The Externality of Taxing the 'Rich': Evidence from Hedge Funds

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Abstract

This study examines whether increases in the personal income tax rate disincentivize hedge fund managers to exert effort. Using plausible exogenous variations in federal and state statutory tax rates, we find that fund managers' marginal income tax rates are negatively associated with fund performance. The results are similar when we analyze the effect of a major U.S. federal income tax increase in 2013 and use non-U.S. fund managers as a control group. In response to a tax hike, fund managers hold stocks with lower information asymmetry and trade less. We further find that higher incentives from compensation contracts help mitigate tax-induced effort shirking. Our study sheds light on the externalities of taxing the affluent and informs the debate on tax system design.

Keywords: hedge funds; taxation; performance; agency problems; incentives
JEL: G12, G20, H20, H24

"Raising taxes on the top 2% of Americans is tantamount to killing the goose that lays the golden eggs." – MarketWatch August 2010[2]

1. Introduction

According to the Congressional Budget Office, the top 1% of the most affluent American households collected 16.7% of aggregate income and paid 26.6% of aggregate federal personal income tax in 2014.[3] Therefore, not surprisingly, how much and how to tax high-income individuals are among the most controversial questions for the design of tax policy. Concerns about rising inequality have led to the support for progressive tax codes. However, high-income individuals may possess skills that are valuable for the performance of the economy. At the center of the debate is whether wealthy individuals' economic activities have positive (or negative) externalities and how they respond to attempts to tax them. However, there has been surprisingly little hard evidence uncovered on the impact of tax system on the behavior of the rich primarily due to the paucity of data on this population (Slemrod, 1998).

We study whether increases in the personal income tax rate disincentivize the affluent to exert effort. We examine this research question through the behavior of hedge fund managers. Hedge fund managers are among the most affluent segment of the population and are subject to the highest marginal federal and state personal income taxes under the current tax code. According to Institutional Investor, the average compensation of a hedge fund manager was $1.4 million in 2018 (Whyte, 2018). Furthermore, a substantial portion of their compensation is taxed as ordinary income.[4] Hedge funds offer a nice setting to study the impact of taxes on the affluent as it allows

[2] https://www.marketwatch.com/story/killing-geese-that-lay-golden-eggs-2010-08-10.
[3] https://www.cbo.gov/publication/53597.
[4] Hedge fund managers' compensation consists of management and incentive fees, with the former constituting a large portion of their compensation. For instance, Yin and Zhang (2019) document that management fees, on average,

us to gauge how taxes affect fund managers' effort in terms of fund performance and portfolio management decisions. Moreover, since fund managers act as delegated agents for investors and actively exploit mispricing opportunities, economic behavior of fund managers in response to a personal income tax hike may have important implications on the externalities of personal income taxes.[5]

Economic theories predict two opposing effects of tax on hedge fund managers' work incentives. On the one hand, an increase in tax rate lowers the after-tax income for a manager, reducing the marginal benefit to a manager's effort. This reduced benefit could lead to a lower level of exerted effort since other uses of time, such as leisure, may offer relatively higher utility. In a principal-agent relation, the disincentivizing effect of personal income tax on a fund manager also imposes a cost on the principals (fund investors) in the form of inferior fund performance. On the other hand, tax increases can also increase labor input through an income effect—more effort needs to be exerted to make up for the loss of income and maintain current consumption.[6] Therefore, ultimately how taxes affect managers' incentives to exert effort is an empirical question.

Using plausible exogenous variations in top federal and state statutory tax rates from 1994 to 2017, we examine the relation between personal income tax rate and hedge fund performance.

account for more than 70% of a manager's compensation across a broad sample of hedge funds. Similarly, Lan, Wang, and Yang (2013) show that management fees represent the majority of total compensation to fund managers. Management fees are taxed as ordinary income. However, the incentive fee (the fund manager's share of realized investment profits) can be taxed at a lower capital gains tax rate, but only if the investment is held for more than one year prior to 2018 and more than three years after passage of the Tax Cuts and Jobs Act of 2017. Otherwise, the incentive fee is also treated as ordinary income for tax purposes. Hedge funds typically hold their positions for less than a year (Davis 2019; Picker 2017). Thus, a hedge fund manager's compensation through incentive fees is often taxed using ordinary income rates.

[5] Although one can also observe the performance of mutual fund managers, there is no data on their compensation except the structure (Ma, Tang, and Gómez, 2019). Also, they increasingly work in teams (Chen et al., 2004; Massa, Reuter, and Zitzewitz, 2010; Bär, Kempf, and Ruenzi, 2011) which makes it challenging to ascertain individual manager's compensation.

[6] One counter argument for why the income effect may not be applicable to affluent people is that they are not working to cover the costs of essential needs as perhaps the rank-and-file employees. However, McClelland and Mok (2012) finds little compelling evidence that high-income taxpayers have substantially greater elasticities with respect to their labor input compared to the labor input of other taxpayers.

We assume that fund managers work and therefore pay personal income tax in the state where their funds are located because every state taxes income earned in the state for both residents and non-residents (Armstrong, Glaeser, Huang, and Taylor, 2019). We further assume that hedge fund managers face the highest marginal personal ordinary income tax rates. We find that fund managers' personal income tax rate is negatively associated with hedge fund performance after controlling for fund characteristics correlated with fund returns, time-varying macro-economic factors, and fund fixed effects that absorb the effect of unobserved time-invariant factors such as managerial skill.[7] Specifically, a one standard deviation increase in the tax rate is associated with a 1.1 percentage point decrease in the annual alpha from a seven-factor Fung and Hsieh (2004) model augmented with an emerging market factor. This effect is economically large as it is close to the average annual alpha of 1.2 percentage points. This finding is robust to the use of alternative performance measures such as raw returns and style-adjusted returns. We find similar panel results using an international sample of hedge funds.

To alleviate potential endogeneity concerns that unobserved macroeconomic factors may drive both tax policy and fund performance, we also conduct two difference-in-differences (DID) analyses. Following Giroud and Rauh (2019), the first setting involves state-level tax increases of at least 100 basis points (1%). We find evidence of a decline in fund performance around large state-level tax increases for all three measures of performance. We further conduct an additional DID analysis using an international sample of hedge funds around the American Taxpayer Relief Act of 2012. The Act took effect on January 1, 2013 and increased the maximum federal ordinary income tax from 35% to 40.79%. In addition, the maximum long-term capital gain tax increased significantly from 15% to 24.99%. Since the Act may coincide with changes in macroeconomic

[7] Fund fixed effects also subsume state fixed effects as location of funds do not change over time.

conditions, we use foreign fund managers whose countries did not experience any major personal income tax changes during 2011-2015 as the control group. Following Giroud and Rauh (2019), we use personal income tax data from the OECD website to identify six countries that had insignificant changes in personal tax rates as a control group (Switzerland, Chile, Germany, Denmark, Sweden, and Turkey).[8] Based on the 8-factor model, we find some evidence of a decline in the performance of US-based funds subsequent to the enactment of the Act. U.S. funds experience a 0.6 percentage point decrease in the fund's 8-factor alpha during the three-year period after the tax increase, relative to the foreign funds in our control sample.

Since the key job function of a hedge fund manager is to make investment decisions on behalf of fund investors, we further explore direct evidence of tax hikes on effort shirking by examining hedge fund managers' portfolio management decisions. If portfolio managers shirk their effort after an increase in their personal income tax rates, they may opt to reduce investment in stocks with greater information asymmetry, which requires more time and effort to gather and process information. Furthermore, following an increase in personal income tax rates, portfolio managers may choose to trade less to avoid the costly effort associated with security selection. Consistent with the prediction of tax-induced effort shirking, we find that higher tax rates are associated with hedge fund managers holding stocks of firms with less information asymmetry. Specifically, an increase in personal tax rates is associated with a greater proportion of stocks held in firms that are larger in market capitalization and lower in R&D intensity as well as firms that have greater analyst following and higher liquidity. In addition, we find lower portfolio turnover subsequent to an increase in the tax rates of hedge fund managers providing more supportive evidence of effort shirking.

[8] http://www.oecd.org/tax/tax-policy/tax-database.htm.

Next, we examine whether incentives from hedge fund managers' compensation contracts at least partially offset the disincentive effect of higher taxes. Economic theory suggests that compensation contracts can be designed to incentivize portfolio managers to exert effort into information collection and processing (Stoughton, 1993). Therefore, we examine whether managerial incentives, captured through total delta and the incentive-portion of a manager's compensation, could potentially mitigate the adverse consequences of higher personal taxes on fund performance. We provide evidence consistent with better performance among high-delta funds and managers that derive a larger portion of compensation through incentive pay. We also examine whether fund investors could influence the design of compensation contracts to mitigate the negative impact of tax increases. Since hedge fund fees are set at the inception date and rarely change over time, we investigate the relation between incentive fee and the personal tax rate at the inception date of a fund, after controlling for fund characteristics and fixed effects for both style and investment company. We document a positive association between incentive fee and personal tax rate, suggesting that a higher incentive fee in managerial compensation contracts helps mitigate potential effort shirking due to higher taxes.

Lastly, we explore alternative explanations of our main results. First, the negative relation between tax rate and fund performance may be driven by reduced risk taking rather than effort shirking. For example, Ljungqvist, Zhang, and Zuo (2017) argue that higher taxes reduce corporate risk taking because higher taxes reduce the expected net present value for more risky projects as the government shares in the firms' upside gains, but not downside losses. Since we use risk-adjusted performance (style-adjusted returns or eight-factor alphas) in our empirical analysis, changes in stock returns due to potential changes in risk-taking behavior are accounted for (through the market factor) and therefore alleviates this concern to some extent. Nonetheless, we adopt two

additional risk-adjusted performance measures, namely the Sharpe ratio and information ratio, to further address this issue. We continue to find a robust negative relation between the tax rate and these alternative measures of risk-adjusted fund performance.[9] Another alternative explanation is that hedge fund managers may adopt trading strategies that are more tax efficient upon an increase in tax rates. Such tax-efficient portfolio management may lead to lower pre-tax fund returns. To examine this alternative explanation, we further include a measure of tax efficient management as an additional control in our empirical specification. We continue to find a negative and significant impact of managerial personal income tax on fund performance. In additional robustness tests, our results continue to hold using a subsample of hedge funds that file 13F forms.

Our study contributes to the empirical literature on the effects of personal tax rate on labor input. In prior studies, labor input is usually measured in terms of labor quantity, i.e., labor participation or hours worked using survey data, or as income reported in tax returns (McClelland and Mok, 2012). These quantity measures suffer from several limitations. For example, labor participation and hours worked does not capture the quality (i.e., intensity) of work and career changes. In contrast, in our setting of the hedge fund industry, we measure labor input using the output of labor, i.e., fund performance, which captures the combined effect of both the quality and quantity of labor input. This is analogous to using patent activity as a measure of innovation to capture both quantity and quality of innovation inputs instead of just the quantity of inputs as in the case of R&D (Agarwal, Vashishtha, and Venkatachalam, 2018).[10] In addition, we can proxy for managers' effort through their portfolio management decisions. Furthermore, the

[9] Furthermore, statutory corporate tax rates did not change over our sample period alleviating the concern that changes in corporate tax rates may be influencing stock returns.

[10] Prior research finds a positive relation between trading and fund performance among equity mutual funds (e.g., Pástor et al. 2017). Furthermore, if fund performance poorly captures manager effort, then it should bias us against finding significant results as greater noise in the measure would inflate the standard errors in our statistical tests.

characteristics of hedge fund manager compensation contracts allows us to examine whether greater incentive provisions are used to mitigate the disincentivizing effect of an increase in personal tax rate.

Perhaps due to paucity of data, there have been only a few studies examining the impact of the tax system on the behavior of the very affluent, or on the contribution of the affluent to overall economic performance. Goolsbee (2000) examines the responsiveness of taxable income to changes in marginal tax rates using executive compensation data from 1991 to 1995. He documents a large short-run response but almost entirely from a temporary shift in the timing of compensation (i.e., the exercise of stock options). Armstrong, Glaeser, Huang, and Taylor (2017) find a positive relation between CEOs' personal tax rates and corporate risk-taking. Compared to the corporate setting in which firm performance can be driven by various stakeholders and decision makers, hedge fund performance is primarily driven by the actions of its managers and can better capture their effort. Moreover, using the setting of hedge funds in a principal-agent relation, our study uncovers a negative consequence of taxing the rich: lower returns for fund investors. Our results also imply a potentially negative externality of taxes on market efficiency, since hedge fund managers play an important role in discovering and reducing mispricing (Cao, Liang, Lo, and Petrasek, 2017; Cao, Chen, Goetzmann, and Liang, 2018) and informed monitoring (Brav, Jiang, Partnoy, and Thomas, 2008).

Our study also contributes to the literature on delegated portfolio management. Prior studies investigate the effect of incentive fees, high watermark provisions, and managerial ownership on hedge fund performance (Agarwal, Daniel, Naik, 2009; Elton, Gruber, and Blake, 2003) and risk-taking behavior (Aragon and Nanda, 2011). To the best of our knowledge, this study is the first to examine the incentive effect of personal tax rate changes on managers' effort

and fund performance. Moreover, this study adds to the literature that investigates tax implications in delegated portfolio management. Previous studies examine whether mutual fund managers adopt investment strategies that are tax-efficient for fund investors (Sialm and Starks, 2012; Sialm and Zhang, 2018), how mutual fund investors respond to after-tax returns (Bergstresser and Poterba, 2002), and the effect of tax-motivated trading by mutual funds on asset prices (Gibson, Safieddine, and Titman, 2000). In contrast, we investigate how personal tax rate changes affect fund performance and portfolio selection.

2. Data and Summary Statistics

2.1 Data

We use several sources of data in our analyses. The first datasets are on the various tax rates and macroeconomic variables used in this paper. We obtain data on the combined federal and state income tax rates from the NBER TAXSIM database. Corporate tax rates are from the University of Michigan Tax Database for 1994–2000 and from the Tax Foundation for the years 2000–2017. Cross-country corporate and personal income tax rates are from the OECD database. The macroeconomic variables of cross-country GDP, income, and employment data are also from the OECD database. Interstate data on GDP, income, and unemployment come from the Bureau of Economic Analysis. Hedge fund data are from the Lipper/TASS database which has been widely used in prior hedge fund studies (e.g., Sadka, 2010; Teo, 2011). TASS provides monthly fund returns and assets under management, a snapshot of fund characteristics, and information on the management companies/investment advisors. Both live and dead funds are included in the analysis to mitigate survivorship bias. Because data on defunct funds are not available before 1994, the return observations before 1994 introduce a survivorship bias and therefore are removed from the sample. In addition, funds often report return data prior to their listing date in the database.

Because well-performing funds have stronger incentives to list, for example, after the incubation period, the backfilled returns are usually higher than the non-backfilled returns. To mitigate the backfill and incubation biases, we remove the backfilled return data, and keep only the returns after the listing date of each fund in the database. In addition, a fund must have non-missing fund characteristics, including management fee, incentive fee, fund style, fund size, and the use of high watermark, lockup, or leverage to be included in the sample. Using these filters, we have 3,088 funds (1,672 investment companies) in the final sample between January 1994 and December 2017.[11]

We also use Thomson-Reuters Institutional (13F) Holdings data set which provides quarterly holdings by asset management companies that are obligated to file Form 13F with the Securities and Exchange Commission (SEC). Form 13F is filed at the level of the asset management company or fund sponsor (henceforth, "asset management company"). Each asset management company can manage multiple hedge funds or portfolios (henceforth, "hedge funds"). To identify asset management companies that operate hedge funds, we first compile a list of company names using the "Companies" file in the TASS data. We then manually match these company names with those in the 13F Holdings data set. This procedure yields a total of 512 asset management companies that manage hedge funds. Subsequently, we match the hedge fund holding data with firm, equity, and analyst characteristics using Compustat, CRSP, and I/B/E/S Estimates, respectively.

2.2 Summary statistics

[11] Note that we exclude funds of hedge funds throughout our analyses because we investigate the actions of fund managers in terms of security selection and portfolio turnover to determine changes in their effort. Funds of hedge funds invest in other hedge funds rather than directly in the primary security markets.

Table I reports the descriptive statistics. Panel A presents the summary statistics of top federal, state, and combined ordinary income tax rate at the monthly level for both domestic and international funds. Panel B reports the summary statistics of hedge fund performance and characteristics. Hedge fund performance is measured at the fund-month level using raw returns, style-adjusted returns calculated using style benchmark, and alphas from an eight-factor model, i.e., Fung and Hsieh (2004) seven-factor model augmented with an emerging market factor (*8-Factor Alpha*). As reported in Panel B of Table I, the average alpha is 0.1 percentage points monthly and the standard deviation is 3.4 percentage points. Additional fund characteristics at the fund-month level include fund assets under management (*Assets*) measured in millions of dollars, fund flow (*Flow*), fund age (*Age*) measured in months. An average fund manages $227.75 million, has 0.4 percentage points monthly (or 4.8 percentage points annualized) flows, and is 86.52 months (about 7 years) old. We also report fund characteristics that remains time-invariant at the fund level. These variables are incentive fees (*IncentiveFee*), management fees (*ManagementFee*), highwater mark (*HighwaterMark*), and lockup period (*Lockup*). The average management fee and incentive fee are 1.4% and 17.2%, respectively. Among the hedge funds in our sample, 72% use a highwater mark provision. The average lockup period is 5.46 months. Panel C shows the summary statistics of stocks held by hedge fund managers at the fund-stock-quarter level. *HFownership* is measured by the shares of the stock owned by a hedge fund manager divided by the total shares outstanding. The average ownership in a stock is 0.7%. Other stock characteristics are firm size (*LnFirmSize*), analyst coverage (*LnAnalyst*), firm age (*LnFirmAge*), stock illiquidity (*Illiquidity*), idiosyncratic return volatility (*IdioVolatility*), R&D expenditures (*R&D*), market-to-book ratio (*MB*), stock price (*LnPrice*), stock momentum (*Momentum*), dividend yield (*D/P*), price-to-sales ratio (*P/S*), and equity beta (*Beta*). Panel D provides summary statistics for the macroeconomic

variables that we use in this study. The average state-level corporate tax rate is 42.4%. The average international corporate tax rate significantly lower at 24.9%. Average state GDP growth rate, income growth rate, and unemployment are 2.0%, 4.0%, and 6.2% while their international counterparts are 1.5%, 1.5%, and 6.3%, respectively.

< INSERT TABLE I >

3. The impact of tax rate on hedge fund performance

To examine whether an increase in personal tax rate affects a hedge fund manager's effort, we first use hedge fund performance to capture a fund manager's effort. Since fund performance should reflect both a fund manager's skill and effort, we carefully control for fund manager skill using fund fixed effects. We also control for other fund characteristics that can affect fund performance as suggested in the previous literature (e.g., Agarwal, Daniel, and Naik, 2009). We further control for time-varying macroeconomic factors that may impact fund returns. Relative to other measures of labor input used in prior studies (e.g., labor participation and hours worked), fund performance has the advantage of capturing both the quantity and quality of labor input.

A manager's personal tax rate can affect manager's effort through two channels. The *substitution hypothesis* predicts a lower effort level when the tax rate is higher. When there is a tax increase, it lowers the after-tax income for a manager and reduces the marginal benefit from a manager's effort. This reduced net benefit could lead to a lower level of exerted effort since other uses of time, such as leisure, may become relatively more attractive. In contrast, the *income hypothesis* suggests that tax hikes can increase managerial effort. When higher taxes reduce a manager's net after-tax income, the manager may exert more effort to make up for the lost income and maintain current levels of consumption. Therefore, the effect of a tax increase on manager's effort is an empirical question. In the following subsections, we examine the effect of personal

tax rates on fund performance using panel regressions with fund fixed effects and difference-in-differences analyses.

3.1 Baseline tests

In our first set of empirical tests, we examine the relation between fund managers' personal income tax rates and fund performance using plausibly exogenous variations in federal and state statutory tax rates in a panel regression setting. We assume that hedge fund managers face the highest marginal personal income tax rate. The maximum federal and state income tax rate is calculated by Dan Feenberg of the National Bureau of Economic Research (NBER) and his collaborators using the TAXSIM model, assuming a married couple filing jointly with an income of $1,500,000, property tax deductions of $150,000, and the reciprocal deductibility of federal and state income taxes where applicable. We further assume that fund managers pay personal income tax in the state where their funds are located, given that every state taxes income earned in the state for both residents and non-residents (Armstrong, Glaeser, Huang, and Taylor, 2019).

We estimate the following regression to examine the effect of tax rate on hedge fund performance:

$$Performance_{i,t} = \alpha_0 + \alpha_1 Manager\_Tax_{i,t} + \sum \alpha_j Controls_{i,} + \varepsilon_{i,t} \quad (1)$$

$Performance_{i,t}$ is the return of hedge fund i in month t. We measure hedge fund performance using raw returns, style-adjusted returns, and alphas from an eight-factor model. To compute style-adjusted returns, we use raw returns of hedge fund i in month t minus the average returns of all hedge funds following the same style. We estimate the eight-factor alpha by regressing monthly raw returns of a hedge fund on the seven factors in the Fung and Hsieh (2004) model augmented with an emerging market factor over a 36-month rolling window. We require a minimum of 24 non-missing monthly returns in each estimation window to estimate alpha. The

eight-factor model controls for market returns to account for changes in the stock returns due to changes in tax rates. $Manager\_Tax_{i,t}$ is the maximum combined federal and state income tax rate of manager *i* in month *t*. Following prior literature (e.g., Agarwal, Daniel, and Naik, 2009), fund characteristic controls include the logarithm of assets under management (*LnAsset*), fund flows (*Flow*), and logarithm of fund age (*LnAge*). All fund characteristic control variables are lagged by one month. To account for time-varying macroeconomic factors that may simultaneously impact fund returns, we further include corporate tax rate (*Corporate_Tax*), state-level GDP growth rate (*StateGDPGrowth*), state-level income growth rate (*StateIncomeGrowth*), and state unemployment rate (*StateUnemployment*). To account for unobservable fund manager skill, we include fund fixed effects.[12]

As shown in Table II, the coefficient on $Manager\_Tax_{i,t}$ is negative and statistically significant across all columns. The results are robust to the use of different performance measures including raw returns, style-adjusted returns, and 8-factor alphas. These results indicate that a higher personal tax rate of the fund manager is associated with a lower hedge fund performance. The economic magnitude is also significant. For example, column (3) in Table II shows that a one standard deviation increase in personal tax rate is associated with a 1.1 (0.029×0.033×12) percentage point decrease in annual alpha. With respect to the control variables, fund size is negatively associated with fund performance, consistent with prior work suggesting a decreasing returns-to-scale in the hedge fund industry (e.g., Getmansky, 2012; Yin, 2016). Furthermore, fund age is negatively associated with fund performance consistent with younger funds performing better (Aggarwal and Jorion, 2010). Overall, our results suggest that the substitution effect

[12] The inclusion of fund fixed effects also subsumes state fixed effects as fund location does not vary over time in our sample.

dominates the income effect. That is, when personal income tax rates increase, fund managers reduce effort because the reward to effort (after-tax income) becomes lower.

< INSERT TABLE II >

We further examine how personal tax rates impact fund performance using an international sample of funds. The set of hedge funds comes across all Organization for Economic Cooperation and Development (OECD) countries from 1994 to 2017. Our model for analysis follows equation (1) except for *Manager_Tax* and the macroeconomic variables, which are replaced with their international counterparts. *Manager_Tax* is replaced with *Manager_Tax_OECD* which is measured as the top marginal income tax rate in the OCED country where the fund is located. We further substitute state-level corporate tax rate (*StateCorporate_Tax*), state-level GDP growth rate (*StateGDPGrowth*), state-level income growth rate (*StateIncomeGrowth*), and state-level unemployment rate (*StateUnemployment*) for *CountryCorporate_Tax*, *CountryGDPGrowth*, *CountryIncomeGrowth*, and *CountryUnemployment*, respectively.

Table III presents the results of this analysis. As shown in column (3), *Manager_Tax_OECD* is negatively associated with fund returns as measured by the 8-factor alpha. A one standard deviation increase in personal tax rate is associated with a 1.7 (0.060×0.023×12) percentage point decrease in annual alpha. Among our alternative measures of fund performance, there remains a negative and statistically significant association between *Manager_Tax_OECD* and raw returns although the result for style-adjusted returns is not significant. Overall, the results from this table using an international sample of funds are consistent with the results in Table II.

< INSERT TABLE III >

3.2 Difference-in-differences analyses

We use two alternative difference-in-differences (DID) analyses to alleviate the concern that certain macroeconomic factors may drive both tax policy and fund performance in our panel regressions. The first setting examines a five-year [−2, +2] window around major state-level tax increases. Following Giroud and Rauh (2019), we define a major tax increase as an increase of at least 100 basis points. Since major state-level tax increases can overlap across different states, a hedge fund can serve as both a treatment and control observation. Our model follows equation (1) but substitutes *Manager_Tax* for *Treatment*, where *Treatment* is set to one if a fund manager is in a state that experiences a large increase in state income taxes (100 basis points or higher) and zero, otherwise.

The second setting uses the increase in the maximum federal income tax rate due to the American Taxpayer Relief Act (ACT) of 2012 as an event study to examine the relation between tax hike and effort shirking, measured by fund performance. The ACT took effect on January 1, 2013 and reverted the top marginal federal tax rate to the higher rates after the expiration of the Bush-era tax cuts while retaining the lower personal income tax rate on the other income brackets. This tax change marks the largest tax rate increase on high earners over our sample period. Specifically, the ACT increased the maximum statutory ordinary income tax rate from 35% to 39.6%, reinstated the 3% phaseouts of itemized deductions, and imposed a 0.9% Medicare tax surcharge on ordinary income and a 3.8% Medicare tax surcharge on net investment income. As a result, the maximum federal ordinary income tax increased from 35% in 2012 to 40.79% in 2013. The maximum long-term capital gain tax increased from 15% in 2012 to 24.99% in 2013.

As the tax rate change may coincide with global macroeconomic changes, we use foreign fund managers that are not subject to major changes in personal income tax as the control group and perform a different-in-differences (DID) analysis. To qualify for the control group, the country

where a fund manager lives should not have experienced a large tax rate change during 2011-2015. Following Giroud and Rauh (2019), we obtain personal income tax data from the OECD website and use 1% as the cutoff to define large versus small personal income tax change. The control countries are Switzerland, Chile, Germany, Denmark, Sweden, and Turkey.

We use the following equation to estimate the effect of a tax increase on fund performance:

$$Performance_{i,t} = \beta_0 + \beta_1 Post_t \times Domestic_{i,t} + \sum \beta_j Controls_{i,} + \varepsilon_{i,t} \quad (2)$$

As in equation (1), we measure hedge fund performance using raw return, style-adjusted return, and 8-factor alpha. $Post_t$ is an indicator variable, which equals 1 if the time period is after the ACT, and zero otherwise. $Domestic_{i,t}$ is an indicator variable that equals 1 if the hedge fund manager resides in the U.S., and zero otherwise. The control variables are same as in equation (1) but with country-level macroeconomic variables. We further include fund, fund style, and year fixed effects.

Table IV presents the results. In Panel A, we see that *Treatment* is negative and statistically significant across all measures of fund performance with coefficients for *Treatment* ranging from −0.002 to −0.005 and statistically significant at the 5% level. On average, the 8-factor alpha declines by 0.5 percentage points for hedge funds in states with a large tax increase. Panel B presents the results using the model specified in equation (2). As shown in this panel, the coefficient on the interaction term *Post* × *Domestic* is negative and statistically significant at the 10% level when fund performance is measured using the 8-factor alpha. These results suggest that U.S. funds incur a 0.6 percentage point decline in monthly 8-factor alpha relative to foreign fund managers during the three-year period after the tax increase. However, *Post* × *Domestic* is not statistically significant when raw and style-adjusted returns are used to measure fund performance.

Overall, we continue to find evidence that an increase in personal tax rates has a negative influence on fund performance. Using a DID framework, we show that the results hold using a

domestic experiment using state-by-state increase in state taxes. Using the ACT of 2012 and an international sample of hedge funds provides weaker supporting evidence.

< INSERT TABLE IV >

4. Tax rate and stock selection

One major advantage of using the hedge fund industry to examine the relation between tax and effort is that fund managers' actions are readily observable through their stock selection. This setting allows us to explore direct evidence of effort shirking by examining the security selection decisions of hedge fund managers. One of the primary job functions of portfolio managers is to acquire and process private information about security prices to manage the portfolios for their investors (e.g., Stoughton, 1993). Hedge fund managers may shirk by exerting less effort in acquiring and processing private information of stocks with greater information asymmetry. Following the prior literature (e.g., Chari, Jagannanthan, and Ofer, 1988; Glosten and Milgrom, 1985; Brennan and Subrahmanyam, 1995; Aboody and Lev, 2000), we use several proxies for information asymmetry: firm size, analyst coverage, firm age, stock illiquidity, R&D expenditure, and idiosyncratic volatility of stock returns. We then examine the relation between personal tax rate of a fund manager and the extent of information asymmetry of the stocks held.

Specifically, we estimate the following regression model at the stock-quarter level, which allows us to control various stock characteristics:

$$\begin{aligned} HFownership_{i,j,t} = \; & \gamma_0 + \gamma_1 InformationAsymmetry_{i,t-1} \times Manager\_Tax_{i,t} \\ & + \gamma_2 InformationAsymmetry_{i,t-1} + \gamma_3 Manager\_Tax_{i,t} \\ & + \sum \gamma_j Controls_{i,} + \varepsilon_{i,j,t} \end{aligned} \quad (3)$$

$HFownership_{i,j,t}$ is the total number of shares of a stock *i* owned by a hedge fund *j* divided by the total number of shares outstanding in quarter *t*. $InformationAsymmetry_{i,t-1}$ are proxies of

information asymmetry of stock *i* during quarter *t*-1. These proxies include firm size (*LnFirmSize*), analyst coverage (*LnAnalyst*), illiquidity (*Illiquidity*), R&D expenditures (*R&D*) and stock idiosyncratic volatility (*IdioVolatility*). Detailed variable definitions are in the Appendix. Fund-level controls include lagged fund size (*LnAssets*), fund flow (*Flow*), and fund age (*LnAge*). In addition, we control for additional stock characteristics including market-to-book ratio (*MB*), stock price (*LnPrice*), momentum (*Momentum*), dividend yield (*D/P*), and market beta (*Beta*). We include fund, stock, and year fixed effects to further account for unobserved manager skill, stock characteristics, and macroeconomic shocks, respectively.

The results of the security selection analyses are presented in Table V. As shown in Table V, the coefficient on $Manager\_Tax_{i,t}$ is negative and statistically significant across all regressions, suggesting that, on average, fund managers take on less concentrated positions after increases in personal tax rate. Since Bushee and Goodman (2007) show that changes in institutional ownership with large positions in a firm are indicative of informed trading, this result is supportive of the view that hedge fund managers shirk effort in their search for private information when they experience an increase in personal income tax. The coefficients on the interaction terms between tax and all measures of information asymmetry are statistically significant and carry signs that are consistent with our expectations. These results suggest that hedge fund managers disproportionally increase their equity holdings of firms that are larger, have lower R&D expenditures, have greater analyst following, and have stocks with greater liquidity and lower idiosyncratic volatility, after an increase in tax rate. Overall, these cross-sectional analyses suggest that fund managers increase their holdings of stocks with lower information asymmetry when personal tax rates are higher. Also, these results provide supportive evidence that hedge fund managers shirk effort in gathering private information when they face disincentives from a higher personal tax rate.

< INSERT TABLE V >

5. Tax rate and portfolio turnover

If higher personal tax is associated with a lower effort level, fund managers may reduce their effort by living a quiet life and trading less. To test this hypothesis, we examine the association between tax rate and portfolio turnover and estimate the following regression model:

$$Turnover_{i,t} = \delta_0 + \delta_1 Avg(Manager\_Tax_{i,t}) + \sum \delta_j Controls_{i,} + \varepsilon_{i,t} \quad (4)$$

$Turnover_{i,t}$ is defined as the portfolio turnover across all funds controlled by investment company *i* in quarter *t.* Following Ben-David, Franzoni, and Moussawi (2012), it is estimated as the minimum of the absolute values of buys and sells during quarter *q* divided by the total holdings at the end of quarter *q*−1, where buys and sells are measured using end-of-quarter *q*−1 prices. As a robustness check, we proxy for portfolio turnover using two alternative measures introduced by Carhart (1997) and modified based on the critique by Chen, Jegadeesh, and Wermers (2000). Specifically, our first alternative measure of portfolio turnover ($AltTurnover_1$) is calculated as the minimum of buys and sells for the quarter plus the absolute value of investor inflows or redemptions, scaled by lagged assets. Our second alternative measure of portfolio turnover ($AltTurnover_2$) is similar to the first measure but subtracts the absolute value of investor inflows or redemptions. Our variable of interest is $Avg(Manager\_Tax_{i,t})$ which is defined as the average fund manager tax rate across all funds controlled by investment company *i* in quarter *t*. The set of control variables used include logarithm of assets under management (*LnAsset*), fund flow (*Flow*), fund returns (*Return*), logarithm of fund age (*LnAge*) as well as the same set of macro-economic controls used in equation (1). We further aggregate the fund observations by taking the average of each variable across all funds controlled by an investment company since the observations are at the investment company-quarter level, due to the use of 13F data, for this analysis.

Table VI presents the results. As shown in column (1), we find a negative association between personal tax rate and portfolio turnover after controlling for fund characteristics and investment company fixed effects and that the association is statistically significant (coefficient = –0.492, *t*-statistic = –3.21). Using alternative measures of *Turnover*, columns (2) and (3) present results with similar inferences as from column (1). Specifically, that the coefficient of $Avg(Manager\_Tax_{i,t})$ is negative and statistically significant at the 1% level across both columns. Overall, the results from this table provide supportive evidence suggesting that higher taxes reduce manager effort as evidenced by lower turnover in the portfolios that they manage.[13]

< INSERT TABLE VI >

6. Managerial incentives

So far, we have shown that an increase in personal tax rates can lead to a deterioration in fund performance. In this section, we explore the role that managerial incentives can have in the relation between personal tax rates and fund performance. Specifically, we predict that the negative impact of higher taxes on fund returns is less severe when managerial incentives from their compensation contracts are greater. To measure managerial incentives, we follow Agarwal, Daniel, and Naik (2009) and estimate total delta. Total delta is defined as the overall pay-performance sensitivity of a hedge fund manager's compensation. Specifically, it is the total expected dollar increase in the manager's compensation for a 1% increase in the fund's net asset value. We also compute the incentive portion of a fund manager's compensation as an alternative measure of managerial incentives. We then estimate the following regression:

[13] An alternative explanation for this finding can be that higher tax rates may reduce turnover not because of a reduction in manager effort but because the manager may wish to reduce his/her tax expenses. To the extent that the results may partially be driven by this alternative explanation, we include tax efficient management (defined later in Section 8) as another independent variable in our empirical analyses. Our main results remain unchanged, suggesting that higher taxes are associated with lower effort.

$$Performance_{i,t} = \rho_0 + \rho_1 HiIncentive_{i,t} \times Manager\_Tax_{i,t} + \rho_2 HiIncentive_{i,t} + \rho_3 Manager\_Tax_{i,t} + \sum \rho_j Controls_i + \varepsilon_{i,t} \quad (5)$$

$Performance_{i,t}$ is the return of hedge fund i in month t. As in equation (1), we measure hedge fund performance using raw return, style-adjusted return, and 8-factor alpha. $HiIncentive_{i,t}$ is an indicator set to one if the manager's incentives (as measured by either total delta of fund i in month t or the incentive portion of a fund manager's compensation), is above the median across the entire sample and zero, otherwise. $Manager\_Tax_{i,t}$ is the maximum combined federal and state income tax rate of manager i in month t. Control variables and fixed effects are same as those used in equation (1). Panel A of Table VII presents the results for *Delta*. The coefficient on the interaction term, *Hi_Delta*×*Manager_Tax*, our main variable of interest, is positive and statistically significant across all three measures of fund returns. Panel B of Table VII presents the results using the incentive portion of a manager's compensation as an alternative measure for manager incentives. Similar to the results of panel A, the interaction term, *Hi_CompIncentive* ×*Manager_Tax* is positive and statistically significant in columns (1) and (2) when the dependent variable is *Raw Returns* or *Style-Adjusted Returns*, but insignificant in column (3) when examining *8-Factor Alpha*. Overall, the results from this table suggest that the effect of tax rate hikes on effort shirking is less severe when managerial incentives are high.

< INSERT TABLE VII >

7. Tax rate and incentive fee

Since our results suggest that there is a negative effect of personal tax on a hedge fund manager's effort level, we investigate if fund investors recognize and attempt to mitigate the disincentive effect of a tax change. Economic theory suggests that fund investors (principals) can design a compensation contract to incentivize delegated portfolio managers (agents) to exert greater effort (Stoughton, 1993). Therefore, provisions in fund managers' compensation contracts

can be used to offset the disincentive effect on effort due to a tax increase. Specifically, we examine the relation between personal tax rate and incentive fees. Managers get to keep a greater portion of fund profits and should have a greater incentive to exert effort when the incentive fee is higher. Therefore, when an increase in tax rate disincentivizes managers to exert effort, investors may set a higher incentive fee to induce managers' effort. Since hedge fund fees are set at the inception date and rarely change over time, we investigate the relation between incentive fee and the personal tax rate at the inception date of a fund through the following cross-sectional regression:

$$\text{Log}(1+IncentiveFee_{i,t}) = \delta_0 + \delta_1 Manager\_Tax_{i,t} + \sum \delta_j Controls_{i,t-1} + \varepsilon_{i,t} \quad (6)$$

$IncentiveFee_{i,t}$ is the incentive fee received by hedge fund manager i at a fund's inception month t. $Manager\_Tax_{i,t}$ is the maximum combined federal and state income tax rate of fund manager i at a fund's inception month t. We include a set of variables that control for characteristics of the investment company to which a fund belongs. First, we include *HighwaterMark*, an indicator set to one for the presence of a highwater mark and zero, otherwise. We further include an indicator, *Lockup*, to control for the presence of a lockup period. We also include management fees (*ManagementFee*) since management and incentive fees are often determined jointly at the fund's inception. We further include the logarithm of assets under management (*LnAsset*), flows of fund (*Flow*), and logarithm of fund age (*LnAge*) at the investment company level. We also include a set of macroeconomic variables (*Corporate_Tax*, *StateIncomeGrowth*, *StateUnemployment*, and *StateGDPGrowth*). We further include investment company fixed effects to capture unobserved time-invariant factors that can impact the incentive fee such as the reputation of the investment company.

As shown in Table VIII, we find a positive relation between incentive fee and personal tax rate after controlling for fund characteristics, macro-economic factors, and fund style and

investment company fixed effects. For example, the coefficient in column (3) is 0.291 and is statistically significant at the 5% level. This result indicates that a one standard deviation increase in personal tax rate is associated with a 10.1% increase in the incentive fee. Overall, our results suggest that a higher incentive fee is set to mitigate the disincentive effect of a tax increase.

< INSERT TABLE VIII >

8. Alternative explanations

While we find robust results that a tax rate increase leads to a lower fund performance, this negative association may be driven by reduced risk taking instead of effort shirking. For instance, Ljungqvist, Zhang, and Zuo (2017) argue that taxes reduce corporate risk taking because higher taxes reduce expected profits more for risky projects than for safe ones as the government shares in firms' profits, but not losses. To address this alternative explanation, we use two measures of risk-adjusted returns, including style-adjusted returns and alphas from an 8-factor model (which accounts for the impact of tax rate changes on market returns), in our analyses and continue to find a negative impact of tax increase on these risk-adjusted returns. To further mitigate this concern, we examine additional alternative risk-adjusted return measures as a robustness check. Specifically, we examine how manager tax rates are associated with the Sharpe ratio, which adjusts a fund's return by its total risk, and information ratio, which adjusts a fund's alpha by the risk of generating alpha. Following Brown, Lu, Ray, and Teo (2018), Sharpe ratio is estimated as the average monthly fund excess return divided by the standard deviation of monthly fund returns, and information ratio is estimated as the average monthly fund alpha divided by the standard deviation of monthly fund residuals. Both ratios are estimated at the fund-year level. Furthermore, we require

that data be available for at least nine months during the year for which these ratios are calculated.[14] The control variables follow those used in equation (1) before.

Table IX presents the results. The Sharpe and information ratios are used as alternative measures of risk-adjusted performance. Column (1) shows a negative association between personal tax rate (*Manager_Tax*) and Sharpe ratio and that the association is statistically significant at conventional levels (coefficient = –1.258, *t*-statistic = –3.77). Column (2) provides similar results using the information ratio. The coefficient of *Manager_Tax* is –0.683 with a *p*-value of less than five percent (*t*-statistic = –2.19). Overall, the results from this table further support our interpretation that hedge fund managers reduce effort and deliver lower fund performance after a tax rate increase.[15]

< INSERT TABLE IX >

Another alternative explanation is that hedge fund managers may adjust their behavior in anticipation of the changes in tax law. Specifically, managers may become more tax efficient. This increase in tax efficiency may be associated with the observed decline in fund performance. To examine this alternative explanation, we further include a measure of tax efficient management as an additional control in our main model specified in equation (1). We capture tax efficient management through *Tax Burden*, measured as the tax liability of an investment firm divided by the market value of its stock holdings (Sialm and Zhang, 2018; Sialm and Starks, 2012). Tax liability is computed as the realized long-term and short-term capital gains (net of losses), and dividends multiplied by their respective tax rates. All other control variables remain the same as those used in equation (1).

[14] Results are robust to alternative cutoffs.
[15] Furthermore, there were no changes in statutory corporate tax rate of 35% during our sample period. This alleviates any potential concerns about returns of the underlying assets held by hedge funds being influenced by such changes.

Table X presents the results. Note that the number of observations substantially decreases compared to the analyses in Table I when we include *Tax Burden* as an additional covariate because tax efficiency measure can only be determined annually. Therefore, we use fund-year observations for this analysis. Despite the potential loss of statistical power, we continue to find a negative and statistically significant coefficient for *Manager_Tax* across all three of our return measures with coefficients ranging from −0.336 to −0.469 and *t*-statistics ranging from −2.24 to −2.74. Overall, these results mitigate concerns that tax efficient management could be driving the negative relation between personal tax rates and fund performance.

< INSERT TABLE X >

9. Additional Robustness Tests

We further examine the subset of 13F filers among hedge funds and reanalyze the relation between personal tax increases and fund performance. In Section 4, we examine how personal tax rates can influence the stock selection decisions of a fund manager based on their holdings listed in 13F filings. In this section, we verify that our finding of a negative effect of the tax rate on fund performance holds for this subsample of 13F filers. Table XI presents the results of this analysis. The model for these analyses follows equation (1). As the table shows, we continue to find a negative association between *Manager_Tax* and all three measures of fund returns. Overall, the results from this table provide supportive evidence for our main findings suggesting that personal tax increases are associated with lower effort and worse fund performance.

< INSERT TABLE XI >

We also examine how tax cuts could impact manager effort. While our main results suggest that tax increases reduce manager effort, tax cuts could have the opposite effect. Namely, that a

tax cut could increase manager effort. We examine this prediction by examining a domestic sample of large tax cuts at the state level (a tax reduction of 100 basis points or more) and a cross-country sample around the Bush tax cuts of 2003. We utilize the DID models and 5-year [−2, +2] windows elaborated in Section 3.2 to test the impact of tax cuts on fund performance. In untabulated results, we find either insignificant or weak positive results between tax cuts and measures of fund performance.[16]

< INSERT TABLE XII >

10. Conclusions

At the center of the debate on having a progressive tax code is the amount of deadweight loss created by such laws. The revenue from increasing income taxes on the wealthy can be substantial. However, the cost of diverting the wealth and talents of the affluent into socially unproductive activities can also be significant. We overcome data limitations on the behavior of the affluent by studying these issues in the setting of hedge funds. Our unique setting allows us to capture effort shirking using fund performance and the characteristics of the stocks selected by the fund managers. We find that an increase in personal tax rates is associated with less effort by hedge fund managers, reflected by a lower fund performance, selection of stocks with lower information asymmetry, and lower portfolio turnover. We further show that higher incentives arising from the compensation contracts of hedge fund managers help mitigate the disincentive effect induced by higher taxes, and that higher managerial incentives can partially mitigate the negative impact of higher tax rates on fund performance. We further show that our results continue to remain significant using a variety of robustness checks. Overall, our results suggest that a tax increase

[16] One potential reason why a tax cut may not induce greater effort is because it is more costly to exert that effort (i.e., the cost of exerting effort is convex). For instance, say that a fund manager was working 60 hours a week prior to experiencing a tax cut. While a fund manager may keep more income after a tax cut, the cost of increasing the hours worked to 70 per week may not be worth the additional effort and health toll for the fund manager.

leads to effort shirking by hedge fund managers. Furthermore, our findings suggest negative externalities of taxing hedge fund managers as manifested in the form of lower returns to fund investors.

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Table I: Summary Statistics

This table reports summary statistics of our key variables. Our main sample includes hedge funds that report returns in U.S. dollars and have a U.S. office address. The sample period is from 1994 to 2017. Summary statistics include sample size (*N*), mean, median, standard deviation (*Std Dev*), 25th percentile (*P25*), and 75th percentile (*P75*). Panel A of the table presents the summary statistics of top ordinary income tax rates at the monthly level. Panel B reports the summary statistics of hedge fund performance and characteristics. Hedge fund performance is measured at the fund-month level using raw returns, style-adjusted return calculated using style index returns, and alphas from the Fung and Hsieh (2004) 7-factor model augmented with the emerging market factor (*8-Factor Alpha*). Additional fund characteristics at the fund-month level include fund assets under management (*Asset*) measured in millions, fund flow (*Flow*), fund age (*Age*) measured in months. We also report fund characteristics that remains time-invariant at the fund level. These variables are incentive fees (*IncentiveFee*), management fees (*ManagementFee*), highwater mark (*HighwaterMark*), and lockup dummy (*lockup*). Panel C shows the summary statistics of stocks held by hedge fund managers at the fund-stock-quarter level. *HFownership* is measured by the total number of shares of a stock owned by hedge funds divided by the total shares outstanding of the stock. Other stock characteristics are firm size (*LnFirmSize*), analyst coverage (*LnAnalyst*), firm age (*LnFirmAge*), stock illiquidity (*Illiquidity*), idiosyncratic return volatility (*IdioVolatility*), R&D expenditures (*R&D*), market-to-book ratio (*MB*), stock price (*LnPrice*), stock momentum (*Momentum*), dividend yield (*D/P*), price-to-sales ratio (*P/S*), and equity beta (*Beta*). Panel D reports the summary statistics for the macroeconomic variables. Detailed variable definitions are provided in the Appendix. All variables are winsorized at the 1st and 99th percentiles.

Panel A: Ordinary Income Tax Rates

	N	Mean	Median	Std Dev	P25	P75
Federal	149,470	0.348	0.336	0.026	0.327	0.374
State	149,470	0.069	0.069	0.029	0.057	0.090
Manager_Tax	149,470	0.417	0.411	0.029	0.398	0.440
Manager_Tax_OECD	61,605	0.440	0.417	0.060	0.400	0.493

Panel B: Hedge Fund Performance and Characteristics

	N	Mean	Median	Std Dev	P25	P75
Fund-month Observations						
Raw Return	149,470	0.005	0.006	0.039	-0.009	0.021
Style-adjusted Return	127,921	-0.001	-0.001	0.037	-0.016	0.014
8-Factor Alpha	94,291	0.001	0.002	0.034	-0.012	0.015
Assets ($ Million)	149,470	227.750	47.200	894.707	13.900	155.116
Flow	149,470	0.004	0.000	0.090	-0.010	0.014
Age (Months)	149,470	86.520	71.000	63.082	38.000	120.000
Fund Level Observations						
Management Fee	3,115	0.014	0.015	0.005	0.010	0.018
Incentive Fee	3,205	0.172	0.182	0.045	0.182	0.182
Highwater Mark	3,205	0.720	1.000	0.449	0.000	1.000
Lockup period (months)	3,205	5.456	0.000	7.560	0.000	12.000

Panel C: Stock Holding Characteristics

	N	Mean	Median	Std Dev	P25	P75
Fund-stock-quarter Observations						
HFownership	1,464,017	0.007	0.001	0.016	0.000	0.006
LnFirmSize	1,464,017	7.435	7.303	1.901	6.096	8.625
LnAnalyst	1,464,017	2.708	2.773	0.819	2.197	3.332
LnFirmAge	1,464,017	2.828	2.773	0.778	2.303	3.497
Iliquidity	1,464,017	0.083	0.032	0.153	0.015	0.080
IdioVolatility	1,464,017	0.139	0.123	0.066	0.089	0.174
R&D	1,464,017	0.046	0.004	0.081	0.000	0.064
MB	1,464,017	2.215	1.664	1.956	1.240	2.502
LnPrice	1,464,017	2.997	3.063	1.002	2.431	3.595
Momentum	1,464,017	0.219	0.113	0.622	-0.146	0.425
D/P	1,464,017	3.264	0.000	8.946	0.000	1.225
P/S	1,464,017	0.259	0.017	1.853	0.005	0.051
Beta	1,464,017	1.129	1.088	0.583	0.746	1.476

Panel D: Macroeconomic Variables

	N	Mean	Median	Std Dev	P25	P75
Corporate_Tax	149,470	0.424	0.425	0.019	0.421	0.438
StateGDPGrowth	149,470	0.020	0.022	0.023	0.003	0.038
StateIncomeGrowth	149,470	0.040	0.043	0.028	0.021	0.061

StateUnemployment	149,470	0.062	0.056	0.019	0.049	0.075
CountryCorporate_Tax	61,605	0.249	0.280	0.078	0.210	0.300
CountryGDPGrowth	61,605	0.015	0.020	0.021	0.011	0.026
CountryIncomeGrowth	61,605	0.015	0.021	0.031	-0.001	0.034
CountryUnemployment	61,605	0.063	0.056	0.021	0.048	0.078

Table II: Personal Income Tax and Hedge fund Performance: Panel Regression

This table reports the panel regression results on the relation between a hedge fund manager's personal income tax rate and fund performance. Our sample includes hedge funds that report returns in U.S. dollars and have a U.S. office address. The sample period is from 1994 to 2017. Coefficients are estimated based on the model presented in Equation (1). The dependent variables are *Raw Return* in column (1), *Style-adjusted Return* in column (2), and *8-Factor Alpha* in column (3). Hedge fund manager's tax rate is measured as the top federal and state combined ordinary income tax rate (*Manager_Tax*) based on fund manager's office address. Other fund-specific variables include *LnAsset*, *Flow*, and *LnAge*. *LnAsset* is the logarithm of fund assets under management. *Flow* is the flows of fund. *LnAge* is the logarithm of fund age. Macroeconomic factors included are *Corporate_Tax*, *StateGDPGrowth*, *StateIncomeGrowth*, and *StateUnemployment*. *Corporate_Tax* is the combined federal and state top marginal corporate tax rate. *StateGDPGrowth* is the annual growth rate in gross state domestic product. *StateIncomeGrowth* is the annual growth rate in state personal income. *StateUnemployment* is the annual state unemployment rate. Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered at the fund level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	*Raw Returns*	*Style-adjusted Returns*	*8-Factor Alpha*
$Manager\_Tax_t$	-0.040***	-0.018**	-0.033***
	(-4.86)	(-2.14)	(-2.70)
$LnAsset_{t-1}$	-0.003***	-0.003***	-0.003***
	(-12.86)	(-10.72)	(-6.30)
$Flow_{t-1}$	-0.001	0.001	0.000
	(-0.82)	(0.83)	(0.00)
$LnAge_{t-1}$	-0.002***	-0.004***	-0.004***
	(-7.05)	(-9.12)	(-7.32)
$Corporate\_Tax_t$	-0.009	0.017	0.107**
	(-0.33)	(0.61)	(2.34)
$StateGDPGrowth_t$	-0.007	0.032***	0.204***
	(-0.82)	(3.98)	(13.18)
$StateIncomeGrowth_t$	-0.019***	-0.009	-0.135***
	(-2.67)	(-1.34)	(-10.65)
$StateUnemployment_t$	0.012	0.013	0.034*
	(1.01)	(1.10)	(1.78)
Fund FE	Yes	Yes	Yes
Observations	149,470	127,921	94,291
Adj. R-squared	0.034	0.027	0.024

Table III: Personal Income Tax and Hedge fund Performance: International Results

This table reports the regression results on the relation between a hedge fund manager's personal income tax rate and fund performance using an international sample of OECD Countries. The sample period is from 1994 to 2017. Coefficients are estimated based on the model presented in Equation (1). The dependent variables are *Raw Return* in column (1), *Style-adjusted Return* in column (2), and *8-Factor Alpha* in column (3). Hedge fund manager's tax rate (*Manager_Tax_OECD*) is measured as the top marginal income tax rate in OCED countries. Other fund-specific variables include *LnAsset, Flow*, and *LnAge*. *LnAsset* is the logarithm of fund assets under management. *Flow* is the flows of fund. *LnAge* is the logarithm of fund age. Macroeconomic factors included are *CountryCorporate_Tax*, *CountryGDPGrowth*, *CountryIncomeGrowth*, and *CountryUnemployment*. *CountryCorporate_Tax* is the country-level top marginal corporate income tax rate. *CountryGDPGrowth* is the annual growth rate in gross domestic product. *CountryIncomeGrowth* is the annual growth rate in country personal income. *CountryUnemployment* is the annual state unemployment rate. Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered at the fund level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	*Raw Returns*	*Style-adjusted Returns*	*8-Factor Alpha*
$Manager\_Tax\_OECD_t$	-0.016**	-0.006	-0.023**
	(-2.16)	(-0.75)	(-2.33)
$LnAsset_{t-1}$	-0.002***	-0.002***	-0.002***
	(-7.52)	(-6.80)	(-6.28)
$Flow_{t-1}$	-0.002	-0.002	0.003
	(-1.13)	(-1.13)	(1.24)
$LnAge_{t-1}$	-0.002***	-0.001	-0.004*
	(-3.17)	(-1.16)	(-1.86)
$CountryCorporate\_Tax_t$	0.017	-0.024	0.022
	(1.15)	(-1.34)	(1.34)
$CountryGDPGrowth_t$	-0.015	-0.013	0.014
	(-0.56)	(-0.46)	(0.48)
$CountryIncomeGrowth_t$	-0.008	-0.018	-0.016
	(-0.69)	(-1.44)	(-1.35)
$CountryUnemployment_t$	0.064*	0.115***	0.028
	(1.82)	(2.60)	(0.87)
Fund FE	Yes	Yes	Yes
Fund Style × Time FE	Yes	Yes	Yes
Observations	61,605	47,324	36,535
Adj. R-squared	0.179	0.076	0.100

Table IV: Personal Income Tax and Hedge fund Performance: Difference-in-Differences Analyses

This table reports the difference-in-differences (DID) analysis results on the relation between a hedge fund manager's personal income tax rate and fund's performance. Panel A presents results at the state-level while panel B presents results using an international sample. In Panel A, the treatment group (*Treatment*) are the hedge fund managers in states that experience a large increase in state income taxes of at least 100 basis points or higher. The sample consists of observations within a five-year window [-2, +2] around a large state tax increase. In Panel B, the treatment group is the U.S. hedge fund managers (managers of funds reporting in U.S. dollars with a U.S. office address) that experience an increase in federal income tax in 2013 due to a tax law change (ACT 2012). The control group is the hedge fund managers in OECD countries that do not experience a major tax change during that period. These control countries are Switzerland, Chile, Germany, Denmark, Sweden, and Turkey. *Domestic* is a dummy variable that equals 1 if the hedge fund manager resides in the U.S., and 0 otherwise. *Post* is a dummy variable that equals 1 if the time period is after the tax law change, and 0 otherwise. The event window is [2011, 2015]. Coefficients are estimated based on the model presented in Equation (2). The dependent variables are raw returns in column (1), style-adjusted returns in column (2), and 8-Factor alpha in column (3). Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered at the investment company level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: State DID analysis			
	(1)	(2)	(3)
VARIABLES	*Raw Returns*	*Style-adjusted Returns*	*8-Factor Alpha*
$Treatment_t$	-0.002**	-0.003**	-0.005***
	(-2.00)	(-2.23)	(-3.39)
$LnAsset_{t-1}$	-0.004***	-0.004***	-0.003***
	(-5.31)	(-4.86)	(-3.64)
$Flow_{t-1}$	-0.001	-0.001	-0.002
	(-0.52)	(-0.58)	(-0.65)
$LnAge_{t-1}$	-0.002***	-0.002**	-0.005**
	(-2.72)	(-2.11)	(-2.15)
$Corporate\_Tax_t$	0.001	0.000	0.001**
	(1.14)	(0.63)	(2.53)
$StateGDPGrowth_t$	0.015	0.028	0.037*
	(0.65)	(1.11)	(1.70)
$StateIncomeGrowth_t$	-0.004	-0.002	-0.104***
	(-0.14)	(-0.07)	(-2.95)
$StateUnemployment_t$	-0.012	-0.078	-0.028
	(-0.12)	(-0.76)	(-0.31)
Fund FE	Yes	Yes	Yes
Fund Style × Time FE	Yes	Yes	Yes
Observations	46,954	40,070	32,660
Adj. R-squared	0.328	0.181	0.125

Panel B: Cross-Country DID analysis			
	(1)	(2)	(3)
VARIABLES	*Raw Returns*	*Style-adjusted Returns*	*8-Factor Alpha*
$Post_t \times Domestic_t$	-0.001	0.000	-0.006*
	(-0.52)	(0.11)	(-1.95)
$LnAsset_{t-1}$	-0.004***	-0.004***	-0.004***
	(-6.99)	(-4.83)	(-5.27)
$Flow_{t-1}$	0.006*	0.008**	0.009***
	(1.91)	(2.07)	(2.67)
$LnAge_{t-1}$	-0.001	-0.001	0.000
	(-0.59)	(-0.55)	(0.08)
$CountryCorporate\_Tax_t$	-0.057	-0.093	0.045
	(-0.93)	(-1.32)	(0.67)
$CountryGDPGrowth_t$	0.019	0.039	0.056
	(0.32)	(0.57)	(0.89)
$CountryIncomeGrowth_t$	0.028	0.010	0.050
	(1.03)	(0.28)	(1.47)
$CountryUnemployment_t$	0.016	0.029	-0.130
	(0.16)	(0.23)	(-1.45)
Fund FE	Yes	Yes	Yes
Fund Style × Time FE	Yes	Yes	Yes
Observations	41,043	30,406	32,056
Adj. R-squared	0.310	0.151	0.170

Table V: Personal Income Tax and Stock Selection

This table reports the regression results on the relation between a hedge fund manager's personal income tax rate and manager's stock selection. Our sample includes hedge funds that report returns in U.S. dollars and have a U.S. office address. The sample period is from 1994 to 2017. Coefficients are estimated based on the model presented in Equation (3). The dependent variable is *HFownership*, measured by the number of shares of a stock held by a fund divided by the total number of shares outstanding of the stock. Hedge fund manager's tax rate is measured as the top federal and state combined ordinary income tax rate (*Manager_Tax*) based on fund manager's office address. *LnAsset* is the logarithm of fund assets under management. *Flow* is the flows of fund, and *LnAge* is the logarithm of fund age. Stock characteristics are firm size (*LnFirmSize*), analyst coverage (LnAnalyst), firm age (*LnFirmAge*), stock illiquidity (*Illiquidity*), idiosyncratic return volatility (*IdioVolatility*), R&D expenditures (*R&D*), market-to-book ratio (*MB*), stock price (*LnPrice*), stock momentum (*Momentum*), dividend yield (*D/P*), price-to-sales ratio (*P/S*), and equity beta (*Beta*). Fund, stock, and year fixed effects are included in all regressions. Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered by fund. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	*HFownership*				
LnFirmSize×Manager_Tax	0.011***				
	(2.78)				
LnAnalyst×Manager_Tax		0.017**			
		(2.25)			
Illiquidity×Manager_Tax			–0.008***		
			(–4.41)		
R&D×Manager_Tax				–0.018***	
				(–5.27)	
IdioVolatility×Manager_Tax					–0.012***
					(–2.89)
Manager_Tax	–0.122***	–0.085***	–0.038**	–0.038**	–0.038**
	(–3.30)	(–2.88)	(–2.26)	(–2.24)	(–2.22)
Stock Characteristics					
LnFirmSize	–0.008***	–0.003***	–0.003***	–0.003***	–0.003***
	(–4.54)	(–9.40)	(–9.36)	(–9.42)	(–9.47)
LnAnalyst	–0.001***	–0.008**	–0.001***	–0.001***	–0.001***
	(–4.89)	(–2.46)	(–4.63)	(–4.66)	(–4.68)
LnFirmAge	–0.000	–0.000	0.000	0.000	0.000
	(–1.07)	(–0.35)	(0.18)	(0.14)	(0.06)
Illiquidity	0.006***	0.006***	0.010***	0.006***	0.006***
	(4.89)	(4.87)	(7.96)	(4.86)	(4.84)
IdioVolatility	–0.003*	–0.004*	–0.004*	–0.004*	0.002
	(–1.71)	(–1.87)	(–1.82)	(–1.81)	(0.64)
R&D	–0.003***	–0.003***	–0.003***	0.006***	–0.003***
	(–2.70)	(–2.76)	(–2.76)	(2.71)	(–2.80)

MB	0.000***	0.000***	0.000***	0.000***	0.000***
	(2.73)	(3.97)	(4.55)	(4.73)	(4.45)
LnPrice	0.001***	0.001***	0.001***	0.001***	0.001***
	(6.59)	(6.35)	(6.13)	(6.17)	(6.26)
Momentum	0.000*	0.000*	0.000*	0.000*	0.000*
	(1.92)	(1.91)	(1.78)	(1.75)	(1.79)
D/P	–0.000	–0.000**	–0.000***	–0.000***	–0.000***
	(–1.49)	(–2.41)	(–2.73)	(–2.75)	(–2.65)
P/S	0.000**	0.000**	0.000**	0.000**	0.000**
	(2.43)	(2.41)	(2.34)	(2.26)	(2.36)
Beta	–0.001***	–0.001***	–0.001***	–0.001***	–0.001***
	(–6.59)	(–6.39)	(–6.02)	(–6.02)	(–5.96)
Fund Characteristics					
LnAsset	0.001***	0.001***	0.001***	0.001***	0.001***
	(5.50)	(5.49)	(5.41)	(5.41)	(5.41)
Flow	–0.000	–0.000	–0.000	–0.000	–0.000
	(–1.11)	(–1.17)	(–1.20)	(–1.18)	(–1.16)
LnAge	0.000	0.000	0.000	0.000	0.000
	(0.92)	(0.86)	(0.87)	(0.87)	(0.88)
Fund FE	Yes	Yes	Yes	Yes	Yes
Stock FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	1,464,017	1,464,017	1,464,017	1,464,017	1,464,017
Adj. R-squared	0.438	0.438	0.437	0.437	0.437

Table VI: Personal Tax Rate and Portfolio Turnover

This table reports the regression results on the relation between a hedge fund manager's personal income tax rate and portfolio turnover. Our sample includes hedge funds that report returns in U.S. dollars and have a U.S. office address. The sample period is from 1994 to 2017. Observations are at the investment company-quarter level. Coefficients are estimated based on the model presented in equation (4). The dependent variable is *Turnover*, defined as the minimum of the absolute values of buys and sells during a quarter q divided by the total holdings at the end of quarter $q-1$, where buys and sells are measured using end-of-quarter $q-1$ prices. $AltTurnover_1$ is an alternative proxy calculated as the minimum of buys and sells for the quarter plus the absolute value of investor inflows or redemptions, scaled by lagged assets. $AltTurnover_2$ is similar to $AltTurnover_1$, but subtracts the absolute value of investor inflows or redemptions. All of the variables are equally-weighted averages, represented by *Avg()*, taken across all hedge funds within a firm. Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered by investment company. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	*Turnover*	$AltTurnover_1$	$AltTurnover_2$
$Avg(Manager\_Tax_t)$	-0.492***	-0.818***	-1.212***
	(-3.21)	(-2.76)	(-3.82)
$Ln[Avg(Asset_{t-1})]$	-0.002	0.001	-0.004
	(-1.61)	(0.29)	(-1.39)
$Avg(Flow_{t-1})$	-0.042	0.053	0.106*
	(-1.60)	(0.68)	(1.71)
$Avg(Return_{t-1})$	0.115***	0.385***	0.559***
	(5.85)	(5.46)	(11.14)
$Ln[Avg(Age_{t-1})]$	-0.004	-0.024***	-0.010
	(-1.07)	(-3.02)	(-1.27)
$Avg(Corporate\_Tax_t)$	0.274	0.490	0.669
	(0.79)	(0.59)	(0.92)
$Avg(StateGDPGrowth_t)$	0.174	0.310	0.789***
	(1.63)	(0.98)	(3.50)
$Avg(StateIncomeGrowth_t)$	-0.183*	-0.871***	-0.774***
	(-1.89)	(-3.97)	(-3.56)
$Avg(StateUnemployment_t)$	-0.259	0.340	-0.303
	(-1.46)	(0.84)	(-0.82)
Investment company FE	Yes	Yes	Yes
Observations	14,585	14,585	14,585
Adj. R-squared	0.578	0.373	0.526

Table VII: Managerial Incentives

This table reports the regression results on how managerial incentives can influence the relation between personal income tax rates and fund returns. Coefficients are estimated based on the model presented in equation (6). Panel A presents the results using total delta to measure managerial incentives. Panel B presents the results using option delta to capture managerial incentives. The dependent variables are *Raw Return* in column (1), *Style-adjusted Return* in column (2), and *8-Factor Alpha* in column (3). Hedge fund manager's tax rate is measured as the top federal and state combined ordinary income tax rate (*Manager_Tax*) based on fund manager's office address. *High_Delta* is an indicator set to one if the manager's total delta of fund i in month t, is above the median across the entire sample and zero, otherwise. *High_CompIncentive* is an indicator variable set to one if the manager's incentive portion of compensation is above the median and zero otherwise. Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered at the fund level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel A: Delta			
	(1)	(2)	(3)
VARIABLES	*Raw Returns*	*Style-adjusted Returns*	*8-Factor Alpha*
$Manager\_Tax_t \times High\_Delta_t$	0.023*	0.024*	0.039**
	(1.76)	(1.65)	(2.14)
$High\_Delta_t$	0.002	0.002	-0.007
	(0.31)	(0.26)	(-0.99)
$Manager\_Tax_t$	-0.093**	-0.081*	-0.037
	(-2.23)	(-1.72)	(-0.83)
$LnAsset_{t-1}$	-0.005***	-0.005***	-0.004***
	(-15.72)	(-14.73)	(-11.88)
$Flow_{t-1}$	0.001	0.002	0.003*
	(0.81)	(1.16)	(1.74)
$LnAge_{t-1}$	-0.002***	-0.002***	-0.001
	(-3.81)	(-3.20)	(-0.52)
$Corporate\_Tax_t$	0.012	0.013	0.008
	(0.42)	(0.43)	(0.20)
$StateGDPGrowth_t$	0.012	0.012	0.022*
	(0.94)	(0.89)	(1.75)
$StateIncomeGrowth_t$	-0.005	-0.014	0.013
	(-0.32)	(-0.81)	(0.75)
$StateUnemployment_t$	0.049	0.048	0.097**
	(1.30)	(1.17)	(2.17)
Fund FE	Yes	Yes	Yes
Fund Style × Time FE	Yes	Yes	Yes
Observations	111,838	96,944	68,850
Adj. R-squared	0.321	0.167	0.117

Panel B: Incentive Portion of Compensation			
	(1)	(2)	(3)
VARIABLES	*Raw Returns*	*Style-adjusted Returns*	*8-Factor Alpha*
$Manager\_Tax_t \times High\_CompIncentive_t$	0.040***	0.039***	0.023
	(3.31)	(2.98)	(1.61)
$High\_CompIncentive_t$	-0.001	-0.001	0.001
	(-0.24)	(-0.19)	(0.12)
$Manager\_Tax_t$	-0.107***	-0.100**	-0.042
	(-2.68)	(-2.22)	(-0.98)
$LnAsset_{t-1}$	-0.006***	-0.006***	-0.005***
	(-18.00)	(-16.69)	(-12.59)
$Flow_{t-1}$	-0.000	0.000	0.002
	(-0.39)	(0.07)	(1.14)
$LnAge_{t-1}$	-0.001**	-0.001**	0.000
	(-2.49)	(-2.23)	(0.26)
$Corporate\_Tax_t$	0.013	0.020	0.013
	(0.51)	(0.74)	(0.35)
$StateGDPGrowth_t$	0.015	0.015	0.025**
	(1.24)	(1.16)	(2.04)
$StateIncomeGrowth_t$	-0.017	-0.026	0.001
	(-1.13)	(-1.54)	(0.05)
$StateUnemployment_t$	0.036	0.025	0.079*
	(1.03)	(0.64)	(1.81)
Fund FE	Yes	Yes	Yes
Fund Style × Time FE	Yes	Yes	Yes
Observations	111,838	96,944	68,850
Adj. R-squared	0.332	0.180	0.123

Table VIII: Personal Tax Rate and Incentive Fee

This table reports the regression results on the relation between a hedge fund manager's personal income tax rate and fund's incentive fee. Our sample includes hedge funds that report returns in U.S. dollars and have a U.S. office address. The sample period is from 1994 to 2017. Coefficients are estimated based on the model presented in equation (5). The dependent variable is Log(1+*IncentiveFee*) where *IncentiveFee* is the fund's incentive fee. Hedge fund manager's tax rate is measured as the top federal and state combined ordinary income tax rate (*Manager_Tax*) based on fund manager's office address. *HighwaterMark* is an indicator variable set to one for the presence of a high-water mark and zero, otherwise. *Lockup* is an indicator variable set to one for the presence of a lockup period and zero, otherwise. *ManagementFee* is the fund's management fees. *LnAsset* is the logarithm of fund assets under management. *LnAge* is the logarithm of fund age. *Return* is a fund's raw return over the past quarter. Column (1) includes style fixed effects. Columns (2) and (3) include style and investment company fixed effects. All control variables are lagged by one month. Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered by investment company. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

VARIABLES	Log(1+*IncentiveFee*)		
	(1)	(2)	(3)
$Manager\_Tax_t$	0.214***	0.191**	0.291**
	(4.27)	(1.98)	(2.53)
$HighwaterMark_t$	0.025***	0.029***	0.047***
	(6.55)	(4.76)	(3.51)
$Lockup_t$	0.000	0.000*	0.000
	(0.87)	(1.96)	(1.43)
$ManagementFee_t$	1.368***	1.440***	1.565***
	(4.57)	(3.21)	(3.30)
$Corporate\_Tax_t$	-0.140**	-0.123	-0.217
	(-2.43)	(-1.06)	(-1.14)
$StateIncomeGrowth_t$	0.043	0.056	-0.072
	(0.78)	(0.63)	(-0.53)
$StateUnemployment_t$	-0.026	-0.096	-0.274**
	(-0.47)	(-0.92)	(-2.23)
$StateGDPGrowth_t$	-0.123*	-0.209	-0.181
	(-1.71)	(-1.60)	(-0.99)
$LnAsset_{t-1}$			-0.003
			(-0.90)
$LnAge_{t-1}$			-0.001
			(-0.23)
$Return_{t-1}$			0.004
			(0.38)
Style FE	Yes	Yes	Yes
Investment Company FE	No	Yes	Yes
Observations	3,115	3,115	608
Adj. R-squared	0.090	0.373	0.502

Table IX: Personal Tax Rate and Alternative Measures of Risk-Adjusted Fund Performance

This table reports the regression results on the relation between a hedge fund manager's personal income tax rate and alternative measures of a fund's risk-adjusted performance. Coefficients are estimated based on the model presented in equation (2). The dependent variables are *Sharpe Ratio*, measured as the average monthly fund excess return divided by the standard deviation of monthly fund returns, and *Information Ratio*, measured as the average monthly fund alpha divided by the standard deviation of monthly fund residuals. Hedge fund manager's tax rate is measured as the top federal and state combined ordinary income tax rate (*Manager_Tax*) based on fund manager's office address. Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered by fund. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)
VARIABLES	*Sharpe Ratio*	*Information Ratio*
$Manager\_Tax_t$	-1.258***	-0.683**
	(-3.77)	(-2.19)
$LnAsset_{t-1}$	-0.128***	-0.103***
	(-12.89)	(-10.77)
$Flow_{t-1}$	-0.283***	-0.260***
	(-5.23)	(-4.67)
$LnAge_{t-1}$	-0.068***	-0.130***
	(-5.57)	(-6.96)
$Corporate\_Tax_t$	4.356***	2.238*
	(3.57)	(1.71)
$StateGDPGrowth_t$	6.348***	1.686***
	(19.67)	(5.42)
$StateIncomeGrowth_t$	-3.615***	-0.082
	(-11.35)	(-0.33)
$StateUnemployment_t$	2.838***	1.046**
	(4.49)	(2.32)
Fund FE	Yes	Yes
Observations	10,868	6,729
Adj. R-squared	0.517	0.384

Table X: Tax Efficient Management

This table reports the panel regression results on the relation between a hedge fund manager's personal income tax rate and fund performance after controlling for tax efficient management. Our sample includes hedge funds that report returns in U.S. dollars and have a U.S. office address. The sample period is from 1994 to 2017. Coefficients are estimated based on the model presented in equation (1) with an additional control for tax efficient management (*Tax Burden*). The dependent variables are *Raw Return* in column (1), *Style-adjusted Return* in column (2), and *8-Factor Alpha* in column (3). Hedge fund manager's tax rate is measured as the top federal and state combined ordinary income tax rate (*Manager_Tax*) based on fund manager's office address. *Tax Burden* is the tax liability of an investment firm divided by market value of the stock holdings. *LnAsset* is the logarithm of fund assets under management. *Flow* is the flows of fund, and *LnAge* is the logarithm of fund age. Fund fixed effects are included in all regressions. All control variables are lagged by one month. Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered at the fund level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	*Raw Returns*$_t$	*Style-adjusted Returns*$_t$	*8-Factor Alpha*$_t$
Manager_Tax$_t$	-0.469***	-0.377**	-0.336**
	(-2.74)	(-2.24)	(-2.28)
TaxBurden$_{t-1}$	-0.355***	-0.198***	-0.068
	(-4.99)	(-2.87)	(-1.32)
LnAsset$_{t-1}$	-0.045***	-0.039***	-0.020**
	(-5.16)	(-4.13)	(-2.55)
Flow$_{t-1}$	-0.068	-0.043	-0.025
	(-1.64)	(-1.02)	(-0.71)
LnAge$_{t-1}$	-0.049***	-0.021**	-0.027***
	(-5.95)	(-2.50)	(-2.94)
Corporate_Tax$_t$	1.938***	-0.143	0.240
	(2.71)	(-0.29)	(0.49)
StateGDPGrowth$_t$	2.383***	0.101	0.329**
	(10.18)	(0.41)	(2.14)
StateIncomeGrowth$_t$	-1.630***	-0.485**	-0.023
	(-8.37)	(-2.28)	(-0.19)
StateUnemployment$_t$	0.038	-0.555**	-0.366*
	(0.17)	(-2.43)	(-1.77)
Fund FE	Yes	Yes	Yes
Observations	2,928	2,552	2,121
Adj. R-squared	0.064	0.102	0.210

Table XI: Personal Income Tax and Hedge fund Performance using 13F filers

This table reports the panel regression results on the relation between a hedge fund manager's personal income tax rate and fund performance using a subsample of 13F filers. Our sample includes hedge funds that report returns in U.S. dollars and have a U.S. office address. The sample period is from 1994 to 2017. Coefficients are estimated based on the model presented in equation (1). The dependent variables are *Raw Return* in column (1), *Style-adjusted Return* in column (2), and *8-Factor Alpha* in column (3). Hedge fund manager's tax rate is measured as the top federal and state combined ordinary income tax rate (*Manager_Tax*) based on fund manager's office address. *LnAsset* is the logarithm of fund assets under management. *Flow* is the flows of fund, and *LnAge* is the logarithm of fund age. All control variables are lagged by one month. Fund fixed effects are included in all regressions. Detailed variable definitions are described in the Appendix. Standard errors are adjusted for heteroskedasticity and clustered at the fund level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	*Raw Returns*	*Style-adjusted Returns*	*8-Factor Alpha*
$Manager\_Tax_t$	-0.033***	-0.034***	-0.027***
	(-2.70)	(-2.94)	(-2.73)
$LnAsset_{t-1}$	-0.003***	-0.003***	-0.002***
	(-6.30)	(-5.47)	(-5.46)
$Flow_{t-1}$	0.000	-0.001	-0.002
	(0.00)	(-0.22)	(-0.61)
$LnAge_{t-1}$	-0.004***	-0.002***	-0.002***
	(-7.32)	(-3.72)	(-3.47)
$Corporate\_Tax_t$	0.107**	-0.015	0.039
	(2.34)	(-0.42)	(1.22)
$StateGDPGrowth_t$	0.204***	-0.005	0.030**
	(13.18)	(-0.36)	(2.28)
$StateIncomeGrowth_t$	-0.135***	-0.036***	-0.017*
	(-10.65)	(-2.98)	(-1.67)
$StateUnemployment_t$	0.034*	-0.055***	-0.048***
	(1.78)	(-2.98)	(-2.77)
Fund FE	Yes	Yes	Yes
Observations	43,719	38,087	31,500
Adj. R-squared	0.029	0.022	0.019

Appendix

Variable	Definition	Data Source
Panel A: Hedge Fund Performance		
Raw Returns	Fund monthly net-of-fee return.	TASS
Style-Adjusted Returns	The difference between fund monthly returns and the return of the style index.	TASS
8-Factor Alpha	Risk-adjusted returns calculated from Fung and Hsieh (2004) 7-factor model augmented with the emerging market factor.	TASS; David Hsieh's Data Library
Sharpe Ratio	Average monthly fund excess return divided by the standard deviation of monthly fund return	TASS
Information Ratio	Average monthly fund alpha divided by the standard deviation of monthly fund residuals	TASS
Panel B: Income Tax Rate		
Manager_Tax	Highest combined federal and state income tax rate, assuming the individual is in top brackets at both the federal and state levels, married filing jointly with $150,000 in deductible property taxes, and allowing for deductibility of state income taxes in states where applicable.	NBER
Manager_Tax_OECD	Top marginal personal income tax rate in OECD countries	OECD
Panel C: Hedge Fund Characteristics (listed in alphabetical order)		
$AltTurnover_1$	The minimum of buys and sells for the quarter plus the absolute value of investor inflows or redemptions and scaled by lagged assets	TASS
$AltTurnover_2$	The minimum of buys and sells for the quarter minus the absolute value of investor inflows or redemptions and scaled by lagged assets	TASS
Flow	Percentage capital flows of fund *i* at the end of each month *t*, estimated as: $Flow_{i,t} = [AUM_{i,t} - AUM_{i,t-1} \times (1+Return_{i,t})]/AUM_{i,t-1}$	TASS
HighWaterMark	A binary variable that equals one if a fund uses a highwater mark provision, and zero otherwise.	TASS
High_CompIncentive	An indicator set to one if the incentive portion of the manager's compensation is above the median and zero otherwise. Computed based on Agarwal, Daniel, and Naik (2009).	TASS
Hi_Delta	An indicator set to one if the manager's total delta of fund *i* in month *t*, is above the sample median value and zero, otherwise. Computed based on Agarwal, Daniel, and Naik (2009).	TASS
IncentiveFee	The percentage of fund profits that investors pay to fund managers.	TASS
LnAsset	Natural logarithm of asset under management (AUM).	TASS
LnFundAge	Natural logarithm of the number of months between the fund's inception date and the current date.	TASS
Lockup	The minimum amount of time (in months) an investor must commit the capital.	TASS
ManagementFee	The percentage of fund AUM paid to fund managers regardless of the fund's performance.	TASS

Tax Burden	The tax liability of an investment firm divided by the market value of its stock holdings. Tax liability is computed as the realized long-term capital gain and short-term capital gains (net of losses), and dividend multiplied by their respective tax rates.	13F
Turnover	The minimum of the absolute values of buys and sells during quarter *q* divided by the total holdings at the end of quarter *q*−1	TASS
Panel D: Firm Characteristics and other (listed in alphabetical order)		
Beta	Market beta estimated from a market model using daily stock return.	CRSP
D/P	Dividend yield measured by dividend-to-price ratio.	CRSP
Idiosyncratic Return Volatility	The standard deviation of residuals estimated from the Carhart (1997) four-factor model for the past 36 months of stock returns.	CRSP
Iliquidity	The annual average of square root of |stock return|/(Price×Volume) as in Hasbrouck (2009) and Agarwal, Jiang, Tang, and Yang (2013).	CRSP
HFOwnership	Percent of stockholdings by hedge funds in a firm each quarter.	TASS & 13F
LnAnalyst	Natural logarithm of the number of analysts covering a stock.	IBES
LnFirmAge	Natural logarithm of the number of years since the firm first appeared in Compustat	Compustat
LnFirmSize	Natural logarithm of the market capitalization of equity.	CRSP
LnPrice	Natural logarithm of the stock price for each firm-quarter.	CRSP
MB	The market to book ratio.	Compustat
Momentum	Stock price momentum calculated from past 12 months stock returns.	CRSP
P/S	Price-to-sale ratio.	Compustat
R&D	The expenses on research and development scaled by total assets.	Compustat
Panel E: State/Country-level Macroeconomic Variables (listed in alphabetical order)		
Corporate_Tax	Combined federal and state top marginal corporate tax rate	1994–2002 University of Michigan Tax Database; Tax Foundation for 2000–2017
CountryCorporate_Tax	Country-level top marginal corporate income tax rate	OECD
CountryGDPGrowth	Annual growth rate in gross domestic product	OECD
CountryIncomeGrowth	Annual growth rate in country personal income	OECD
CountryUnemployment	Annual state unemployment rate	OECD
StateGDPGrowth	Annual growth rate in gross state product	Bureau of Economic Analysis

StateIncomeGrowth	Annual growth rate in state personal income	Bureau of Economic Analysis
StateUnemployment	Annual state unemployment rate	Bureau of Economic Analysis