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 variation in federal and state statutory tax rates, we find that fund managers' marginal income tax rate is 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. Finally, we find that greater incentive fees are used to mitigate tax-induced effort shirking. Our study sheds light on the externality of taxing the affluent and informs the debate on tax system design.

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

1. Introduction

According to the Congressional Budget Office, the top 1 percent of the most affluent American households collect 16.7% of aggregate income and pay 26.6% of aggregate federal personal income tax in 2014.[‡] 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. The potential cost of these talents being withheld from the economy due to the tax system can be large. 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. According to Institutional Investor, the average hedge fund portfolio manager earned close to $1 million in 2017.[§] Thus, hedge fund managers are among the most affluent segment of the population and are subject to the highest marginal federal and state personal income tax under the current tax code. Examining hedge fund managers allow us to gauge their level of effort through

[†] https://www.marketwatch.com/story/killing-geese-that-lay-golden-eggs-2010-08-10
[‡] https://www.cbo.gov/publication/53597
[§] https://www.institutionalinvestor.com/research/7510/All-America-Buy-Side-Compensation

fund performance and security selection. Moreover, as hedge fund managers act as delegated agents for investors and actively exploit mispricing opportunities, their economic behavior in response to a personal income tax hike may have important implications on the externalities of personal income tax.

Economic theories predict two opposing effects of tax on hedge fund managers' work incentives. On the one hand, a tax rate increase 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 become relatively more attractive. 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) through lower fund performance. On the other hand, tax increases can also increase labor supply through an income effect—more effort is exerted to make up for the loss of income and maintain current consumption. Therefore, how taxes affect managers' work incentive is an empirical question.

Using plausible exogenous variations in top federal and state statutory tax rates from 1994 to 2015, we examine the relation between personal income tax rate and hedge fund performance. We assume that fund managers pay personal income tax in the state where their fund is located because every state taxes income earned in the state for both residents and non-residents (Armstrong, Glaeser, Huang, and Taylor, 2017). 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 fixed effects that capture unobserved time-invariant factors such as managerial skill. Specifically, a one standard deviation increase in the tax rate is associated with a 0.6 percentage point decrease

in the annual Fung and Hsieh seven-factor alpha. The results are robust to the use of alternative performance measures such as raw and style-adjusted returns.

To alleviate the endogeneity concern that unobserved macroeconomic factors may drive both tax policy and fund performance, we conduct a difference-in-differences analysis 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 41.8%. In addition, the maximum long-term capital gain tax increased significantly from 15% to 25.1%. Since the Act may coincide with changes in macroeconomic conditions, we use foreign fund managers whose countries did not experience any major personal income tax changes during 2011-2015 as the control group. Using personal income tax data from the OECD website,[**] we identify twenty-six countries as controls including Australia, Belgium, Canada, Switzerland, France, United Kingdom, Italy, Japan, Korea, and Turkey. We find that U.S. funds experience a 0.3 percent decrease in the monthly Fung and Hsieh seven 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' security selection decisions. If portfolio managers shirk their effort upon an increase in personal income tax rate, they may opt to reduce investment in stocks with greater information asymmetry and require more time and effort to gather and process information. We find that higher tax rates are associated with hedge fund managers holding stocks of firms that are larger in market capitalization and lower in R&D intensity as well as have greater analyst following and higher liquidity. These results indicate that fund managers tend to hold

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

stocks of firms where more information is publicly available when their personal tax rate is higher, indicating a lower level of effort exerted in acquiring private information when selecting stocks.

Finally, we examine whether the compensation contract reflects the consideration to offset the disincentive effect of higher taxes. Economic theory suggests that fee contracts can be designed to incentivize portfolio managers to exert effort into information collection and interpretation (Stoughton, 1993). Since hedge fund fees are set at the inception date and rarely change over time, we investigate the cross-sectional relation between incentive fee and the personal tax rate at the inception date of a fund, after controlling for fund characteristics and investment company fixed effects. We document a positive association between incentive fee and personal tax rate. This finding suggests that a higher incentive fee is used to mitigate the tax-induced effort shirking.

Our study contributes to the empirical literature on the effects of personal tax rate on the labor supply. In prior studies, labor supply is usually measured as labor participation or hours worked using survey data, or as income reported in tax returns (McClelland and Mok, 2012). These measures suffer from several limitations. For example, labor participation and hours worked does not capture the intensity of work and career changes. Taxable income can vary for reasons unrelated to labor supply, such as through compensation timing and tax avoidance. In our setting of the hedge fund industry, we measure labor supply using the output of labor, fund performance, which captures the combined effect of both the intensity and quantity of labor supply. In addition, we can observe managers' effort through their choice of securities where information is more easily attainable. Furthermore, the 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.

There have been 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 due to the scarcity of data. 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. Using the setting of hedge funds in a principal-agent relationship, our study uncovers a negative consequence of taxing the rich: lower returns for fund investors. Our results further imply a potential negative externality on market efficiency, since hedge fund managers play an important role in discovering and reducing mispricing (Cao, Chen, Goetzmann, and Liang, 2016; Cao, Liang, Lo, and Petrasek, 2017) and informed monitoring (Brav, Jiang, Partnoy, and Thomas 2008). Compared to the corporate setting in which firm performance can be driven by various stakeholders and decision makers, fund performance is mostly driven by the fund manager and can better capture the individual's effort level.

Our study also contributes to the literature on delegated portfolio management. Prior studies investigate the effect of incentive fees, highwater mark provisions, and manager ownership on 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 changes on fund managers' effort and fund performance. Moreover, this study adds to the literature that investigates the 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 institutional investors on asset prices (Gilson, Safieddine, and Titman 2000; Ng and Wang, 2004). In contrast, we investigate how personal tax rate changes affect fund managers' effort and fund performance.

2. Data and Summary Statistics

2.1 Data

We use several sources of data in our analyses. The first one is the Lipper/TASS hedge fund database which has been used in a number of 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, voluntarily reported by hedge funds. 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 a stronger incentive 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 bias, we remove the backfilled return data by keeping 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, lagged fund size, and the use of highwater mark, lockup, or leverage to be included in the sample. There are 3,088 funds (1,672 investment companies) in the final sample. The sample period is from January 1994 to December 2017.

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/fund sponsor (henceforth, "asset management company"). Each asset management company can manage multiple hedge funds/portfolios (henceforth, "hedge funds"). In order to identify asset management companies that operate hedge funds, we first compile a list of asset management company names using the "Companies" file in the TASS Hedge Fund data sets. We then manually match these company names with the company names in the Thomson-Reuters Institutional (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

Table 1 reports the descriptive statistics. Panel A presents the summary statistics of top federal and state ordinary income tax rate 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 returns calculated using index benchmark, and alphas from 8-factor model, i.e., Fung and Hsieh (2004) 7-factor model augmented with the emerging market factor (*8-Factor Alpha*). As reported in the table, the average alpha is 0.2% monthly and the standard deviation is 3.4%. Additional fund characteristics at the fund-month level include fund assets under management (*Asset*) measured in millions of dollars, fund flow (*Flow*), fund age (*Age*) measured in months. The average assets are $229 million. 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*). The average management fee and incentive fee are 1.4% and 17.2%,

respectively. There are 72% of hedge funds that use highwater mark provision. 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 total shares outstanding. The average ownership is 0.7%. Other stock characteristics are firm size (*LnFirmSize*), analyst coverage (*LnAnalyst*), firm age (*LnFirmAge*), stock illiquidity (*Illiquidity*), idiosyncratic return volatility (*Volatility*), 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*).

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 work 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 further control for other fund characteristics that can affect fund performance as suggested in the previous literature (e.g., Agarwal, Daniel, and Naik, 2009). Relative to other measures of labor supply used in prior studies (e.g., labor participation and hours worked), fund performance has the advantage of capturing both quantity and intensity of labor supply.

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. This is because a tax increase lowers the after-tax income for a manager and reduces the marginal benefit from a manager' 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 work effort. When higher taxes reduce a manager's

net after-tax income, the manager may exert more effort in order to make up for the lost income and maintain current level 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 a difference-in-differences analysis.

3.1 Panel regressions with fund fixed effects

In our first set of empirical tests, we examine the relation between fund managers' personal income tax rates and fund performance using plausible exogenous variations in federal and state statutory tax rate in a panel regression setting. We assume that hedge fund managers face the highest marginal personal income tax rates. 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 TAXISM 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 at the state where their fund is located, given that every state taxes income earned in the state for both residents and non-residents (Armstrong et al., 2017).

Specifically, we use the following regression to examine the effect of tax rate on hedge fund performance:

$$Performance_{i,t} = a_0 + a_1 Tax_{i,t} + a_2 Controls_{i,t-1} + e_{i,t} \qquad (1)$$

$Performance_{i,t}$ is the return of hedge fund i in month t. We measure hedge fund performance using raw returns, style-adjusted returns, and the alpha from an eight-factor model which includes the seven factors from Fung and Hsieh (2004) augmented with an emerging market factor. To compute style-adjusted returns, we use raw returns of hedge fund i in month t minus

the returns of hedge funds with the same style. We compute the eight-factor alpha by regressing monthly raw returns of a hedge fund on the seven factors in Fung and Hsieh (2004) 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 generate alpha. $Tax_{i,t}$ is the maximum state income tax rate of manager *i* in month *t*. We include covariates of fund returns (*Controls*) documented in the previous literature (Agarwal, Daniel, and Naik, 2009). The control variables are the logarithm of assets under management (*LnAsset*), flows of fund (*Flow*), and logarithm of fund age (*LnAge*). All control variables are lagged by one-month. To account for unobservable fund manager skill, we further include fund fixed effects.

As shown in Table II, the coefficient on *Tax* is negative and statistically significant across all columns. The results are robust to 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 0.63 (= 0.028×0.019×12) percentage point decrease in annual alpha. With respect to the control variables, fund size is negatively associated with fund performance, consistent with the prior work suggesting a decreasing returns to scale (e.g., Getmansky, 2012). Furthermore, fund age is negatively associated with fund performance consistent with Agarwal, Daniel, and Naik (2009). Overall, our results suggest that the substitution effect dominates the income effect and that when personal income tax rates increase, fund managers reduce effort because the reward to effort (after-tax income) becomes lower.

3.2 Difference-in-differences analysis

To alleviate the concern that certain macroeconomic factors may drive both tax policy and fund performance in our panel regression, we use 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. It 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 41.8% in 2013. The maximum long-term capital gain tax increased from 15% in 2012 to 25.1% 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 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 (2018), 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 Australia, Austria, Belgium, Canada, Switzerland, Chile, Czech Republic, Germany, Denmark, Estonia, Finland, France, United Kingdom, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Norway, New Zealand, Poland, Slovakia, Sweden and Turkey.

Specifically, we use the following equation to estimate the effect of a tax increase on fund performance:

$$Performance_{i,t} = b_0 + b_1 Post_t \times Domestic_{i,t} + b_2 Controls + w_{i,t} \qquad (2)$$

$Performance_{i,t}$ is the return of hedge fund i in month t. As in equation (1), we measure hedge fund performance using raw returns, style-adjusted returns, and 8-factor alphas. $Post_t$ is an indicator variable, which equals 1 if the time period is after the ACT, and 0 otherwise. $Domestic_{i,t}$ is an indicator variable that equals 1 if the hedge fund manager resides in the U.S., and 0 otherwise. Control variables are same as in equation (1) including logarithm of assets under management (*LnAsset*), flows of fund (*Flow*), and logarithm of fund age (*LnAge*). All of the control variables are lagged by one-month. We further add fund and year fixed effects in the regression to control for unobservable fund manager skill and macroeconomic factors.

As shown in Table III, the coefficient on the interaction term $Post \times Domestic$ is positive and statistically significant across all measures of fund performance. For example, the results in the 8-factor alpha regression (column 3 of Table III) suggest that U.S. funds incur a 0.3% decline in the monthly 8-factor alpha relative to foreign fund managers during the three-year period after the tax increase. Among the control variables, fund asset size remains negatively related to fund performance.

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 interpret private information about security prices and manage the portfolio of 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 a number of proxies for information asymmetry including firm size, analyst coverage, firm age, stock illiquidity, R&D expenditures, and stock return volatility. We then employ the following test to 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:

$$\begin{aligned} HFownership_{i,j,t} \\ &= c_0 + c_1 InformationAsymmetry_{i,t-1} \times Tax_{j,t} \\ &+ c_2 InformationAsymmetry_{i,t-1} + c_3 Tax_{j,t} + Controls \\ &+ v_{i,j,t} \qquad (3) \end{aligned}$$

$HFownership_{i,j,t}$ is the percent of shares of stock *i* owned by hedge fund *j* over the total number of shares outstanding in quarter *t*. $InformationAsymmetry_{i,t-1}$ are proxies of stock information asymmetry. These proxies include firm size (*LnFirmSize*), analyst coverage (*LnAnalyst*), illiquidity (*Illiquidity*), R&D expenditures (*R&D*) and stock idiosyncratic volatility (*Volatility*). Detailed variable definitions can be found in the Appendix. We also include hedge fund level controls including 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*).

Fund, stock, and year fixed effects are included to further account for unobserved manager skill, stock characteristics, and macroeconomic shocks, respectively.

The results of the security selection analyses are presented in Table IV. As shown in Table IV, the coefficient on *Tax* is negative and statistically significant across all regressions, suggesting that, on average, fund managers take on less concentrated positions subsequent to 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 private information search 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, subsequent to a tax rate increase. These results suggest that fund managers increase their holdings of stocks with lower information asymmetry when personal tax rates are higher. 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.

5. 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 a tax increase disincentivizes managers' 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. Our regression is specified as follows.

$$IncentiveFee_{i,t} = b_0 + b_1 Tax_{i,t} + b_2 Controls + z_{i,t} \quad (5)$$

$IncentiveFee_{i,t}$ is the incentive fee received by hedge fund manager i at the fund inception month t. $Tax_{i,t}$ is the maximum state income tax rate of fund manager i at the fund inception month t. Control variables are characteristics of the investment company that the hedge fund belongs to. They are the logarithm of assets under management (*LnAsset*), flows of fund (*Flow*), and logarithm of fund age (*LnAge*) at the investment company level. All control variables are lagged by one-month. We further include investment company fixed effects to capture unobserved time-invariant factors that can impact the incentive fee such as the investment company reputation.

As shown in Table V, we find a positive relation between incentive fee and personal tax rate after controlling for fund characteristics and investment company fixed effects. For example, the coefficient in column (3) is 3.164 and is statistically significant at the 1% level. This result indicates that a one standard deviation increase in personal tax rate is associated with a 9% 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.

6. Conclusions

At the center of the debate on progressive tax codes is the amount of deadweight loss created by such tax codes. The revenue from increasing 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 bypass data limitations on the behavior of the affluent by studying the issue 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. We find that an increase in tax is associated with more effort shirking, reflected by a lower fund performance and selection of stocks with lower information asymmetry. Our results suggest that a tax increase leads to effort shirking by hedge fund managers. Our findings also suggest negative externalities of taxing hedge fund managers are manifested in the form of lower returns to fund investors and potentially a less efficient financial market.

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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. 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 federal and state ordinary income tax rate 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 index benchmark, 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 dollar value of a stock divided by the total dollar value of the portfolio. Other stock characteristics are firm size (*LnFirmSize*), analyst coverage (*LnAnalyst*), firm age (*LnFirmAge*), stock illiquidity (*Illiquidity*), idiosyncratic return volatility (*Volatility*), 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*). Detailed variable definitions are provided in the Appendix. All variables are winsorized at the 1st and 99th percentiles.

Panel A: Top Federal and State Ordinary Income Tax Rate

	N	Mean	Median	Std Dev	P25	P75
Federal	153,076	0.348	0.337	0.026	0.328	0.375
State	153,076	0.069	0.069	0.029	0.057	0.090
Federal and State`	153,076	0.417	0.411	0.028	0.398	0.440

Panel B: Hedge Fund Performance and Characteristics

	N	Mean	Median	Std Dev	P25	P75
Fund-month Observations						
Raw Return	153,076	0.006	0.006	0.039	-0.008	0.021
Style-adjusted Return	131,023	0.000	-0.001	0.036	-0.016	0.014
8-Factor Alpha	96,841	0.002	0.002	0.034	-0.012	0.015
Asset ($ Million)	153,076	229.083	48.225	883.287	14.15	158.30
Flow	153,076	0.004	0.000	0.090	-0.009	0.014
Age (Months)	153,076	86.897	72.000	63.267	38.00	120.00
Fund Level Observations						
Management Fee	3,205	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	3,205	5.456	0.000	7.560	0.000	12.00

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
Volatility	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

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. *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 investment company level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)
VARIABLES	Raw Returns	Style-adjusted Return	8-Factor Alpha
Manager_Tax	-0.015**	-0.038***	-0.019***
	(-2.23)	(-5.61)	(-2.83)
LnAssets	-0.004***	-0.003***	-0.003***
	(-14.72)	(-13.35)	(-11.27)
Flow	-0.000	-0.001	0.001
	(-0.07)	(-0.91)	(0.64)
LnAge	-0.003***	-0.002***	-0.004***
	(-11.17)	(-6.18)	(-9.05)
Observations	153,076	131,023	96,841
Adj. R-squared	0.024	0.026	0.024

Table III: Personal Income Tax and Hedge fund Performance: Difference-in-Differences Analysis

This table reports the difference-in-differences analysis results on the relation between a hedge fund manager's personal income tax rate and fund's performance. 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 cut during that period. These control countries are Australia, Austria, Belgium, Canada, Switzerland, Chile, Czech Republic, Germany, Denmark, Estonia, Finland, France, United Kingdom, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Mexico, Norway, New Zealand, Poland, Slovakia, Sweden and Turkey. The even window is [2011, 2015] in columns (1) to (3) and [2012, 2014] in columns (4) to (6). Coefficients are estimated based on the model presented in Equation (2). The dependent variables are raw returns in columns (1) and (4), style-adjusted returns in columns (2) and (5), and 8-Factor alphas in columns (3) and (6). *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. *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 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 at the investment company level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Raw Returns$_t$	Style-adjusted Return	8-Factor Alpha	Raw Returns	Style-adjusted Return	8-Factor Alpha
		[2011, 2015]			[2012, 2014]	
Post × Domestic	-0.005***	-0.004***	-0.003***	-0.005***	-0.004***	-0.002*
	(-6.37)	(-4.17)	(-2.86)	(-5.27)	(-3.40)	(-1.76)
LnAsset	-0.003***	-0.003***	-0.002***	-0.004***	-0.004***	-0.004***
	(-8.45)	(-7.69)	(-5.46)	(-6.73)	(-5.81)	(-6.72)
Flow	-0.004**	0.000	0.000	-0.004	-0.001	0.003
	(-2.02)	(0.05)	(0.05)	(-1.47)	(-0.23)	(0.85)
LnAge	-0.001**	-0.000	0.000	-0.002	-0.002	-0.002
	(-2.53)	(-0.02)	(0.09)	(-1.56)	(-1.24)	(-0.47)
Observations	50,138	35,957	38,572	25,267	18,121	20,150
Adj. R-squared	0.174	0.043	0.055	0.152	0.04	0.058

Table IV: Personal Income Tax and Stock Selections

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 dollar value of a stock divided by the total dollar value of the portfolio. 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 (*Volatility*), 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 investment company. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
VARIABLES			HF ownership		
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)	
Volatility×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 Characterstics					
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)
Volatility	-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)
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 V: 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 *IncentiveFee*, measured by the logarithm of 1 plus 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. *ManagementFee* is fund management fees. *HighwaterMark* is a dummy for high-water mark, and *Lockup* is a dummy for a lockup period. *LnAsset* is the logarithm of fund assets under management. *Flow* is the flows of fund, and *LnAge* is the logarithm of fund age. *Return* is a fund's return. 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+Incentive fee)		
$Manager_Tax_t$	2.081***	2.325*	3.164**
	(3.75)	(1.94)	(2.07)
HighwaterMark	0.390***	0.431***	0.700***
	(7.36)	(5.01)	(3.83)
Lockup	0.001	0.005*	0.006
	(0.48)	(1.70)	(1.41)
ManagementFee	0.141***	0.182***	0.208***
	(3.64)	(2.91)	(2.80)
$LnAsset_{t-1}$			-0.036
			(-0.79)
$LnAge_{t-1}$			-0.035
			(-0.59)
$Return_{t-1}$			-0.046
			(-0.40)
Observations	3,205	3,205	615
Style FE	Yes	Yes	Yes
Investment Company FE	NO	YES	YES
Adj. R-squared	0.086	0.331	0.502

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
Alpha	Risk-adjusted returns calculated from Fung and Hsieh (2001) 7-factor model augmented with the Emerging market factor.	TASS; David Hsieh's Data Library
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
Panel C: Hedge Fund Characteristics (listed in alphabetical order)		
Flow	Capital flows of fund i at the end of each month t , calcuated as $\boxed{Flow_{i,t} = \frac{AUM_{i,t} - AUM_{i,t-1} \times (1 + \mathrm{Re}turn_{i,t})}{AUM_{i,t-1}}}$	
HighWaterMark	A binary variable that equals one if a fund uses a high-water mark provision, and zero otherwise.	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
LockupPeriod	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
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 stock returns.	CRSP

Iliquidity	The annual average of square root of |stock return|/(Price×Volume) (Following Hasbrouck (2009) and Agarwal, Jiang, Tang and Yang (2013)	CRSP
IO_Hedge Fund	Percent of stockholdings by hedge fund investors for earch firm-quarter.	TASS & F13
GolfPlays	Natural logarithm of the number of montly golfing plays by the hedge fund manager	GHIN (Golf Handicap and Information Network)
LnAnalyst	Natural logarithm of the number of analysts covering the 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 asset.	Compustat