Mutual Fund Expenses: An Econometric Investigation

by

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Abstract

I utilize a panel data set of 600 funds to evaluate the existence and sources of economies of scale in mutual fund administration. The elasticity of fund expenses with respect to assets is less than one, implying the existence of economies of scale. Average total costs are minimized at $22 billion in assets. All cost items exhibit economies of scale. The greatest sources of scale economies are the "other" administrative expenses, which are a small portion of total costs. An analysis of fund company profits indicates that most scale economies are passed along to shareholders in lower expense ratios.

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> "Mutual funds are now Americans' favorite retail financial product. Fund assets exceeding $7 trillion are held by 88 million shareholders representing 51% of U.S. households. From 1990 to 1998, fees paid by owners of stock mutual funds rose from $2.5 billion to $22.9 billion, an 801% increase" (Bullard 2001).

Understanding mutual funds as an industry requires an understanding of the costs of operating a mutual fund. Costs are related to the structure of the mutual fund industry, encouraging fund mergers (Jayaraman, Khorana, and Nelling 2002) and the formation of fund families (Baumol, Goldfeld, Gordon, and Koehn 1990; Collins and Mack 1997). Fund costs are also associated with fund performance. Studies relating costs and performance find that high-cost funds underperform low-cost funds (Malkiel 1995; Gruber 1996; Carhart 1997). All mutual funds incur ongoing management and administrative expenses, which are deducted from the fund's assets. Since some of these expenses are fixed costs there are potentially enormous economies of scale in managing money.

Several researchers have, in fact, found that there are scale economies in the administration of mutual funds (McLeod and Malhotra 1994; Malhotra and McLeod 1997; Latzko 1999; Rea, Reid, and Millar 1999; Securities and Exchange Commission 2000; LaPlante 2001). However, these studies share two shortcomings. First, they are predominantly cross-sectional analyses utilizing a single observation on each fund. All this permits us to conclude with confidence is that larger funds tend to operate at a lower average cost than smaller funds. Nothing can be concluded about the relationship between changes in funds assets expenses over time. This paper remedies that deficiency by utilizing a panel data set containing up to seven annual observations on a cross-section of mutual funds. The panel data has the advantage that it utilizes information on both the inter-temporal dynamics and the individuality of the entities being investigated. I find that the average elasticity of fund expenses with respect to fund assets is significantly less than one, indicating there are scale economies in mutual fund administration. Average costs including brokerage commissions are minimized at $22 billion in assets.

The second shortcoming is that while these studies speculate upon the possible causes of mutual fund scale economies, they do not investigate the sources of these cost economies. In this paper I attempt to discover the sources of mutual fund economies of scale by examining the relationship between fund assets and the various categories of fund expenses. Investment management fees, the largest single cost category for most funds, are subject to small economies of scale. This is not surprising since the management fee is either a fixed percentage of fund assets, a declining rate in steps or as fund net assets surpass designated breakpoints, or, like the Fidelity Aggressive Growth Fund (2001, p. 22), contains a group fee based on total family assets which "drops as total assets under management increase." Intended to attract assets into funds thereby making economies of scale possible, marketing and distribution fees also exhibit slight economies of scale for small funds. The reliable sources of scale economies are the "other" administrative expenses, especially custodian fees and audit and legal expenses. An analysis of fund company profits indicates that most, if not all, of the scale economies experienced by mutual funds are passed along to shareholders in the form of lower expense ratios rather than showing up as higher profit margins for fund management companies.

The remainder of the paper is organized as follows. Section I discusses the various categories of mutual fund expenses. Section II describes the empirical model used to examine the existence of economies of scale, discusses the data sources, and presents the results. Section III examines the various mutual fund expenses to determine which are subject to in economies of scale. Section IV concludes.

I. Mutual Fund Expenses

Three major categories of mutual fund costs are included in a mutual fund's expense ratio. The first and generally largest is the management fee paid to the fund's investment adviser. Second is the 12b-1 distribution fee spent on advertising, marketing, and distribution services or on commissions to sales representatives. Third are the "other" administrative expenses resulting from the provision of record keeping and transaction services to shareholders. These services include providing statements and

reports, disbursing dividends, providing custodial services, and paying state and local taxes, auditing, legal, and directors' fees.

The investment advisory fee compensates the fund's manager for the expenses it incurs for providing its services, including security research and analysis. The adviser's profit also comes out of the management fee. The investment advisory fee is a fixed percentage amount deducted from fund assets over the year, although some funds have performance-related management fees. Even though Herman (1963) found that management fees were not significantly responsive to variations in asset size, it seems improbable these costs could grow at the same rate as fund assets. It might be more difficult and costly to manage a large portfolio than a small one, but it does not seem likely that it would cost ten times more to manage a $500 million fund than a $50 million portfolio.[1]

The 12b-1 fee is named after the SEC rule allowing mutual funds to pay marketing and advertising costs directly out of fund assets. When first introduced in 1980, the 12b-1 fee was used primarily for marketing and advertising expenses. Over time, the 12b-1 fee has increasingly been used as a distribution fee to compensate brokers and advisers. The purpose of 12b-1 fees is to increase fund assets. By attracting investors into the fund, 12b-1 fees make scale economies possible, but the fees themselves only add to a fund's expenses. Ferris and Chance (1987), Chance and Ferris (1991), McLeod and Malhotra (1994), Malhotra and McLeod (1997), the Securities and Exchange Commission (2000), and Rao (2001) all find that 12b-1 plans raise expense ratios.

The remainder of fund costs included in the expense ratio is for operating costs and shareholder services. The major operating expenses are the fees associated with registering the fund shares sold each year with the SEC, the custodial fees which cover the costs of settling trades and holding fund assets, and the accounting, auditing, and legal costs of running the fund. Shareholder servicing costs are the expenses related to shareholder communications such as responding to shareholder inquiries and

[1]Apropos to the difficulty of managing a large fund, Carhart (1997) finds that a fund's performance is unrelated to its size.

printing and distributing fund prospectuses and reports. Other shareholder servicing costs include transfer agent fees which cover the cost of maintaining accounts, processing transactions, and generating shareholder statements. The transfer agent is usually paid for its services on a per-account basis.

It is some of these other administrative expenses that are potentially subject to large economies of scale. For example, since the transfer agent is paid per-account the cost of maintaining shareholder accounts is the same for all shareholders, regardless of the size of their account. Suppose the annual cost of maintaining an account is $10 and that the mutual fund has 100,000 shareholders. If the fund has $100 million in assets (an average of $1,000 per account), then transfer agent fees are 1.0 percent of fund assets. But, if total assets are $250 million (an average account of $2,500), then transfer agent expenses are 0.4 percent of fund assets. The average cost of maintaining shareholder accounts falls as fund assets rise.

Mutual funds pay over $1 billion a year in brokerage commissions (Livingston and O'Neal 1996, p. 273). These commissions, like management, distribution, and other administrative expenses, are paid directly from the net assets of the fund. Funds are permitted to use brokerage commissions to pay brokers for research services. These so-called "soft dollars" are used to provide funds with "proprietary research, written or oral, computer equipment or terminals, software and databases which provide access to data and analysis of market data, statistical information and securities data, analysis and pricing" (Wasatch Funds 2002, p. 33). Brokerage commissions are an explicit fund cost. However, this cost is not included in the expense ratio reported to shareholders in the fund prospectus or in the statement of operations in the fund's annual report.

II. The Existence of Mutual Fund Scale Economies

A. Model Specification

The cost function of a mutual fund is modeled as a translog function. The advantage of the translog cost function is that it allows scale economies to vary with the level of fund assets. The translog cost function takes the form

(1) $\ln COST = \alpha_0 + \alpha_1 \ln ASSETS + 1/2\ \alpha_2 (\ln ASSETS)^2 + \Sigma_j\ \alpha_j\ X_j + e,$

where COST is the fund's operating expenses, ASSETS equals total fund net assets, X_j is a vector of fund characteristics that may affect costs, and e is a random error term. The vector X_j is included to control for factors that affect the costs of managing and administering a mutual fund. These control variables are a dummy variable that has a value of 0 for bond funds and a value of 1 for equity funds, a second dummy variable distinguishing between funds that hold domestic (= 0) and foreign (= 1) securities, the fund's annualized three-year return in percentage terms, the fund's front-end sales load, the fund's back-end load, and the total amount of other mutual fund assets managed by the family complex to which the fund belongs.

Some types of funds are just more costly to manage. Global and international funds, for example, often have higher custodial, management, and transactions costs and, therefore, tend to have higher expense ratios than domestic growth and equity income funds with the same amount of assets under management. Also, bond funds tend to have lower expenses than similar-sized equity funds.

A fund's average annual return may influence the size of the management fee paid to its investment advisers. Fund managers are rewarded for performance. Managers posting high returns relative to funds with the same investment objective may be able to command a higher fee than managers of funds with lower than average returns.

A fund's sales representative may be compensated by a sales load on the investor who purchased the shares or out of fund assets, through a 12b-1 fee paid by all shareholders. A fund with a front-end or back-end load need not charge as high a 12b-1 fee. So, I expect a negative relationship between fund

expenses and the two load variables. However, the relationship between front and back-end loads and the expense ratio is complex. While the SEC (2000) study found that funds with a front-end load had a smaller expense ratio than funds without such a load, in Hooks' (1996) sample of 1,012 equity funds, load funds actually have a higher average annual expense ratio than no-load funds. Some funds have issued several series of shares. Kemper Growth Fund Class A shares, as a typical example, have a front-end load of 5.75 percent with an expense ratio of 1.05 percent. The Class B shares have a back-end load of 4 percent, but the expense ratio is 2.17 percent. Class C shares have a back-end load of 1 percent and an expense ratio of 1.90. Ivy International Fund Class C shares, on the other hand, have a lower back-end load but the same expense ratio as the Class B shares. Lesseig, Long, and Smythe (2002) find that multiple share class funds have higher expense ratios than single-class funds. Multiple share classes of the same fund are treated separately in the analysis below.

Funds in the same family tend to share expenses such as computer, telephone, and shareholder accounting systems. Therefore, funds that are part of a mutual fund family may obtain greater economies of scale than can be explained solely by fund size. The greater the amount of assets managed by a fund complex, the greater the possible scale economies and consequent reduction in the expense ratios of family members.

B. Data and Sources

A panel of 600 funds was randomly selected from the population of U.S. mutual funds that had been in existence for at least three years as of 1995. The three-year requirement was imposed so that the funds had a performance record and because their sponsor often subsidizes the expenses of new funds.[2] Cost and fund characteristic data were collected for the years 1995 through 2001. Due to fund liquidations and mergers, the sample drops to 398 funds in 2001. Funds are sampled as of the end of their fiscal year.

[2] Christoffersen (2001) examines fee waivers among money market mutual funds.

Table I

Mutual Fund Sample Summary Statistics

The table reports time series averages of annual cross-sectional averages from 1995 to 2001. TNA is total net assets in millions of dollars. Expense ratio is total fund operating expenses, not including brokerage commissions, divided by total net assets. Live funds are those that filed an annual report in 2001. Dead funds discontinued operations prior to 2001.

Time Series Averages of Annual Average Cross-Sectional Attributes, 1995-2001

Group	Total Number	Average Number	Average TNA	Average Expense Ratio	Percentage with Load
All Funds	600	491	$1,221.5	1.23	56.4
By Fund Category					
domestic equity	248	211	1,893.0	1.29	49.3
foreign equity	49	43	1,747.5	1.87	55.7
fixed income	158	117	581.0	1.17	54.5
municipal bond	145	119	420.1	0.93	70.9
By 2001 Status					
live funds	398	398	1,409.4	1.17	55.2
dead funds	202	93	144.6	1.49	63.5

Total mutual fund expenses include the management and administrative costs included in the fund's expense ratio, additional payments for services not directly reported to shareholders in the expense ratio, and commissions for brokerage services. Fund asset and cost data was hand collected from documents filed on EDGAR with the SEC: form NSAR-B, the annual report for registered investment companies, the statement of operations and footnotes in form N-30D, the annual report to shareholders, and the fund's prospectus and accompanying statement of additional information, forms 485APOS and 485BPOS. For observations on a fund with multiple share classes, all expenses (other than class-specific expenses) are allocated to the class of shares being sampled based upon the relative value of the shares of that class. Class-specific expenses, which include distribution and service fees and any other items that are specifically attributable to a particular class, are charged directly to the class of shares in question.

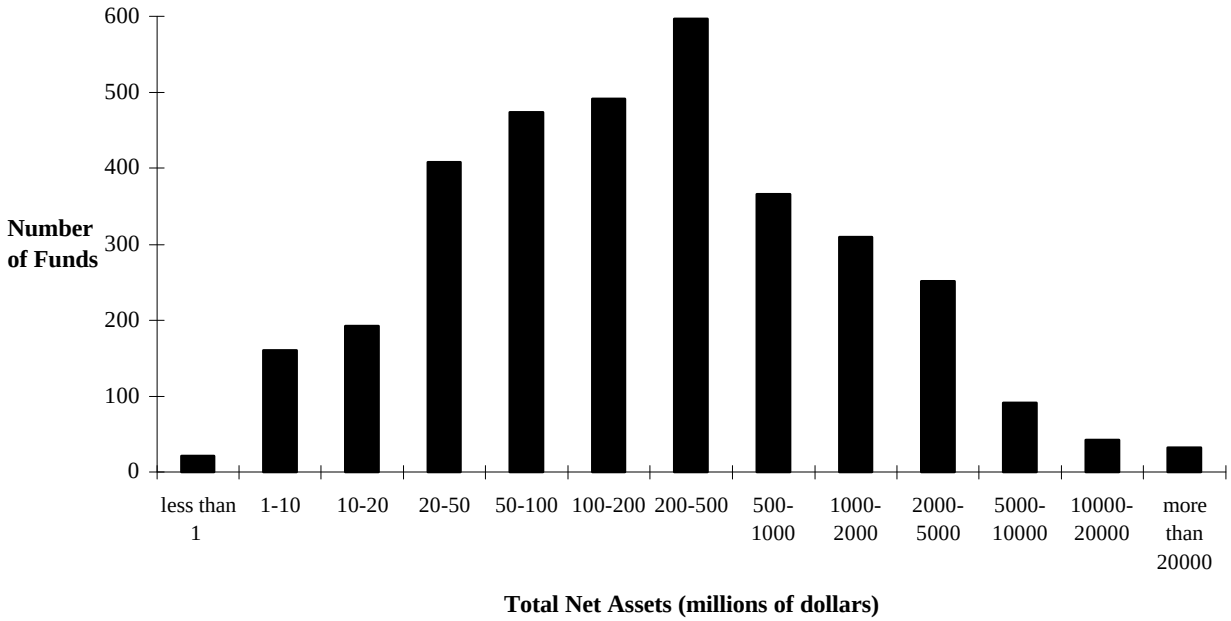


Figure 1. Distribution of fund asset sizes.

Table I reports summary statistics on the sample of funds. Total net assets are the monthly average net assets reported on form NSAR-B. Average total net assets over all 3,434 observations are $1,159.5 million. Median assets are $191.9 million. The largest fund has net assets of $48,793.1 million; the smallest fund has just $2,410 in assets. Figure 1 is a histogram of fund asset sizes. A fund's expense ratio is calculated by taking total fund operating expenses, excluding brokerage commissions, and dividing by total net assets. The average expense ratio over all observations is 1.22. The median is 1.05. The highest expense ratio among sampled funds is 12.51 while the lowest is 0.04.

The return variable is the fund's annualized three-year return as of the end of the fund's fiscal year. The front and back-end load variables take a value of zero for no-load funds and the size of the load in percentage terms for load funds. The family assets variable is the sum of the net assets of all other funds in the family complex to which a mutual fund belongs.

Table II

Panel Estimates of the Translog Total Cost Function

The second column reports the coefficients from a random effects regression of total fund expenses on eight variables: ln COST = $\alpha_0 + \alpha_1$ ln ASSETS + 1/2 α_2 (ln ASSETS)^2 + α_3 EQUITY + α_4 FOREIGN + α_5 RETURN + α_6 FRONT + α_7BACK + α_8 FAMILY + e, where COST denotes total fund operating expenses, ASSETS is total fund net assets, EQUITY is a dummy variable taking a value of 1 for equity funds and a value of 0 for bond funds, FOREIGN is a dummy variable with a value of 1 for foreign funds and 0 for domestic funds, RETURN is the fund's three-year annualized average return, FRONT is the fund's front-end load in percentage terms, BACK is the fund's back-end load in percentage terms, and FAMILY is the total amount of other assets under management in the family to which the fund belongs. The third column adds brokerage commissions to operating costs and includes the fund's portfolio turnover rate among the independent variables. *t*-statistics are in parentheses.

Independent Variables	Total Operating Expenses	Total Operating Expenses plus Brokerage Commissions
Log of fund assets	0.744 (15.95)	0.226 (2.54)
Log of fund assets squared	0.003 (2.55)	0.016 (7.09)
Debt/equity dummy variable	0.333 (10.78)	0.250 (4.00)
Domestic/foreign dummy variable	0.352 (7.39)	0.344 (6.39)
Three-year average annual return	-0.004 (10.27)	-0.004 (8.66)
Front-end load	0.034 (6.15)	0.017 (2.44)
Back-end load	0.080 (9.66)	0.058 (4.66)
Other family assets	-0.000 (1.40)	-0.000 (0.37)
Portfolio turnover		0.001 (11.61)
Constant	-1.106 (2.53)	4.172 (4.80)
Observations	3,434	1,704
Adjusted R^2	0.95	0.95
Standard error of regression	0.41	0.40
p-value of Lagrange multiplier test	0.006	0.000

C. Results

Since this study involves a random sample of 600 funds from the population of all funds that had been in existence for at least three years as of 1995, the translog function in equation (1) is estimated assuming a random effects model. The Lagrange multiplier test indicates the presence of panel effects in the data. The estimated coefficients are reported in Table II. All coefficients, except that of the family assets variable, are significant at the 0.05 level and the adjusted R-squared is quite high. The fund asset coefficient is positive, meaning that costs rise with assets. Equity funds have higher costs than bond funds and foreign funds have higher costs than domestic funds. The negative coefficient on the return variable indicates that funds with high returns have lower costs than similar, low return funds. Consistent with the conjecture of a Lipper (1998) study, the amount of other assets under management in the fund family has no significant affect on individual fund costs. Both load variables have positive coefficients. This implies that load funds have higher expenses than no-load funds, a result contradicting the recent SEC (2000) study. The effect is quite large; based on the coefficients in Table II, in 2001, a domestic equity fund with a 5 percent front-end load, the average amount of assets, $1.6 billion, and average values of the other independent variables had an extra $2,484,214 in expenses compared to an otherwise identical no-load fund. The expense ratio of the load fund would be 0.99 while that of its no-load twin would be 0.83.

The last column in Table II reports on a random effects regression of equation (1) using the sum of total operating expenses and brokerage commissions as the dependent variable. Only those funds reporting non-zero brokerage commissions are included in the analysis. Once again, all the coefficients, except that of the family assets variable, are significant at the 0.05 level.

The elasticity of cost with respect to assets, the percentage change in cost associated with a percentage change in fund assets, can be used to evaluate the existence and extent of scale economies in mutual fund administration. This elasticity is calculated by taking the first derivative of the translog cost function in equation (1):

Table III

Average Cost Elasticities by Fund Size

Cost elasticities, ∂ (ln Cost) / ∂ (ln Assets), are calculated using $\alpha_1 + \alpha_2$ (ln Assets), where α_1 is the coefficient on the log of fund assets and α_2 is the coefficient on the log of fund assets squared from the random effects estimates of the translog total operating expenses cost functions. The translog function is estimated separately for each group of funds. The reported elasticities are the determined using the "average" method (Noulas, Ray, and Miller, 1990). The average method estimates the cost elasticity for each observation and averages across observations to obtain the group average elasticity. If the cost elasticity is less than one, mutual fund expenses increase less than proportionately with fund assets, implying economies of scale. If the elasticity is greater than one, diseconomies of scale exist, and if the cost elasticity equals one, there are constant returns to scale as fund costs increase proportionately with assets. All estimated cost elasticities are less than one and statistically significant at the 0.01 level.

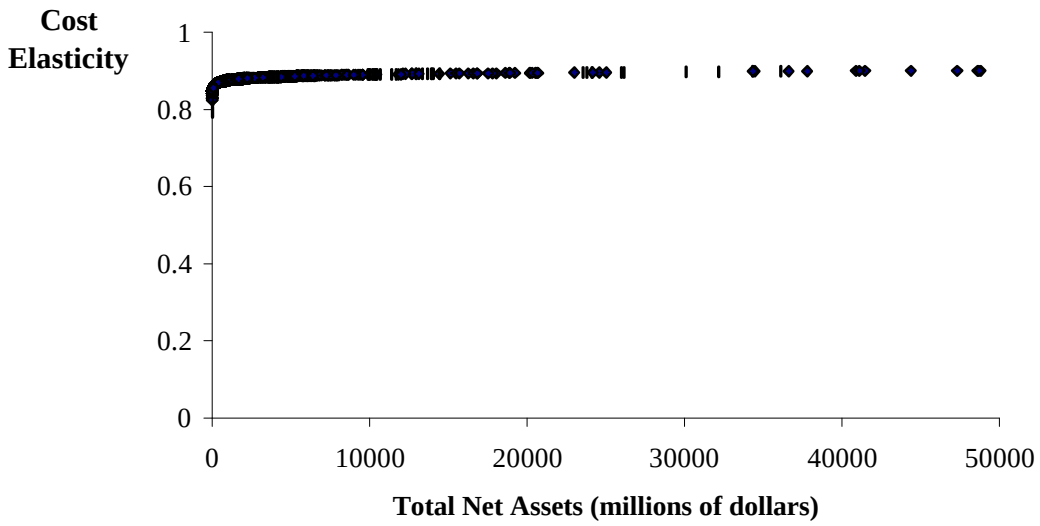
Fund Size (millions of dollars)	Cost Elasticity	Standard Deviation	Observations
0 – 42.2	0.76	.05	687
42.2 – 117.2	0.83	.01	687
117.2 – 316.4	0.85	.02	687
316.4 – 1,085.7	0.94	.04	687
over 1,085.7	0.92	.02	686
All funds	0.87	.01	3,434
All funds (including brokerage commissions)	0.86	.06	1,704

(2) ∂ (ln COST) / ∂ (ln ASSETS) = α_1 + α_2 (ln ASSETS)

If the cost elasticity is less than one, mutual fund expenses increase less than proportionately with fund assets, implying economies of scale. If the elasticity is greater than one, diseconomies of scale exist, and if the cost elasticity equals one, there are constant returns to scale as fund costs increase proportionately with assets.

One approach to evaluating the existence of scale economies using the cost elasticity is the "average" method (Noulas, Ray, and Miller 1990). The average method estimates the cost elasticity for each observation and averages across observations to obtain the group average elasticity. Table III presents estimates of average cost elasticity at different data points to determine how changes in fund size affect cost. For the full sample of funds the average cost elasticity is 0.87 (0.86 when brokerage

Panel A: Operating Costs



Panel B: Operating Costs Plus Brokerage Commissions

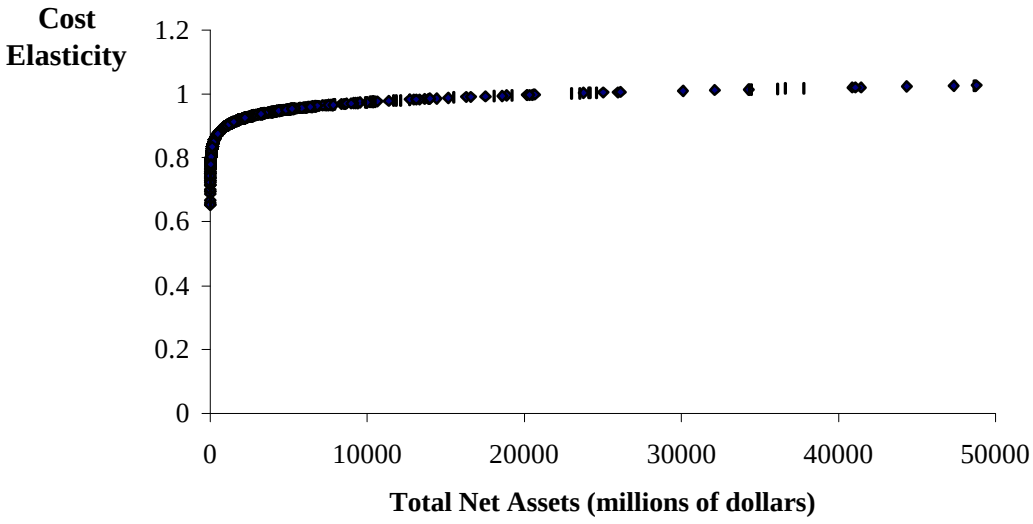


Figure 2. Cost elasticities and fund assets.

commissions are included in total costs). This means that a 10 percent increase in the assets of the average fund results in an additional 8.7 percent in expenses. In 2001, the median fund in the sample had $285.1 million in assets. Doubling the fund's assets results in an extra $2,489,457 in expenses. The

Table IV

Average Cost Elasticities by Investment Objective

Cost elasticities, ∂ (ln Cost) / ∂ (ln Assets), are calculated using $\alpha_1 + \alpha_2$ (ln Assets), where α_1 is the coefficient on the log of fund assets and α_2 is the coefficient on the log of fund assets squared from random effects estimates of the translog total operating expenses cost functions. The translog function is estimated separately for each group of funds. All estimated cost elasticities are less than one and statistically significant at the 0.01 level, implying that scale economies exist in the operation of all types of mutual funds.

Investment Objective	Cost Elasticity	Standard Deviation	Observations
Domestic equity	0.87	.07	1,478
Foreign equity	0.87	.07	304
Fixed income	0.87	.02	816
Municipal bonds	0.83	.03	836
All funds	0.87	.01	3,434

fund's expense ratio would fall from 1.05 to 0.96. A fund with the average amount of assets would see its expense ratio fall 0.067 basis points following a 100 percent increase in assets.

I sorted into the sample quintiles based on total net assets and estimated the translog function separately for the different fund-size groupings. All categories of fund size exhibit economies of scale on average. The estimated cost elasticities are less than one and statistically significant at the 0.01 level. The magnitude of scale economies varies across asset size, falling rapidly with net assets. Figure 2 plots the cost elasticity for each data point against the fund's asset level. The cost elasticity rises rapidly as fund assets increase up to about $500 million. After that, cost elasticities increase more modestly until perhaps $8 billion in assets. Thereafter, the cost elasticity continues to rise very slowly with fund assets but remains below 1.0 when considering just operating expenses. However, when brokerage commissions are included in total costs, the very largest funds have cost elasticities greater than 1.0, implying diseconomies of scale.

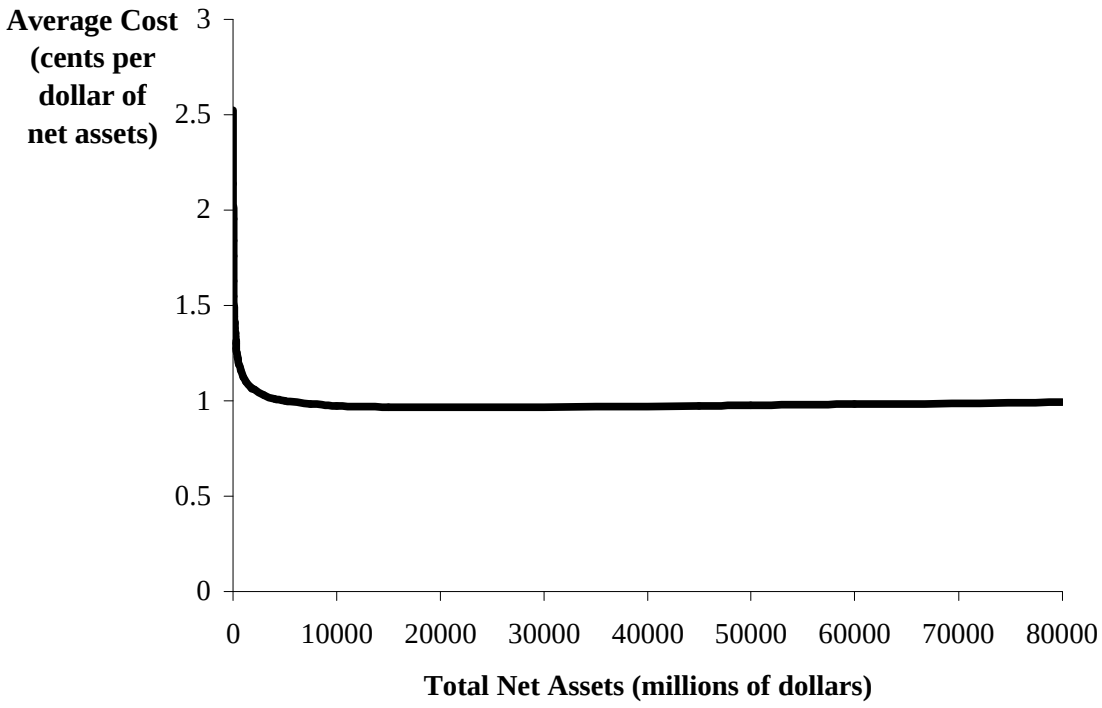


Figure 3. Average cost curve for the typical mutual fund.

Table IV presents estimates of average cost elasticity for the different investment objectives. Equation (1) is estimated separately for each investment objective. All cost elasticities are significantly less than one at the 0.01 level, implying that economies of scale exist in the administration of all types of equity and bond mutual funds. The degree of scale economies is similar for most investment categories. The largest scale economies are exhibited by municipal bond funds, which have a cost elasticity equal to 0.83.

The economies of scale in the mutual fund industry can be summarized by computing the average cost curve facing the typical mutual fund. This is derived by calculating the predicted average total costs including brokerage commissions from the predicted total costs of equation (1) for various fund asset sizes, holding the control variables constant at their mean values. Figure 3 plots the average cost curve for a typical mutual fund. Average costs rapidly diminish over the first $400 million of fund assets. Average costs are minimized at $22 billion in assets. Thereafter, average costs rise with net assets. Only a handful of funds currently have more than $22 billion in assets.

Table V

Categories of Mutual Fund Expenses

Cost characteristics of the fund sample are reported as a percent of operating expenses for all 3,434 observations, as a percent of operating expenses plus brokerage commissions for the 1,704 observations on funds reporting non-zero commissions, and as a percent of total net assets. Data are the cross-sectional averages, including those observations on funds reporting $0 in an expense category (except brokerage commissions.

Expense	Percent of Operating Expenses	Percent of Operating Expenses plus Brokerage Commissions	Percent of Total Net Assets
Management/investment advisory	52.2	47.5	0.59
Marketing/distribution payments	14.2	11.0	0.20
Shareholder servicing agent	13.9	12.7	0.17
Custodian	3.0	2.6	0.04
Auditing and legal	2.6	2.1	0.04
Shareholder communications	2.0	1.6	0.03
Registration	1.7	1.4	0.02
Directors/trustees	0.7	0.6	0.01
Brokerage commissions		12.8	0.29

III. Sources of Mutual Fund Scale Economies

There are modest cost economies of scale in the mutual fund industry. This section investigates which specific expenses are subject to scale economies. Table V summarizes the relative importance of the various cost categories. Note the importance of brokerage commissions, which average 0.29 percent of fund assets. The translog cost function in equation (1) is estimated separately for each cost variable. Cost information for several funds is incomplete so when the empirical model is estimated for each cost category, any observations equal to zero for the specific cost category are deleted.

A. Management/Investment Advisory Fees

A contract between a mutual fund and its investment adviser specifies the services the adviser provides. An investment adviser is responsible for identifying and analyzing possible investments

consistent with the objectives and policies stated in the mutual fund's prospectus. The adviser also determines the amount and timing of such investments. The adviser has the responsibility to monitor and review the fund's portfolio and to cause the purchase and sale of securities in the fund's portfolio. The investment advisory contract is initially approved by a vote of the shareholders and thereafter approved annual by the fund's board of directors.[3]

Table VI presents the results of random effects regressions of equation (1) using the investment advisory fees reported by funds to the SEC as the dependent variable. Model 1 in Table VI employs the entire sample of funds reporting advisory fees. All explanatory variables are significant at the 0.10 level. Interestingly, unlike for total costs where it was irrelevant, the amount of other assets under management in the fund complex has a negative and significant relationship with fund-level investment advisory fees. Perhaps large fund families are able to spread research analyst costs over a larger asset base. Using the average method, investment advisory fees have a cost elasticity equal to 0.91. There are small economies of scale for mutual fund management fees.

The Statement of Additional information for the Oakmark Funds (2002, p. 31) states that "portfolio transactions for each Fund are placed with those securities brokers and dealers that the Adviser believes will provide the best value in transaction and research services for that fund." The practice of using brokerage commissions to pay for research is called "soft dollars" because "the research is paid for through higher commissions or through directing more business to the broker rather than by a separate cash remittance (Pozen 1998, p. 263). Soft dollars allow fund advisers to pay a portion of investment advisory expenses indirectly through commissions rather than directly out of fund assets. It is possible

[3] Deli (2002) explores the structure of fund advisor contracts. Luo (2002) models the effect of market power on fund fee-setting. Brown, Harlow, and Starks (1996) and Chevalier and Ellison (1997) examine the incentives facing mutual fund managers. Freeman and Brown (2001) discuss some legal aspects of mutual fund advisory fee setting.

Table VI

Panel Estimates of Management/Investment Advisory Fees

The second and third columns report the coefficients from a random effects regression of a translog cost function. The dependent variable is the log of fund management fees. *t*-statistics are in parentheses. Cost elasticities are averaged over all observations. The implied cost elasticities are both significantly less than 1.0.

Independent Variables	Model 1	Model 2
Log of fund assets	1.390 (20.19)	1.190 (10.38)
Log of fund assets squared	-0.013 (6.81)	-0.007 (2.27)
Debt/equity dummy variable	0.318 (7.41)	0.186 (2.43)
Domestic/foreign dummy variable	0.323 (4.93)	0.295 (4.49)
Three-year average annual return	-0.003 (5.25)	-0.000 (4.74)
Front-end load	0.021 (2.81)	-0.003 (0.36)
Back-end load	0.021 (1.74)	-0.013 (0.81)
Other family assets	-0.000 (2.31)	-0.000 (0.75)
Portfolio turnover		0.004 (2.80)
Brokerage commissions		0.251 (0.56)
Constant	-8.294 (12.82)	-6.431 (5.76)
Observations	3,331	1,680
Adjusted R^2	0.91	0.93
Standard error of regression	0.57	0.48
p-value of Lagrange multiplier test	0.000	0.000
Average cost elasticity	0.91	0.93
Standard deviation	0.05	0.03

that soft dollar transactions benefit fund shareholders by reducing the size of the advisory fee paid to the fund manager.

Model 2 in Table VI adds the amount of brokerage commissions paid and the fund's portfolio turnover rate to the independent variables. If soft dollars arrangements reduce explicit management fees, then, controlling for the volume of transactions, brokerage commissions ought to be negatively associated with investment advisory fees. However, the coefficient on the amount of brokerage commissions paid is positive but not significantly different from zero. Soft dollars do not benefit shareholders by reducing explicit management expenses.

Investment advisory fees are reported on line 72-F of form NSAR-B. Administrator fees, which are used to oversee the performance of companies that provide services to the fund, are a separate expense item reported on line 72-G. However, some funds pay administrative expenses out of management fees; other fund companies, such as American Century, pay all fund operating expenses except trustee fees out of the management fee, making it complicated to disentangle investment advisory fees from other fund expenses. In an attempt to control for this practice, total expenses net of investment advisory fees as a percent of total expenses was utilized as an additional control variable in an unreported regression. This variable has a positive coefficient significantly different from zero, indicating that high management fees are not associated with lower other costs. High cost funds have high costs in all expense categories.

B. Marketing/Distribution Payments

Distribution payments allow mutual funds to pay for marketing expenses directly out of fund assets. Distribution fees are used to finance activities intended to result in the sale of fund shares. These activities include advertising, printing of prospectuses and reports for other than current shareholders, preparation and distribution of advertising material and sales literature, and payments to broker-dealers and shareholder servicing agents. For example, in fiscal year 2000, shareholders of the Toqueville

Table VII

Pooled OLS Estimates of Distribution Fees

This table reports on a pooled OLS regression of a translog cost function. The dependent variable is the log of fund distribution fees. *t*-statistics are in parentheses. Cost elasticities are averaged over all observations. The implied cost elasticity is significantly less than 1.0.

Independent Variables	
Log of fund assets	0.686 (5.94)
Log of fund assets squared	0.008 (2.44)
Debt/equity dummy variable	0.150 (3.29)
Domestic/foreign dummy variable	0.195 (3.14)
Three-year average annual return	-0.009 (3.22)
Front-end load	0.101 (10.20)
Back-end load	0.350 (27.33)
Other family assets	-0.000 (12.52)
Constant	-3.258 (3.01)
Observations	1,854
Adjusted R^2	0.84
Standard error of regression	0.84
p-value of Lagrange multiplier test	0.266
Average cost elasticity	0.97
Standard deviation	0.03

Small Cap Value Fund paid distribution fees in the amount of $85,531 (Toqueville Trust 2001, p. 16). $8,983 was spent on advertising, $2,297 was spent on printing and mailing prospectuses to prospective shareholders, and $20,243 was spent on compensation to broker-dealers. Essentially, distribution

payments require existing shareholders pay for efforts to attract additional shareholders. The figures in Table V understate the importance of distribution payments. For funds with distribution fees, this expense accounts for 30 percent of total operating costs. For funds with back-end loads, distribution fees are 51 percent of total expenses.

Since the Lagrange multiplier test indicates the absence of panel effects, the results of a pooled OLS regression with the log of distribution payments as the dependent variable are reported in Table VII. All coefficients have the expected sign and are significantly different from zero. Load funds have higher distribution fees than no-load funds. Equity and foreign funds have higher distribution fees than bond and domestic funds. Distribution payments were positively related in unreported to regressions to the ratio of management fees to assets and the ratio of shareholder servicing costs to assets. Distribution fees do not substitute for other expenses. Distribution fees are subject to slight economies of scale; the average cost elasticity is 0.97. Diseconomies of scale set in at $335 million in total net assets.

Distribution fees remain a deadweight loss for shareholders.[4] Consider a domestic no-load equity fund with an average annual three-year return of 10 percent and $50 million in assets. Such a fund would be expected to have an expense ratio of 1.28. Suppose this fund imposes a 0.25 percent 12b-1 distribution fee. This fund's net assets would need to rise to $241 million, an increase of 382 percent, in order to lower the fund's expense ratio back to 1.28. If this fund began with $500 million in assets, net assets would have to rise 1,120 percent to return the fund's expense ratio to its pre-distribution fee level; a 7,660 percent increase is required if the fund began with $5,000 million in assets.

[4] Dellva and Olson (1998) find that funds with distribution fees earn higher risk-adjusted returns. Siggelkow (1999), on the other hand, finds that bond funds with distribution fees are riskier while having similar returns than bond funds without distribution fees.

Table VIII

Panel Estimates of Shareholder Servicing Agent Fees

This table reports on a random effects regression of a translog cost function. The dependent variable is the log of fund shareholder servicing agent fees. *t*-statistics are in parentheses. Cost elasticities are averaged over all observations. The implied cost elasticity is significantly less than 1.0.

Independent Variables	
Log of fund assets	1.117 (7.85)
Log of fund assets squared	-0.006 (1.64)
Debt/equity dummy variable	0.503 (6.81)
Domestic/foreign dummy variable	0.224 (2.01)
Three-year average annual return	-0.008 (8.56)
Front-end load	0.048 (3.72)
Back-end load	0.055 (2.85)
Other family assets	0.000 (2.67)
Distribution payments/net assets	18.256 (3.46)
Constant	-7.146 (5.27)
Observations	3,137
Adjusted R^2	0.79
Standard error of regression	0.95
p-value of Lagrange multiplier test	0.000
Average cost elasticity	0.88
Standard deviation	0.02

C. Shareholder Servicing Agent

Shareholder servicing is the third large mutual fund expense. The fund's transfer agent maintains shareholder accounts, mails shareholder account statements and federal income tax information, processes shareholder transactions and calculates and disburses dividends. Some shareholder servicing agents maintain customer service departments to respond to shareholder inquiries. Transfer agents are either paid a percentage of average daily net assets or based on the number of open shareholder accounts.

Table VIII reports the results of a random effects regression of the log of shareholder servicing agents fees. All independent variables are significant at the 0.10 level. Load funds incur higher shareholder servicing costs than no-load funds. Distribution fees are not a substitute for shareholder servicing fees: distribution payments are positively related to shareholder servicing expenses. Shareholder servicing expenses are subject to economies of scale. The cost elasticity is 0.88.

D. Other Operating Expenses

The greatest sources of economies of scale are the remaining operating expenses. Although these cost categories comprise a small portion of total costs, the cost elasticities for these items are much lower than the cost elasticity of total fund costs. The panel estimates for these other operating expenses are shown in Table IX. Mutual funds are required to place their portfolio securities with a custodian. The custodian is responsible for safeguarding and controlling the fund's cash and securities. The custodian fee is usually a percentage of net assets, although some funds pay a fee based, in part, on portfolio activity. For that reason, the fund's portfolio turnover is included among the explanatory variables for the custodian fees regression. Custodian fees do rise with assets. Note that the *p*-value on the coefficient of the log of assets squared is 0.32. Equity funds have higher custodian costs than bond funds, other things the same. And, foreign funds have much higher custodial expenses than domestic funds. The average cost elasticity for custodian fees is 0.62, indicating the presence of strong scale economies.

Table IX

Panel Estimates of Other Operating Expenses

This table reports the coefficients from random effects regressions of a translog cost function for the remaining operating expenses. The dependent variable is the log of the cost item. *t*-statistics are in parentheses. Cost elasticities are averaged over all observations. The implied cost elasticities are all significantly less than 1.0.

Independent Variables	Custodian Fees	Audit and Legal Expenses	Shareholder Reports	Registration Fees	Directors Expenses
Log of fund assets	0.777	1.557	0.339	-0.536	1.051
	(4.86)	(11.76)	(2.22)	(3.13)	(6.20)
Log of fund assets squared	-0.004	-0.032	0.008	0.027	-0.015
	(1.00)	(9.16)	(2.07)	(6.07)	(3.32)
Debt/equity dummy variable	0.315	0.238	0.373	0.619	0.417
	(4.17)	(3.67)	(5.35)	(14.59)	(5.64)
Domestic/foreign dummy variable	1.497	0.407	0.301	0.211	0.141
	(13.22)	(4.14)	(2.77)	(3.52)	(1.25)
Three-year average annual return	-0.004	-0.000	-0.013	0.003	-0.006
	(2.54)	(0.14)	(8.12)	(1.94)	(3.95)
Front-end load	-0.026	-0.016	0.019	0.010	0.011
	(1.91)	(1.39)	(1.52)	(1.18)	(0.86)
Back-end load	-0.024	-0.031	-0.037	-0.011	-0.008
	(1.16)	(1.72)	(1.92)	(0.77)	(0.40)
Other family assets	-0.000	-0.000	-0.000	0.000	-0.000
	(5.97)	(3.66)	(5.13)	(1.69)	(10.46)
Portfolio turnover	0.001				
	(7.17)				
Constant	-2.933	-7.793	0.857	10.027	-5.716
	(1.94)	(6.23)	(0.59)	(6.12)	(3.53)
Observations	3,109	3,171	2,830	2,816	3,108
Adjusted R^2	0.67	0.38	0.70	0.53	0.52
Standard error of regression	0.98	0.84	0.88	1.01	0.96
p-value of Lagrange multiplier test	0.003	0.000	0.001	0.046	0.000
Average cost elasticity	0.62	0.33	0.66	0.50	0.48
Standard deviation	0.02	0.12	0.03	0.10	0.05

Auditing and legal fees are the greatest source of mutual fund scale economies. The average cost elasticity is 0.33. Although the regression has a rather low adjusted R-squared, it does indicate that equity and foreign funds have higher audit and legal expenses, while the amount of other assets under management at the fund complex is negatively associated with fund-level legal and audit expenses.

Mutual funds are required to provide shareholders with annual and semi-annual reports. This involves printing and postage costs. Surprisingly, the fund's investment performance is negatively related to shareholder communications expenses. Loads are not significantly related to these costs. Shareholder literature has an average cost elasticity equal to 0.66. Again, rising assets reduce the average cost of providing shareholder literature.

Mutual funds must pay registration fees to federal and state regulators. These fees are paid out of fund assets.[5] The results in Table IX indicate that registration fees are subject to economies of scale. So, too, are fund directors fees. Equity funds have higher directors expenses than do bond funds, but there is no significant difference between the directors expenses of domestic and foreign funds. High returns are associated with lower directors costs, while, once again, while the amount of other assets under management at the fund complex is negatively associated with fund-level directors fees.

E. Brokerage Commissions

Brokerage commissions are a significant fund expense.[6] Reported commissions amount to 0.29 percent of fund assets and account for 12.8 percent of total costs for those funds for those funds paying negotiated commissions. These two numbers understate fund transactions costs, however, because funds

[5] The "Investor and Capital Markets Fee Relief Act" of 2002 reduces these filing fees retroactive to October 1, 2001.

[6] Livingston and O'Neal (1996) and Chalmers, Edelen, and Kadlec (1999) examine mutual fund brokerage commissions.

Table X

Panel Estimates of Brokerage Commissions

This table reports on a random effects regression of a translog cost function. The dependent variable is the log of brokerage commissions paid. *t*-statistics are in parentheses. Cost elasticities are averaged over all observations. The implied cost elasticity is significantly less than 1.0.

Independent Variables	
Log of fund assets	1.053 (4.20)
Log of fund assets squared	-0.006 (0.87)
Debt/equity dummy variable	3.255 (21.37)
Domestic/foreign dummy variable	0.734 (5.61)
Three-year average annual return	-0.006 (3.78)
Front-end load	-0.016 (0.90)
Back-end load	-0.017 (0.51)
Other family assets	0.000 (0.89)
Portfolio turnover	0.006 (17.50)
Constant	-9.19 (3.78)
Observations	1,704
Adjusted R^2	0.80
Standard error of regression	1.02
p-value of Lagrange multiplier test	0.000
Average cost elasticity	0.83
Standard deviation	0.02

do not report spreads on principal transactions in their filings to the SEC.[7] There are no commissions or stated markups on principal transactions. Instead, purchases are executed at the ask price net and sales are executed at the bid price net. Only those funds paying brokerage commissions are included in the regressions reported in Table X. The model explains 80 percent of the variation in brokerage commissions. Brokerage commissions rise with fund assets and with portfolio turnover and are higher for equity and foreign funds. The amount of brokerage commissions paid is negatively related to the fund's average annual return. Load variables and other assets under management have no significant effect on brokerage commissions. Brokerage commissions do evidence economies of scale. The average cost elasticity is 0.83.

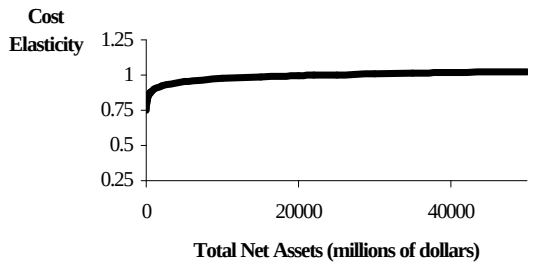
IV. Conclusions

The average mutual fund does experience cost economies of scale. When brokerage commissions are included in fund expenses, average costs are minimized at $22 billion in total net assets. Larger funds experience diseconomies of scale. Panels A-J in Figure 4 portray the measured scale economies at different fund sizes for total costs and the various specific cost items. All cost categories show economies of scale for both the median and mean-sized fund. Only distribution fees quickly experience diseconomies of scale as assets grow. The cost elasticity for auditing and legal fees becomes negative once assets have grown to a sufficient level. The negative cost elasticity implies that audit and legal expenses drop once the size of the fund rises past $33 billion in assets.

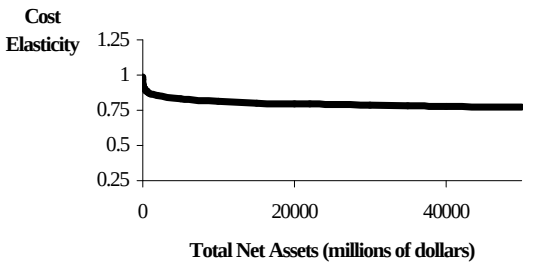
A limitation of this study is that the cost information it relies upon are the prices charged to shareholders by the mutual fund. The actual economies of scale generated by asset growth may be

[7] There is one exception among the 600 funds sampled. Dreyfus Founders funds report imputed commissions on principal transactions in the Statement of Additional Information.

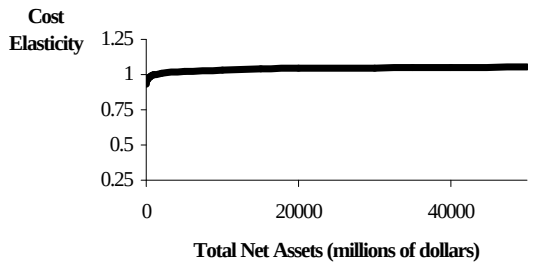
Panel A: Total Fund Expenses



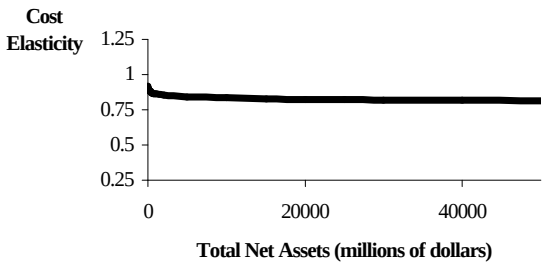
Panel B: Investment Advisory Fees



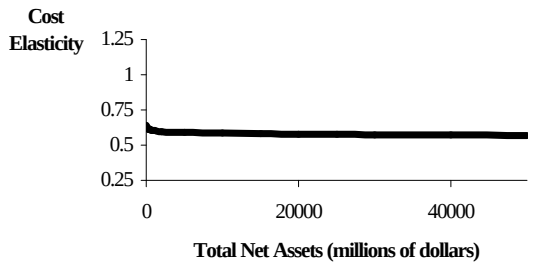
Panel C: Marketing/Distribution Payments



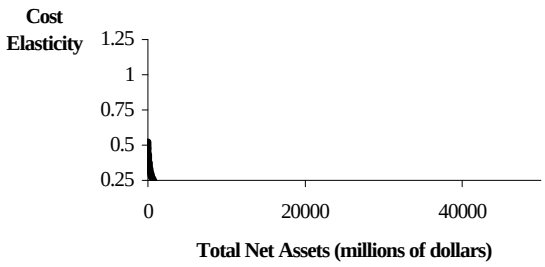
Panel D: Shareholder Servicing Agent



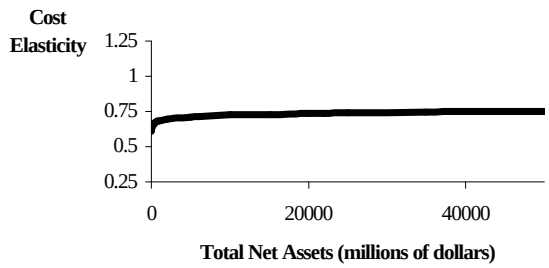
Panel E: Custodian Fees



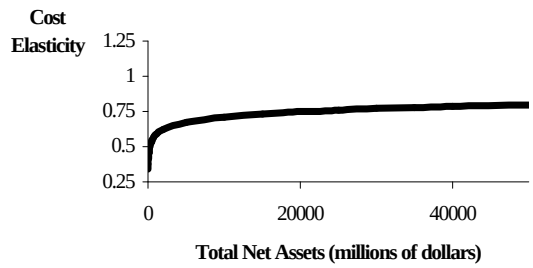
Panel F: Auditing and Legal Expenses



Panel G: Shareholder Communications



Panel H: Registration Fees



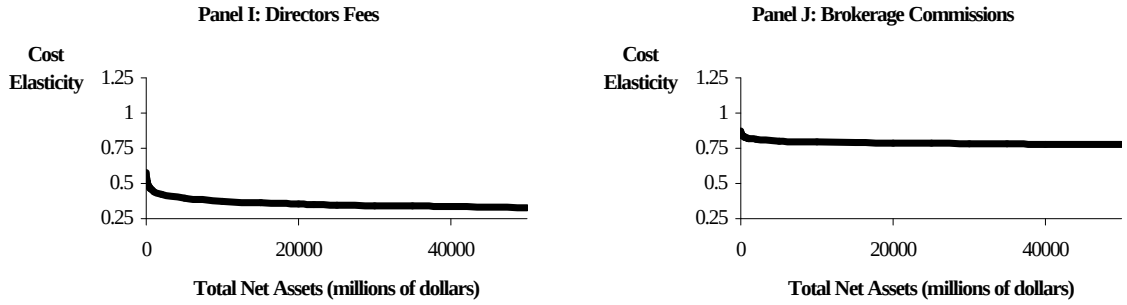


Figure 4. Cost elasticities for various cost categories and fund sizes.

understated if fund operators do not pass along all to shareholders all of the scale economies they experience. John Bogle (2001, p. 158) estimates that only 60 percent of the aggregate expenses paid by fund investors to fund managers is actually spent on operating the fund. The remaining 40 percent is the aggregate pre-tax profit earned by fund management companies.

In order to investigate this issue I examine the operating profit margins of publicly-traded mutual fund management companies. Segment revenue and operating income data was hand-collected from annual 10-K filings with the SEC for 23 mutual fund management companies for the period 1995-2001. Table XI provides some summary statistics. This is not a random sample of mutual fund operators. Most fund companies are not publicly traded. Table XII shows the results of fixed effects regressions of the logs of fund company revenues, operating income, and operating income margins on the log of company assets under management and the log of assets squared. An elasticity with respect to assets similar to the cost elasticity in equation (2) is calculated for each financial item using the coefficients from the panel regressions. The elasticities of fund company revenue and operating income with respect to assets are 0.68 and 0.79, respectively. A 10 percent increase in assets under management increases revenues by 6.8 percent and operating income by 7.9 percent. Since revenues increase faster than actual costs, some of the economies of scale are appropriated by the fund company as higher operating income margins.

Table XI

Fund Management Company Summary Statistics

The table reports time series averages of annual cross-sectional averages from 1995 to 2001. Average assets under management is reported in millions of dollars. Operating income margin is calculated by dividing operating income by revenues.

Time Series Averages of Annual Average Cross-Sectional Attributes, 1995-2001

Total Number	Average Number	Average Assets under Management	Average Operating Income Margin
23	21	$103,471.1	0.296

However, the evidence for this is weak. In comparing the revenue and operating income elasticities, I am unable to reject the null hypothesis that the operating income elasticity is not greater than the revenue elasticity. The *p*-value of the test statistic 0.07. Furthermore, while the elasticity of the operating income ratio to assets is significantly greater than zero, the underlying coefficients provided in the last column of Table XII are not significantly different from zero. Both have *p*-values equal to 0.11. So, while there are indications that some of the economies of scale are captured by fund companies in the form of higher profit margins, the weakness of the evidence leads to the conclusion that most, if not all, of the cost economies of scale resulting from fund asset growth accrue to fund investors in the form of lower expense ratios.

Table XII

Panel Estimates of Fund Management Company Profits

This table reports the coefficients from fixed effects regressions of a translog function for fund management company revenues, pre-tax operating income, and operating income ratio. *t*-statistics are in parentheses. Elasticities with respect to assets are averaged over all observations. The *p*-value of the test statistic that the operating income elasticity is greater than the revenue elasticity is 0.07, meaning there is little statistical difference between the two elasticities. Asset growth does not increase fund company profit margins.

Independent Variables	Revenues	Operating Income	Operating Income Margin
Log of fund assets	-6.819	-8.803	-1.984
	(7.76)	(5.36)	(1.61)
Log of fund assets squared	0.153	0.195	0.043
	(8.19)	(5.60)	(1.63)
Observations	144	144	144
Adjusted R^2	0.96	0.89	0.59
Standard error of regression	0.30	0.57	0.43
p-value of Lagrange multiplier test	0.012	0.000	0.004
Average elasticity with respect to assets	0.68	0.79	0.11
Standard deviation	0.54	0.69	0.15

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