed in context with the availability of human resources to work specific cases.

there should have been a large jump in audits beginning in the early 1980s (Figure 5). That this did not occur reinforces the notion that, at least with national level data, the issue of endogeneity may be ignored.

Figure 5. Modified Wage Gap and Audit Rate: 1947-1999



Source: Modified wage gap, see Appendix; Audit rate, IRS Report of the Commissioner (various issues).

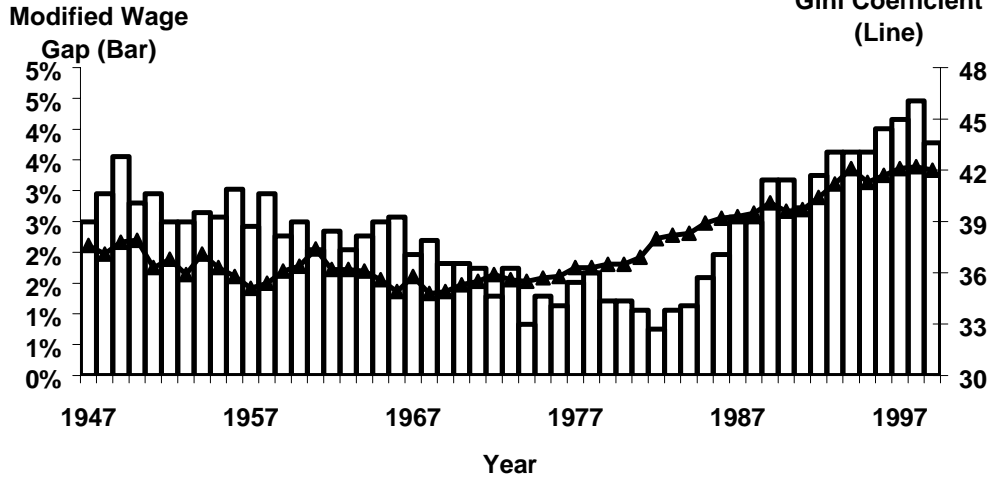
IRS publishes its audit rates on a fiscal year basis. This means that the published audit rate generally refers to the previous year's tax returns. In addition, audit rates lag a year in publication, meaning that taxpayers generally only know about audit coverage from two years ago. If taxpayers base their compliance decisions on the latest available information, then a two-year lag seems appropriate. This is the approach taken in this study. Over the study period, the audit rate_{t-2} displays a weak negative correlation with the wage gap ($r = -0.297$). A negative sign is expected for the regression coefficient.

Gini Coefficient: The inequality measure used for this study is the Gini coefficient for families published annually by the U.S. Census Bureau.¹⁰ Figure 6 graphically displays the trend in family income inequality and the wage gap for 1947 to 1999. The Pearson correlation coefficient between the two variables is 0.635. Until the early 1980's, the Gini coefficient fluctuated in the range of values between 33 and 36. From 1980 to 1999, U.S. income inequality rose 15 percent from 36.5 to 42.0.

There is no single explanation for this rise in U.S. inequality over the past two decades. Burtless (1999) performed a decomposition of the factors contributing to the change in inequality from 1979 to 1996. He found about one-third of the increase was due to growing earnings inequality. Another third of the increase was due to factors involving family composition, such as the shift from two-parent to single-parent families and the higher correlation of husband and wife earnings. The remaining one-third was due to a variety of other factors: the growing inequality of non-wage sources of income, the increased importance of unearned income received disproportionately by the most affluent households, and the declining effectiveness of government transfers to the very poor. Due to the hypothesized relationship between income inequality and compliance opportunity costs, a positive sign is expected on the regression coefficient.

¹⁰ Between 1992 and 1993, the Gini coefficient rose from 0.404 to 0.429, a jump of 6.2 percent. Subsequent analysis has determined that possibly one-half of this increase was due to changes in data collection procedures (see U.S. Census Bureau, 1996; Ryscavage, 1995). The Gini coefficients for 1993-1999 have been adjusted downward in this study to account for this overestimate.

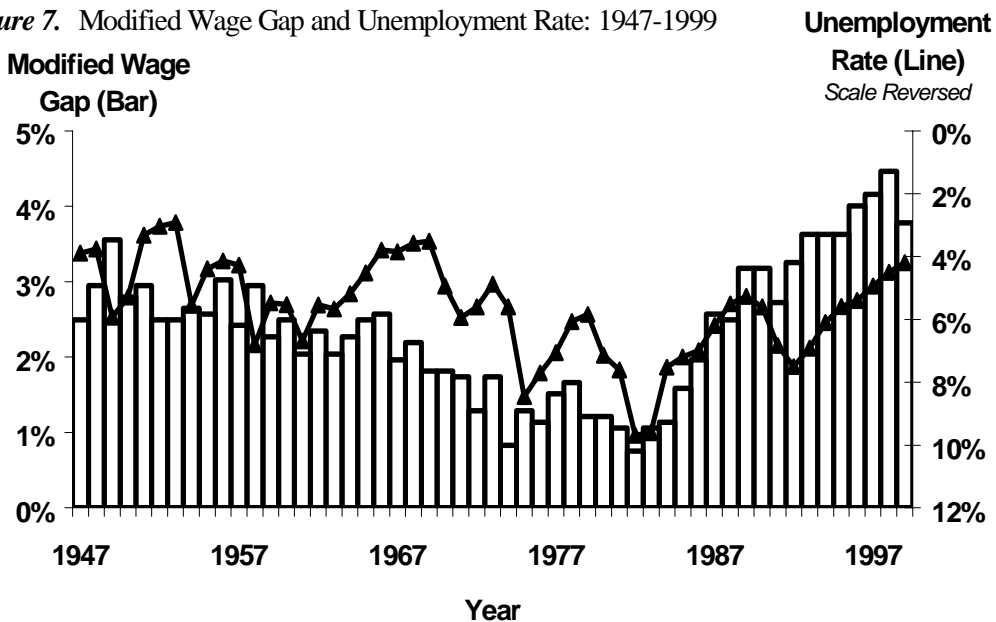
Figure 6. Modified Wage Gap and Gini Coefficient: 1947-1999



Source: Modified wage gap, see Appendix; Gini coefficient, U.S. Bureau of the Census [<http://www.census.gov/hhes/income/histinc/f04.html>]

Unemployment Rate: The unemployment rate (Figure 7) is included as a predictor variable to account for variation in the modified wage gap not due to evasion. Although the modified wage gap is adjusted to account for the unreported income of legitimate nonfilers, the lack of annual data on nonfilers suggests the modified wage gap may not be sensitive to year-to-year changes in employment levels. Adding the unemployment rate as an independent variable allows us to pick up this source of variation.

Figure 7. Modified Wage Gap and Unemployment Rate: 1947-1999



Source: Modified wage gap, see Appendix; Unemployment rate, Bureau of Labor Statistics, [<http://www.bls.gov/webapps/legacy/cpsatab1.htm>].

Figure 7 shows the modified wage gap is negatively correlated with the unemployment rate ($r = -0.427$). Thus, the evasion rate appears to rise when the unemployment rate is falling. This likely occurs as more low-income earners enter the workforce when the economy improves. Many of these employees are temporary, part-time, or seasonal workers who hold jobs created to meet the surge in demand. Others are full-time workers hired at entry-level positions. Since many of those who hold these jobs earn less the minimum amount needed to file a tax return, their appearance in the labor market likely pulls the wage gap upward. For this reason, a negative sign is anticipated for unemployment rate. Pearson correlation coefficients for all variables used in the model are shown in Table 3.

TABLE 3
PEARSON CORRELATION COEFFICIENTS FOR STUDY VARIABLES

	Wage gap	Gini Coefficient	Tax Rate	Audit Rate*	Unemployment Rate
Gini Coefficient	0.63545 ($<.0001$)				
Tax Rate	-0.54977 ($<.0001$)	-0.00977 (0.9447)			
Audit Rate*	-0.29706 (0.0343)	-0.75738 ($<.0001$)	-0.36724 (0.0080)		
Unemployment Rate	-0.42384 (0.0016)	0.19294 (0.1663)	0.51110 (0.0001)	-0.38115 (0.0058)	
Wage & Salary Income	-0.21685 (0.1188)	0.30091 (0.0286)	0.32799 (0.0165)	-0.39746 (0.0039)	0.41295 (0.0021)

Number of observations = 53

Prob > |r| under H0: Rho=0

*Lagged 2 time periods

ESTIMATION RESULTS.

The estimated regression model is:

$$[4] \quad WG_t = \beta_0 + \beta_1 PD_{t-2} + \beta_2 WAGSAL_t + \beta_3 TR_t + \beta_4 GINI_t + \beta_5 UR_t + \varepsilon_t$$

The dependent variable is the modified wage gap (WG_t). The predictor variables are the audit rate with a two-year lag (PD_{t-2}), the natural log of inflation-adjusted median wage and salary income ($WAGSAL_t$), the average marginal tax rate (TR_t), Gini coefficient ($GINI_t$), and the unemployment rate (UR_t).

Equation 4 was estimated using the maximum likelihood method with correction for first-order and second-order serial correlation. The regression output is shown in Table 4. The variables UR_t , $GINI_t$, $WAGSAL_t$ and PD_{t-2} have the expected signs and the unemployment rate and Gini coefficient are statistically significant. The tax rate variable has a negative sign and is also significant at the five-percent level. The Durbin-Watson statistic indicates the estimated model has been corrected for the presence of serial autocorrelation.

TABLE 4
ESTIMATION RESULTS

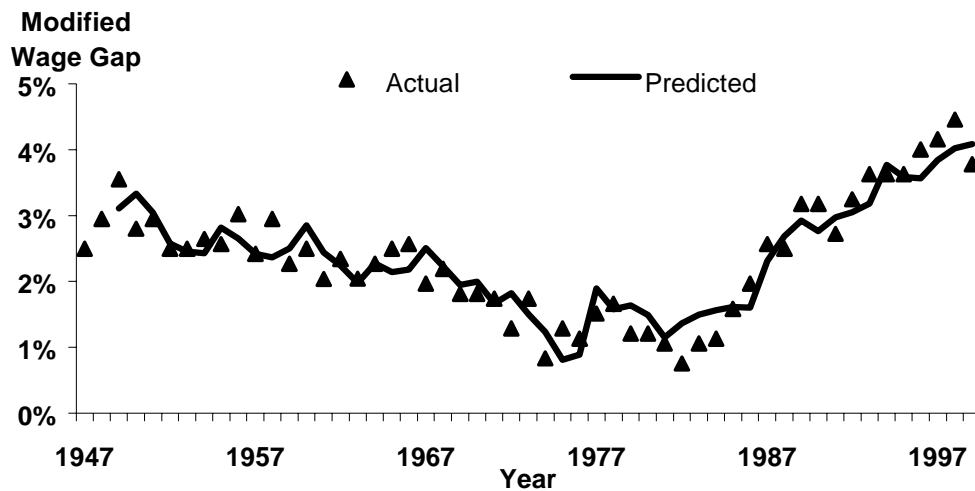
Explanatory Variables	Coefficient	t Ratio	Approx. Prob.
Intercept	7.442	0.99	0.329
UR	-0.130	-3.05	0.004
TR	-0.048	-2.39	0.021
GINI	0.237	3.72	0.001
PD	-0.053	-0.58	0.566
WAGSAL	-1.182	-1.58	0.122
ρ_1	0.192	1.49	0.144
ρ_2	0.545	3.94	0.000
Adjusted R-Square	0.850		
Durbin-Watson	1.94		
N	52		

Based on the estimated coefficients, a decline of one point in the Gini coefficient will reduce the wage gap by 0.24 percentage points. This finding suggests that reducing the level of income inequality may lower tax evasion by reducing both the opportunity and motive to evade. However, a society's willingness to accept a reduction in inequality may depend on the desirability of available alternatives. Proposals seen to be coercive may be met with resistance as compared to measures emphasizing voluntary participation. Instead, political leaders may opt to deal with unpopular measures, such as income redistribution, only after the emergence of a crisis that has left no other obvious course of action.

The results in Table 4 also suggest that an increase in the marginal tax rate by one percentage point yields a 0.05 percentage point reduction in the wage gap due to withholding a greater percentage of total tax due. However, this result likely reflects the unique historical circumstances surrounding the "bracket creep" phenomenon in the 1970s and early 1980s when the increase in the average marginal tax rate outpaced the increase in the effective tax rate. Therefore, the estimated model may distort the role of tax rates per se on underreporting. Nevertheless, the statistical significance of the coefficient on the tax rate variable is further evidence that taxpayers' withholding position is an important indicator of evasion tendencies.

Figure 8 displays a plot of the actual versus predicted wage gap using the regression coefficients.

Figure 8. Plot of Actual and Predicted Modified Wage Gap: 1947-99



Source: Author's Calculations.

CONCLUSIONS AND POLICY IMPLICATIONS.

Socrates: *Here, then, is a discovery of new evils against which the guardians will have to watch, or they will creep into the city unobserved*

Adeimantus: *What evils?*

Socrates: *Wealth and poverty; the one is the parent of luxury and indolence, and the other of meanness and viciousness, and both of discontent.* –Plato, *The Republic*, Book IV.

A satisfactory explanation of the Cox Paradox would provide an important key to understanding the causes of income tax evasion. The two main competing theoretical explanations for the Cox Paradox indirectly point to income inequality as a contributing factor. Economists emphasize the greater opportunities to evade among both the rich and poor while behaviorists would interpret rising economic disparity as a cause of taxpayer stress and increasing evasion propensity. This paper tests the hypothesis that income inequality is a determinant of income tax evasion.

Empirical results show a statistically significant relationship between a measure of income inequality (Gini coefficient) and U.S. wage and salary reporting noncompliance for the period 1947 to 1999. It must be stressed that this finding is not proof of causation in the same sense that mathematical laws describe the motions of the physical universe. Simply put, human beings are not robots, they possess free will and can choose to obey the law or do otherwise. However, this paper has argued that the observed positive correlation between the level of inequality and underreporting rate is consistent with prevailing behavioral and economic theories of tax evasion.

Although not conclusive evidence of causation, this result suggests that a continuation of the global trend of widening economic disparity will make the job of tax enforcement a more challenging one in the years to come. Policy makers have a variety of options to improve compliance. Particular emphasis should be placed on increasing the visibility of transactions by extending third party reporting of income where possible. Enhanced customer service and a simplified tax code should make it easier for many taxpayers to comply.

Reducing the time between an act of evasion and its detection would make evasion less attractive as an alternative to a short-term, high interest loan. While the audit rate was not found to have a statistically significant influence on wage and salary underreporting, this was not too surprising given the already high probability of detection from information documents. Taxpayer audits likely are a more effective enforcement tool when applied to income not covered by third-party reporting, such as business net profits and capital gains.

On the other hand, tax compliance programs that negatively affect taxpayers' financial status may have the unintended consequence of increasing, rather than reducing, evasion. For example, if the adoption of a single flat rate tax system shifts more of the total tax burden onto low-income households, evasion by this group of taxpayers may increase. Alternatively, relying on the wealthy to pay for an ever-increasing share of public goods and services may eventually provoke a "Revolt of the Haves" (Citrin, 1979; Graetz, 1999). If the results reported here are an indication, then macroeconomic policies or *the lack thereof* that result in a shrinking middle class will inevitably bring about increased tax evasion.

Clearly, a topic of such importance for the design of tax policy merits further investigation. Ideas for follow-on studies include extending this approach to other categories of income, such as business and investment income, and substituting a wealth-based measure of inequality for the Census Bureau's Gini coefficient. Andreoni, Erard, and Feinstein (1998) have called for more empirical studies in countries outside the US. Schneider and Enste (2000) provide a good summary of the available data to begin this work. However, their study highlights the lack of reliable evasion data. In particular, there is a need for additional time-series measures of evasion to identify trends that persist over several decades. Finally, a more realistic theoretical framework would admit interdependencies among variables. This topic seems particularly suited for carefully designed experimental studies.

Acknowledgments.

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REFERENCES

- Allingham, Michael G., and Agnar Sandmo.
"Income Tax Evasion: A Theoretical Analysis." *Journal of Public Economics* 1 (November, 1972): 323-38.
- Alm, James, Roy Bahl, and Matthew N. Murray.
"Tax Structure and Tax Compliance." *The Review of Economics and Statistics* 72 No. 4 (November, 1990): 603-613.
- Alm, James, Gary H. McClelland, and William D. Schulze.
"Why Do People Pay Taxes?" *Journal of Public Economics* 48 No. 1 (June 1992): 21-38.
- Andreoni, James, Brian Erard and Jonathan Feinstein.
"Tax Compliance," *Journal of Economic Literature* 36 (June 1998): 818-860.
- Bernasconi, Michele.
"Tax Evasion and Orders of Risk Aversion," *Journal of Public Economics* 67 (1998): 123-134.
- Burtless, Gary.
"Effects of Growing Wage Disparities and Changing Family Composition on the U.S. Income Distribution," Working Paper Number 4. Washington, DC: Brookings Institution, Center on Social and Economic Dynamics, 1999.
- Campbell, David and Michael Parisi.
"Individual Income Tax Returns, 1999", *SOI Bulletin* (Fall 2001): 9-47.
- Carroll, John S.
"A Cognitive-Process Analysis of Taxpayer Compliance." In *Taxpayer Compliance, Vol. 2: Social Science Perspectives*, edited by Jeffrey A. Roth, John T. Scholz, and Ann Dryden Witte. Philadelphia: University of Pennsylvania Press, 1989.
- Carroll, John S.
"How Taxpayers Think About Their Taxes: Frames and Values." In *Why People Pay Taxes: Tax Compliance and Enforcement*, edited by Joel Slemrod. Ann Arbor: University of Michigan Press, 1992.
- Chang, Otto H., and Joseph J. Schultz.
"The Income Tax Withholding Phenomenon: Evidence From TCMP Data," *The Journal of the American Taxation Association* 12 No. 1 (Fall 1990): 88-93.
- Christian, Charles W.
"Voluntary Compliance With The Individual Income Tax: Results From the 1988 TCMP Study," *The IRS Research Bulletin* IRS Publication 1500 (Rev.9-94), (1993/1994): 35-42.
- Citrin, Jack.
"Do People Want Something for Nothing: Public Opinion on Taxes and Government Spending," *National Tax Journal* 32 No. 2 (Supplement 1979): 113-129.
- Clotfelter, Charles T.
"Tax Evasion and Tax Rates: An Analysis of Individual Returns," *The Review of Economics and Statistics* 65 No. 3 (August 1983): 363-373.
- Cox, Dennis.
"Raising Revenue in the Underground Economy," *National Tax Journal* 37 No. 3 (1984):283-288.

- Crane, Steven E. and Nourzad, Farrokh.
 "Inflation and Tax Evasion: An Empirical Analysis," *The Review of Economics and Statistics* 68 No. 2 (May 1986): 217-223.
- Dovring, Folke.
Inequality: The Political Economy of Income Distribution, New York, Praeger, 1991.
- Dubin, Jeffrey A., Graetz, Michael J. and Wilde, Louis L.
 "The Effect of Audit Rates on the Federal Individual Income Tax, 1977-1986", *National Tax Journal* 43 No. 4 (1990): 395-409.
- Elffers, Henk.
Income Tax Evasion: Theory and Measurement, Erasmus University Rotterdam, Kluwer, 1991.
- Engel, Eduardo M.R.A., and James R. Hines Jr.
Understanding Tax Evasion Dynamics, Publication No. 98-22, Office of Tax Policy Research, University of Michigan, 1998.
- Erard, Brian, and Jonathan S. Feinstein.
 "The Role of Moral Sentiments and Audit Perceptions in Tax Compliance," *Public Finance/Finances Publiques* 49 (Supplement 1994): 70-89.
- Erard, Brian, and Chih-Chin Ho.
 "Searching for Ghosts: Who Are the Nonfilers and How Much Tax Do They Owe?" *Journal of Public Economics* 81 (2001): 25-50.
- Ehrlich, I.
 "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation," *Journal of Political Economy* 81 No. 3 (1973): 521-565.
- Falkinger, Josef.
 "Tax Evasion and Equity: A Theoretical Analysis," *Public Finance/Finances Publiques* 3 (1988): 388-395.
- Fajnzylber, Pablo, Daniel Lederman, and Norman Loayza.
Determinants of Crime Rates in Latin America and the World: An Empirical Assessment. Washington D.C.: The World Bank, 1998.
- Feinstein, Jonathan S.
 "An Econometric Analysis of Income Tax Evasion and Its Detection," *Rand Journal of Economics* 22 No. 1 (1991): 14-35.
- Fox, John O.
If Americans Really Understood the Income Tax: Uncovering Our Most Expensive Ignorance. Boulder, Colorado, Westview Press, 2001.
- Fratanduono, Richard J.
 "Trends in Voluntary Compliance of Taxpayers Filing Individual Tax Returns," *Trend Analysis and Related Statistics*, IRS Document 6011 (Rev. 3-86), (1986): 15-26.
- Graetz, Michael J.
The U.S. Income Tax: What It Is, How It Got That Way, and Where We Go from Here. New York, W.W. Norton, 1999.

- Internal Revenue Service.
Income Tax Compliance Research: Estimates for 1973-1981, Appendix B. Department of Treasury, 1983.
- Internal Revenue Service.
Federal Tax Compliance Research: Gross Tax Gap Estimates and Projections for 1973-1992, IRS Publication 7285 (3-88), Washington, D.C., 1988.
- Internal Revenue Service.
Federal Tax Compliance Research: Individual Income Tax Gap Estimates for 1985, 1988, and 1992, IRS Publication 1415 (Rev. 4-96), Washington, D.C., 1996.
- Internal Revenue Service.
Statistics of Income Bulletin, Spring 2001, Washington, D.C. 2001.
- Kahneman, Daniel, and Amos Tversky.
"Prospect Theory: An Analysis of Decision Under Risk," *Econometrica* 47 No. 2 (1979): 263-291.
- Lewis, Alan.
"An Empirical Assessment of Tax Mentality," *Public Finance/ Finances Publiques* 34 No. 2 (1979): 245-257.
- Lewis, Alan.
The Psychology of Taxation, Oxford: Martin Robertson, 1982.
- Long, Susan, and Judyth Swingen.
"Third Party Information Reporting and Compliance." In *Research Conference Report, How Do We Affect Taxpayer Behavior?*, Internal Revenue Service Document 7302 (3-91), Washington, D.C., 1990.
- Olson, Mancur.
The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities, New Haven, Yale University Press, 1982.
- Park, Thae S.
"Comparison of BEA Estimates of Personal Income and IRS Estimates of Adjusted Gross Income," *Survey of Current Business* (November 2001): 9-16.
- Parker, Robert, P.
"Improved Adjustments for Misreporting of Tax Return Information Used to Estimate the National Income and Product Accounts, 1977," *Survey of Current Business* (June 1984): 17-25.
- Plato.
The Republic Translated by Benjamin Jowett, New York, Barnes and Noble, 1998.
- Plumley, Alan H.
The Determinants of Individual Income Tax Compliance: Estimating The Impacts of Tax Policy, Enforcement, and IRS Responsiveness, Internal Revenue Service, Publication 1916 (Rev. 11-96), Washington, D.C., 1996.
- Pommerehne, Werner W., Albert Hart, and Bruno S. Frey.
"Tax Morale, Tax Evasion and the Choice of Policy Instruments in Different Political Systems," *Public Finance/ Finances Publiques* 49 (Supplement): 52-69.
- Rhoades, Shelley C.

"The Impact of Multiple Component Reporting on Tax Compliance and Audit Strategies," *The Accounting Review* 74 No. 1 (1999): 63-85.

Rice, Eric M.

"The Corporate Tax Gap: Evidence on Tax Compliance by Small Corporations." In *Why People Pay Taxes: Tax Compliance and Enforcement*, edited by Joel Slemrod. Ann Arbor: University of Michigan Press, 1992.

Roth, Jeffrey A., John T. Scholz, and Ann D. Witte.

Taxpayer Compliance, Vol. 1: An Agenda for Research. Philadelphia, University of Pennsylvania Press, 1989.

Ryscavage, Paul.

"A Surge in Growing Income Inequality?", *Monthly Labor Review* (August 1995): 51-61.

Scholz, John T., and Mark Lubell.

"Adaptive political attitudes: Duty, Trust, and Fear as Monitors of Tax Policy", *American Journal of Political Science* 42 No. 3 (July 1998): 903-920.

Schneider, Friedrich, and Dominik H. Enste.

"Shadow Economies: Size, Causes, and Consequences," *Journal of Economic Literature* 38 (March 2000): 77-114.

Sen, Amartya.

On Economic Inequality, New York, Oxford University Press, 1996.

Thomas, Jim.

"Quantifying the Black Economy: 'Measurement Without Theory' Yet Again?," *The Economic Journal* 109 (June 1999): F381-F389.

U.S. Census Bureau.

"A Brief Look at Postwar U.S. Income Inequality", *Current Population Reports, Series P60-191*, June 1996.

Warneryd, K., and B. Walerud.

"Taxes and Economic Behavior: Some Interview Data on Tax Evasion in Sweden," *Journal of Economic Psychology* 2, (1982): 187-211.

Witte, A. D., and D.F. Woodbury.

"The Effect of Tax Laws and Tax Administration on Tax Compliance: The Case of the U.S. Individual Income Tax," *National Tax Journal* 38 No. 1 (1985): 1-14.

Yitzaki, Shlomo.

"A Note on Income Tax Evasion: A Theoretical Analysis", *Journal of Public Economics* 3 No. 2 (1974): 201-202.

APPENDIX.

One can think of the BEA's reported wage gap as being comprised of three components: 1) underreporting by filers, 2) unreported income by persons with a legal obligation to file and 3) unreported income by legitimate nonfilers (i.e., persons with income below the legal filing threshold). In the 1988 TCMP, filer underreporting was estimated at \$19.9 billion. Data from a special survey of nonfilers conducted as part of the 1988 TCMP survey allows us to estimate second component of the wage gap. The third component we will estimate as a residual.

To determine the amount of nonfiler wage and salary income in 1988 we rely on data reported in Erard and Ho (2001). Using audit data from 3,549 secured delinquent returns of nonfilers, the authors estimate that an additional 7.9 million individual tax returns should have been filed in 1988. The mean total income (before adjustments and credits) on these returns was \$12,448 (\$1988). Wages and salaries accounted for 69.9 percent of total nonfiler income. Of the 7.9 million estimated nonfilers, only 41 percent had some taxes withheld (less than one half the 87 percent withholding rate for filers). Using this information, we estimate nonfiler unreported wage and salary income in 1988 as: $7.9 \text{ million nonfilers} * \$12,448 * 0.699 * 0.59 = \40.6 billion

The \$40.6 billion figure does not include the wages of nonfilers with an obligation to file and some withholding. However, given the considerable uncertainties involved in deriving the various IRS and BEA "gap" measures, a more conservative estimate seems appropriate. We now derive a modified wage gap for 1988 as the sum of underreported wage and salary income for filers (\$19.9 billion) and nonfilers (\$40.6 billion), for a total of \$60.5 billion. This amount represents 75.6 percent of the 1988 reported wage gap of \$80.0 billion. Therefore, we estimate legitimate nonfilers accounted for \$19.5 billion, or 24.4 percent, of the reported wage gap in 1988.

Since we only have nonfiler data for one year, we cannot repeat this procedure for the remaining 52 years of data in our time-series. However, we can adjust the reported wage gap for other years using the 1988 modified wage gap to reported wage gap ratio of 0.756. The results are shown in columns C and D of Table A-1. Table A-1 also compares historical TCMP estimates of filer underreporting (column F of Table A-1) to corresponding data estimated using the modified wage gap (column G). The entries in column G are calculated for TCMP years by multiplying the modified wage gap by the ratio of 1988 filer underreporting divided by the 1988 modified wage gap ($\$19.9 \text{ billion} / \$60.5 \text{ billion} = 0.329$). The MAPE for all eight years is 20.0 percent and drops to 11.8 percent when the values for 1969 and 1988 are excluded.

TABLE A-1

DERIVATION OF MODIFIED WAGE GAP AND COMPARISON WITH TCMP DATA

	A	B	C	D	E	F	G	H	I
					Pre-1979 TCMP Filer W&S				
	BEA Adjusted Wage Amount	BEA Reported Wage Gap	Modified Wage Gap	Relative Modified Wage Gap	Filer Wage & Salary Underreporting per TCMP	Underreporting Adjusted for Undetected Income	Filer W&S Underreporting @ 32.9% of Column C	Absolute Difference	Absolute Percent Error
Year	(\$ Billions)	(\$ Billions)	(\$ Billions)	(%)	(\$ Billions)	(\$ Billions)	(\$ Billions)	(\$ Billions)	
1999	\$4,390.0	\$219.5	\$165.9	3.78%					
1998	\$4,105.1	\$242.2	\$183.1	4.46%					
1997	\$3,792.7	\$208.6	\$157.7	4.16%					
1996	\$3,547.2	\$188.0	\$142.1	4.01%					
1995	\$3,391.7	\$162.8	\$123.1	3.63%					
1994	\$3,214.6	\$154.3	\$116.7	3.63%					
1993	\$3,029.2	\$145.4	\$109.9	3.63%					
1992	\$2,960.5	\$127.3	\$96.2	3.25%					
1991	\$2,788.9	\$100.4	\$75.9	2.72%					
1990	\$2,685.7	\$112.8	\$85.3	3.18%					
1989	\$2,576.2	\$108.2	\$81.8	3.18%					
1988	\$2,424.2	\$80.0	\$60.5	2.49%	\$19.9	\$19.9	\$19.9	\$0.0	0.0%
1987	\$2,244.1	\$76.3	\$57.7	2.57%					
1986	\$2,119.2	\$55.1	\$41.7	1.97%					
1985	\$1,990.5	\$41.8	\$31.6	1.59%	\$11.1	\$11.1	\$10.4	\$0.7	6.8%
1984	\$1,833.3	\$27.5	\$20.8	1.13%					
1983	\$1,678.6	\$23.5	\$17.8	1.06%					
1982	\$1,650.0	\$16.5	\$12.5	0.76%	\$4.1	\$4.1	\$4.1	\$0.0	0.0%
1981	\$1,500.0	\$21.0	\$15.9	1.06%					
1980	\$1,331.3	\$21.3	\$16.1	1.21%					
1979	\$1,231.3	\$19.7	\$14.9	1.21%	\$3.5	\$3.5	\$4.9	\$1.4	28.6%
1978	\$1,122.7	\$24.7	\$18.7	1.66%					
1977	\$965.0	\$19.3	\$14.6	1.51%					
1976	\$880.0	\$13.2	\$10.0	1.13%	\$1.0	\$3.3	\$3.3	\$0.0	0.1%
1975	\$800.0	\$13.6	\$10.3	1.29%					
1974	\$800.0	\$8.8	\$6.7	0.83%					
1973	\$713.0	\$16.4	\$12.4	1.74%	\$1.1	\$3.6	\$4.1	\$0.5	11.5%
1972	\$635.3	\$10.8	\$8.2	1.29%					
1971	\$578.3	\$13.3	\$10.1	1.74%					
1970	\$545.8	\$13.1	\$9.9	1.81%					
1969	\$516.7	\$12.4	\$9.4	1.81%	\$0.1	\$0.3	\$3.1	\$2.8	89.4%
1968	\$469.0	\$13.6	\$10.3	2.19%					
1967	\$423.1	\$11.0	\$8.3	1.97%					
1966	\$397.1	\$13.5	\$10.2	2.57%					
1965	\$354.5	\$11.7	\$8.8	2.50%	\$1.1	\$3.6	\$2.9	\$0.7	24.0%
1964	\$340.0	\$10.2	\$7.7	2.27%					
1963	\$307.4	\$8.3	\$6.3	2.04%					
1962	\$293.5	\$9.1	\$6.9	2.34%					
1961	\$277.8	\$7.5	\$5.7	2.04%					
1960	\$266.7	\$8.8	\$6.7	2.49%					
1959	\$256.7	\$7.7	\$5.8	2.27%					
1958	\$238.5	\$9.3	\$7.0	2.95%					
1957	\$234.4	\$7.5	\$5.7	2.42%					
1956	\$227.5	\$9.1	\$6.9	3.02%					
1955	\$211.8	\$7.2	\$5.4	2.57%					
1954	\$194.3	\$6.8	\$5.1	2.65%					
1953	\$193.9	\$6.4	\$4.8	2.50%					
1952	\$181.8	\$6.0	\$4.5	2.50%					
1951	\$169.2	6.6	\$5.0	2.95%					
1950	\$145.9	5.4	\$4.1	2.80%					
1949	\$129.8	6.1	\$4.6	3.55%					
1948	\$133.3	5.2	\$3.9	2.95%					
1947	\$118.2	3.9	\$2.9	2.49%					

Source: Author's Calculations

Cols A&B: Park (2001).

Col C: Col B * 0.756.

Col D: Col C / Col A.

Col E: IRS (1996) and Fratantuono (1986).

Col F: Col E * 3.28 for pre-1979 entries. See IRS (1996).

Col G: Col C * 0.329

Col H: | Col G - Col F |

Col I: (Col H / Col G) * 100