Abstract
Are you rich enough for a family office? Focusing purely on the financial economics of a family office, we derive the minimum assets under management compatible with the family office’s investment management skills and costs versus the family benchmark alternative as well as its risk aversion. We find that rules of thumb like “the minimum size for a family office is 100 million” can be grossly misleading. Our analysis is equally applicable to deciding on the threshold size for in-house asset management.
1. Introduction
Wealthy families require means to facilitate intergenerational transfer of wealth. Financially repressive times and hostile public opinion necessitate professional management. Driven by a concentration of global wealth, family offices are among the fastest growing investment organisations. In theory, they are one of the last remaining unconstrained investors with long term, intergenerational horizons. While this makes them an interesting object for asset management-related research, little formal work has been done on how to define the minimum efficient size for a (single name) family office. In this paper, I try answering a simple question: "What is the minimum efficient size for managing a family office?"

2. The Family Office Decision: Make or Buy?
In the absence of applicable literature, I suggest the following model. To achieve operational efficiency, the costs of running a family office need to be spread over a large enough asset base (aum), creating at least the same risk-adjusted performance as an externally managed benchmark investment after fees. To fix our notation, we define the costs of running a family office as a linear combination of fixed costs (costs) and costs related to the size of asset under management (fee\textsubscript{family-office})

\[
\text{costs} + \text{fee}_{\text{family-office}} \cdot \text{aum}
\]

(1)

We can think of costs as the annual costs (salary of investment professionals, office space, risk management software, data, etc...) of running a family office that arise independently of the size of assets under management, while fee\textsubscript{family-office} could represent the asset-based fees for investment products used by the family office, as well as the number of researchers, portfolio managers etc. as assets grow. Running a family office or investing into a diversified wealth management product is equally attractive (provides the same risk adjusted return), if

\[
\frac{\mu_{\text{family-office}} - \text{fee}_{\text{family-office}}}{\sigma_{\text{family-office}}} \cdot \text{aum} = \frac{\mu_{\text{benchmark}} - \text{fee}_{\text{benchmark}}}{\sigma_{\text{benchmark}}}
\]

(2)

where (\mu_{\text{benchmark}}, \sigma_{\text{benchmark}}) and (\mu_{\text{family-office}}, \sigma_{\text{family-office}}) describe the risk–return opportunity set for a benchmark alternative as well as for the prospective family office. Solving Equation (2) for aum, we can derive the optimal (minimum) AUM as

\[
aum^* = \frac{\text{cost}}{\left(\frac{\mu_{\text{family-office}} - \text{fee}_{\text{family-office}}}{\sigma_{\text{family-office}}} - \frac{\mu_{\text{benchmark}} - \text{fee}_{\text{benchmark}}}{\sigma_{\text{benchmark}}}\right)}
\]

(3)

For this to make (technical) sense we demand that

\[
\left(\frac{\mu_{\text{family-office}} - \text{fee}_{\text{family-office}}}{\sigma_{\text{family-office}}} - \frac{\mu_{\text{benchmark}} - \text{fee}_{\text{benchmark}}}{\sigma_{\text{benchmark}}}\right) > 0
\]

(4)

If Equation (4) was violated, this would essentially mean that leveraging up benchmark investments (to the risk level run by the family office) would return more after fees than the family office investment (after fees and before costs). Insourcing asset management would become a poor alternative. In the case that expected returns and risks (before costs) are identical for both the family business and an external benchmark, the minimum efficient size becomes the result of a pure costing exercise, i.e.,
Technically we demand \( \text{fee}_{\text{benchmark}} > \text{fee}_{\text{family-office}} \). Economically this means that without an informational advantage, a family office must at least be able to replicate the same performance at lower fees. Hedge fund replication with cheaper long/short factor indices is such a realistic possibility. For instance: If a family office could achieve the same performance with products that cost 50 bps less than the benchmark product, the critical AUM would amount to at least 200 times the costs of running the family office.

So far, we have not elaborated on which level of risk the family office should run. We start with the idea that the family office’s benchmark choice implicitly defines its risk aversion. For this to hold true we either assume the family asset sponsor holds all his wealth in that family office, or maybe more realistically the sponsor applies goal-based investing, i.e., he applies different levels of risk aversion to different pockets of wealth, which are managed separately. In any case, holding 100% of an asset is only optimal, if

\[
\text{Utility} = (\text{SR}_{\text{benchmark}} + \Delta \text{SR}) \sigma_{\text{family-office}} - \text{fee}_{\text{family-office}} \frac{\sigma_{\text{family-office}}}{\sigma_{\text{benchmark}}} - \frac{\lambda}{2} \sigma_{\text{family-office}}^2
\]

This implicitly defines risk aversion as

\[
\lambda = \frac{\mu_{\text{benchmark}} - \text{fee}_{\text{benchmark}}}{\sigma_{\text{benchmark}}^2}
\]

For instance: For a 4% expected return after fees of 2% and a volatility of 4%, risk aversion becomes 25. What level of risk should the family office run its assets on for an investor with a risk aversion of 25? This will of course depend on the skills of the family office as measured by its prospective Sharpe ratio. We relate our family office Sharpe ratio \( \text{SR}_{\text{family-office}} \) to the benchmark investment \( \text{SR}_{\text{benchmark}} \) by defining

\[
\text{SR}_{\text{family-office}} = \text{SR}_{\text{benchmark}} + \Delta \text{SR},
\]

where \( \Delta \text{SR} \) denotes the difference in Sharpe ratio. This could be due to better information by the family office CIO or lower agency costs. Increased investment opportunities \( \text{SR}_{\text{family-office}} > \text{SR}_{\text{benchmark}} \) lead to higher risk taking. We define the family office utility function as

\[
\text{Utility} = (\text{SR}_{\text{benchmark}} + \Delta \text{SR}) \sigma_{\text{family-office}} - \text{fee}_{\text{family-office}} \frac{\sigma_{\text{family-office}}}{\sigma_{\text{benchmark}}} - \frac{\lambda}{2} \sigma_{\text{family-office}}^2
\]

Risk taking will increase returns before fees (first term), but it will also increase fees (second term). A 10% risk product should be exactly twice as expensive as a 5% risk product. If not, clients would always buy 50% of the 10% risk product (putting the remaining 50% into cash) to pay lower fees. Taking the first derivative of Equation (9) with respect to \( \sigma_{\text{family-office}} \) and solving for the optimal level of \( \sigma_{\text{family-office}} \) we arrive at

\[
\sigma_{\text{family-office}}^* = \frac{(\text{SR}_{\text{benchmark}} + \Delta \text{SR}) - \text{SR}_{\text{family-office}}}{\lambda}
\]
With this knowledge, we arrive at a modified expression for the minimum efficient size of a family office:

\[
\text{aum}^* = \frac{\text{cost}}{SR_{\text{family-office}} \sigma_{\text{family-office}}^* - \text{fee}_{\text{family-office}} \sigma_{\text{family-office}}^* - \left(\mu_{\text{benchmark}} - \text{fee}_{\text{benchmark}}\right) \frac{\sigma_{\text{family-office}}^*}{\sigma_{\text{benchmark}}}}
\]

(11)

where \(SR_{\text{family-office}} \sigma_{\text{family-office}}^* = \mu_{\text{family-office}}\) and \(\text{fee}_{\text{family-office}}\) fees adjusted for the level of risk. Equation (11) provides us with a closed-form solution for the minimum efficient size of a family office. From here we can find explicit expressions for various sensitivities (\(\frac{\text{aum}}{\text{daum}} > 0, \frac{\text{aum}}{\Delta \text{SR}} < 0, \ldots\)), which we leave the reader to work out because they do not offer much additional insight. We could of course also turn the question around by asking, What is the required Sharpe ratio for a family office of a given size to justify its cost structure? The following section will illustrate our framework in the context of a realistic example.

**Case Study**

We assume the alternative for investing the family wealth consists of a multi-strategy fund with 4.5% annual volatility offering a Sharpe ratio of 1.5 before fees of 180 bps per annum. Alternatively, the family office can access a portfolio of risk premia for 90 bps. The latter serves as default option for investments, i.e., no family office. From the family benchmark choice, we can derive its implied risk aversion (assuming no outside wealth) from Equation:

\[
\lambda = \frac{\mu_{\text{benchmark}} - \text{fee}_{\text{benchmark}}}{\sigma_{\text{benchmark}}^2} = \frac{4.5\% - 1.8\%}{4.5^2} = 24.24
\]

The benchmarks Sharpe ratio after fees is easily calculated as

\[
\frac{SR_{\text{benchmark}} \sigma_{\text{benchmark}}^* - \text{fee}_{\text{benchmark}}}{\sigma_{\text{benchmark}}} = \frac{1.5 \cdot 4.5\% - 1.8\%}{4.5\%} = 1.1
\]

We now apply Equation (11) to calculate the minimum size for a family office with costs of 2 million and a Sharpe ratio advantage of 0.1 before fees (i.e., a Sharpe ratio of 1.6). As an intermediate step, we calculate the new optimal level of risk taking (improved investment opportunities demand higher risk taking) as

\[
\sigma_{\text{family-office}}^* = \frac{(SR_{\text{benchmark}} + \Delta \text{SR}) - \frac{\text{fee}_{\text{family-office}}}{\sigma_{\text{benchmark}}}}{\lambda}
\]

\[
= \frac{(1.5 + 0.1) - 0.009}{24.44} = 5.73\%
\]

The expected return before costs now becomes 9.16% (1.6 time 5.73%). For these inputs, the minimum required amount for AUM becomes

\[
\text{aum}^* = \frac{2000000}{(1.6 \cdot 5.73\% - 0.009 \cdot 5.73\%)/4.5\% - (6.75\% - 0.018)/4.5\%} \cdot 5.73\% = 116402116
\]
Looking purely at the financial economics of a family office, we find that for a modest increase in the family officer’s abilities relative to the risk–return relationship already offered by an available product and for running costs of 2 million, we need at least 116 million in AUM given the family’s risk aversion. For costs of 10 million, we would then need five times as much AUM. Minimum levels of AUM for varying family office costs and investment skills are shown in Exhibit 1. Our results would of course change if we reduced the costs for running the family money externally from 180 bps to 100 bps. In this case the minimum AUM amounts to about 331 million.

Exhibit 1: Minimum Efficient AUM

Notes: We assume the alternative for investing the family wealth consists of a multi-strategy fund with 4.5% annual volatility offering a Sharpe ratio of 1.5 at fees of 180 bps per annum. Alternatively, the family office can access a portfolio of risk premia for 90 bps.

The described framework could easily be applied to real data investigating the efficiency of existing family offices only if these data were available. The size of AUM (family financial wealth), the cost structure of the family office, its asset allocation and return expectations, as well as external fees are data points that wealthy families typically protect. To the author’s knowledge these data are not available.

Parameters Outside The Model

So far, we did not explicitly look into non-financial return–related motives to set up a family office, e.g., service centralisation (family education, trust administration, organisation of philanthropic activities, tax advice). Each of these services carry a price tag and can be accessed within a family office or through outside contracting. We would simply subtract these costs (as a fraction of AUM) to the numerator on the left side in Equation (2) to achieve equal implied service levels.

\[
\frac{\mu_{\text{family-office}} - \text{fee}_{\text{family-office}} - \frac{\text{costs - services}}{\text{aum}}}{\sigma_{\text{family-office}}} = \frac{\mu_{\text{benchmark}} - \text{fee}_{\text{benchmark}}}{\sigma_{\text{benchmark}}}
\]

All other non-monetary benefits need to be sufficiently large to cover the inefficiency costs arising from suboptimal family office scale. Let \( aum_{\text{actual}} < aum^{\text{hk}} \).
We can then calculate the loss from running a family office of suboptimal size versus investing into a passive portfolio instead.

\[
\text{opportunity - loss} = \text{costs} \left( 1 - \frac{\text{aum}_{\text{actual}}}{\text{aum}^*} \right)
\]

For instance: Suppose \( \text{aum}^* \) equals 200 million with costs of 2 million. The family office runs at 100 million. The opportunity loss then amounts to 1 million per annum.

**Conclusion**

We build a parsimonious but novel framework for modelling the trade-off between the costs of setting up a family office (fixed and variable, i.e., size-dependent) and its financial benefits (cheaper market access and better management skills). Non-financial benefits of owning a family office are outside the scope of our model. However, the difference in risk-adjusted return between minimum family office size and actual family office size might be useful for placing a number on the non-financial benefits.
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