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## Dimensional Fund Advisors (DFA)'s Entry into the Retirement Market

In early 2011, David Booth wondered if it was finally the right time for his investment management firm, Dimensional Fund Advisors (DFA), to enter the retirement market. DFA realized that the explosive projected growth in the retirement market presented a huge opportunity, but Booth wondered if perhaps DFA was too late to the game. Industry stalwarts like Fidelity and Vanguard had established a foothold in this space, and presented a formidable competitive challenge to DFA's dreams of building a large business in managing retirement assets. Booth was emboldened by the potentially unique product that DFA sought to bring to the market, which he felt could compete head-to-head with products like Vanguard's "target-date retirement funds," but he did not discount the challenges that lay ahead.

### Background on DFA

Dimensional Fund Advisors was founded in 1981 by Booth and Rex Sinquefeld, two former University of Chicago Graduate School of Business students. While at Chicago, both Booth and Sinquefeld had been indoctrinated into the "efficient markets" philosophy, which stated that stocks' expected returns were explained by their exposures to risk, and that average investors could not consistently beat the market on a risk-adjusted basis. Indeed Booth later credited his very first investments course at Chicago, taught by Eugene Fama, with providing the philosophical foundation for DFA's investment philosophy. In 2008, Booth made a \$300 million donation to University of Chicago Graduate School of Business; in recognition of this gift, the school was then renamed the University of Chicago Booth School of Business.

While it believed in the principles of efficient markets, DFA also felt that it could add value through skillful trading and an emphasis on ideas backed by rigorous academic research. For example, several of DFA's core products applied the concepts of "size" and "value" developed in the academic research of Eugene Fama and Kenneth French, who showed that small stocks and value stocks outperformed over long periods of time.<sup>1</sup> DFA argued that these high returns were due to the higher risks on these types of stocks, and developed a series of products designed to provide

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<sup>1</sup> See Fama, Eugene, and Kenneth French, 1992, The cross section of expected stock returns, *Journal of Finance* 46, 427-466.

exposure to these added “dimensions” of risk. By 2011, DFA had expanded their product line far beyond the small-cap and value equity mutual funds that they had designed at the firm’s outset in order to capture the size and value phenomena in equity returns; DFA now offered a multitude of domestic and international equity and fixed income funds. At the end of 2010, DFA’s assets under management had swelled to over \$200 billion.

## The Retirement Market in 2011

While DFA’s recent growth was impressive, the principals at DFA realized that future growth in their index-like mutual fund products was increasingly threatened by low-cost index providers like Vanguard, and by the recent rise in the popularity of exchange-traded funds (ETFs). As a result, DFA had begun to explore other areas that might offer substantial future growth potential, that might fit with their emphasis on efficient implementation, and that might allow them to leverage their unique connections with academia. DFA concluded that the retirement market presented exactly this type of opportunity.

To give a feel for the size of the retirement market in the US, see **Exhibit 1**. It had grown over 4 fold in the past 20 years from 4 trillion to over 17 trillion dollars. Over the last two decades, a large shift had also taken place from defined benefit (DB) plans, where employees were guaranteed a fixed set of benefits upon retirement, to defined contribution (DC) plans, where employees allocated their contributions themselves in order to achieve a level of wealth upon retirement. DB plans had inherent structural problems largely because their accounting treatment systematically underpriced the cost of the benefits and understated the risk to the plan sponsor that guaranteed those benefits.<sup>2</sup> The stock market fall in 2000-2002, coupled with the fall in interest rates during that period, brought this problem to the forefront: DB plan assets fell substantially, and DB plan liabilities increased substantially, putting the plans under extreme financial pressure. Many firms were forced to close their plans, and many sponsors adopted DC plans to replace these DB plans. Other firms, no longer wanting to bear the risk or cost of operating their DB plans, joined in the shift toward DC plans. This can be seen in **Exhibit 1** in that DC total assets overtook DB total assets in the early 1990s, and by 2010, DC assets were roughly 100% larger than total DB assets.

In terms of this growing Defined Contribution (DC) market, assets grew from just under 1 trillion dollars in 1990 to roughly 4.5 trillion dollars in 2010 (**Exhibit 1**). The Individual Retirement Account (IRA) market also grew by roughly the same amount over these two decades. In fact, by 2010, the IRA and DC markets together made up over half of the entire US retirement market.

While the DC market had been growing quickly, there were two ways to see how important this market could potentially be for DFA. The first was in **Exhibit 2**. From **Exhibit 2**, mutual fund assets had been becoming a larger and larger portion of 401(k) plans.<sup>3</sup> Mutual funds had grown from only 9% of 401(k) assets in 1990 to 59% of 401(k) assets in 2010 (over a 6 fold increase).<sup>4</sup> Thus, an increased appetite by 401(k) investors for mutual funds might mean they were ready for DFA’s unique mutual fund product offerings.

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<sup>2</sup> DC Magazine, July 2011, pg. 4.

<sup>3</sup> 401(k) plans were a type of Defined Contribution plan, in fact the largest of the sub-categories of DC plans. The other sub-categories of DC plans were 403(b) plans, 457 plans, and Keogh plans. As all sub-categories moved together, we will give many results for 401(k) plans, which can be interpreted as identical for the 401(k) market more generally.

<sup>4</sup> Other large investments in 401(k) plans included company stock (see Cohen, Lauren, 2009, Loyalty Based Portfolio Choice, Review of Financial Studies, 22, 1213-1245) and insurance-linked products.

The retirement market, though, was not only a *potential* expansion option. Instead, it seemed more of an inevitable path DFA must take, as retirement assets were becoming a dominant part of the mutual fund space. To quantify this, **Exhibit 3** shows that in 2010, DC + IRA assets made up 40% of the 11.8 trillion dollars in the US mutual fund industry. **Exhibit 4** shows the evolution of this from 1990. The percentage of the mutual fund universe that was held by retirement accounts (DC+IRA) fully doubled over this two decade period. For “long-term” funds (basically mutual funds ex-money market funds),<sup>5</sup> this retirement share of the market in 2010 was even higher, at 48%. Thus, nearly half of all non-money market mutual fund assets were held in retirement accounts. The message from **Exhibit 4** was clear to Booth: the future growth of the mutual fund industry would be heavily routed through this retirement channel.

### *Attracting Retirement Assets to Mutual Funds*

DFA prided itself on its ability to deliver superior versions of risk exposure products, often through passing on cost-savings relative to competitors because of skilled execution. Thus, Booth was well-aware of the convex relationship between performance and flow that had been shown in the mutual fund industry.<sup>6</sup> Specifically, the evidence was that the best-performing funds garnered a disproportionate share of future investor flows into mutual funds. One way this had been shown in the literature was to run the following regression for all funds:

$$(1) \% Flow_t = \alpha + \beta * Return_{t-1} + \lambda * Return_{t-1}^2$$

Where  $\% Flow_t$  was the flow into a given fund in period(t) as a percentage of TNA.  $Return_{t-1}$  and  $Return_{t-1}^2$  were then the return (or risk-adjusted return) of the same fund in the prior period, and the return squared. While  $Return_{t-1}$  measured whether the relationship between flows and past returns was positive, the squared-term was meant to capture the convex relationship. A positive and significant  $\lambda$  would mean that the relationship between flow and past performance was convex.

While the convex relationship had held in the past, Booth wondered whether the dramatic shift in mutual fund assets and flows to the retirement market had changed this relationship. He decided to collect data on flows and performance, which he would use to test this thesis. An excerpt of this data is in **Exhibit 5**.<sup>7</sup> He wanted to be systematic, as getting DFA's strategy wrong could have dire growth consequences.

## Dimensional Managed DC

Amidst this backdrop, DFA had begun to explore how best to enter the retirement space. DFA felt that a well-designed, comprehensive retirement solution had yet to emerge in the marketplace, and they were eager to design such a solution. DFA's long ties to academia provided useful once again, as they soon engaged in a partnership with Robert Merton, a finance professor at MIT and a 1997

<sup>5</sup> Long-term funds are defined by the Investment Company Institute to include equity, hybrid, and bond funds.

<sup>6</sup> See Brown, Keith, W. V. Harlow, and Laura Starks, 1996, Of tournaments and temptations: An analysis of managerial incentives in the mutual fund industry, *Journal of Finance* 51, 85-110; Chevalier, Judy, and Glenn Ellison, 1997, Risk taking by mutual funds as a response to incentives, *Journal of Political Economy*, 105, 1167-1200; Goetzmann, William, and Nadav Peles, 1997, Cognitive dissonance and mutual fund investors, *Journal of Financial Research* 20, 145-158; Sirri, Erik, and Peter Tufano, 1998, Costly search and mutual fund flows, *Journal of Finance* 53, 1589-1622.

<sup>7</sup> The full data series are provided in the Spreadsheet Supplement to the case.

Nobel Laureate, regarding a retirement product that Merton and a team of financial engineers had recently developed.

DFA shared Merton's belief that the recent shift towards defined contribution (DC) plans currently offered by most employers placed a huge burden on their employees, most of whom had neither the time nor the expertise to effectively manage their retirement assets. Merton summed up the problem as follows:

"With more widespread adoption of DC plans, participants—from brain surgeons to assembly line workers—are being called on to make complex financial management decisions that they have not had to make in the past, they aren't equipped to make now, and, even with education, they will not be capable of making in the future. Their situation is like being a surgical patient who, while being wheeled into the operating room, has the surgeon lean down and say, "I can use anywhere from 7 to 17 sutures to close you up. Tell me what number you think is best." That is not only a frightening decision for a patient to be faced with, but it is one that most people are poorly qualified to make. All of this points to the need for a next-generation retirement solution."<sup>8</sup>

The retirement product that Merton had developed was called SmartNest, which was an individually tailored pension program that required a modest set of inputs from employees before they could simply "set it and forget it." DFA was intrigued by SmartNest, and hoped to incorporate and rebrand the program under DFA's umbrella as "Dimensional Managed DC." The plan incorporated many of the aspects of the current defined contribution (DC) system, but unlike most plans it focused on providing an inflation-protected annuity rather than an ending-date lump sum amount of total wealth. The goal was to make sure that plan participants would have a high likelihood of reaching the income they needed, even if they themselves did not actively participate in the financial decision-making process.

### *Dimensional Managed DC: The Big Idea*

The program offered a highly customized solution, which inputted items such as a participant's gender, marital status, age, and salary, and created a default setting for retirement age, contribution rate, desired target retirement income protected for inflation, and minimum risk income level. The model also incorporated each participant's expected Social Security payments, existing DB plan rights, existing DC plan balances, and expected future DC plan contributions. The algorithm used all of this information, plus simulations for equity prices, interest rates, and annuity prices, to create an optimized asset allocation strategy for each person. **Exhibit 6** displays these inputs graphically. The participant's investment allocation was then changed dynamically in response to changes in income, accumulations, contributions, and market conditions. While participants were not required to have any involvement in the process, individuals could intervene and further customize various settings (e.g., by changing retirement dates, contribution amounts, etc.) if they chose to do so.

At its core, the program was designed with a simple goal in mind: to provide participants with their desired level of income to live on during retirement, without forcing them to make decisions about portfolio optimization, rebalancing, etc., for which they were ill-equipped to make (i.e., though a "managed account"). As Merton said, "If they don't like what the feedback says – if the probability [of achieving their desired level of income] is too low – we offer ways to improve it. There are only three things they can do: save more, work longer, or take more risk. That's it."

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<sup>8</sup> DC Magazine, July 2011, pg. 5.

**Exhibit 7** illustrates how DFA viewed their product relative to their competitors. The big idea behind Dimensional Managed DC can clearly be seen from the starkly different distribution of retirement income outcomes that Dimensional offered versus a traditional 401(k). Dimensional saw as a critical component that they minimize the likelihood of a participant falling below a “retirement income minimum” that the participant would designate when starting the program. This can be seen in the much more desirable distribution of outcomes below the income minimum, and in fact all of the way up to the desired retirement income level (which the participants also designate). Of course Dimensional did not get this for free. Instead, Dimensional “paid” for this by giving up right-tail retirement outcomes that were possible in more traditional 401(k) plans. In sum, the basic calculus of Dimensional Managed DC was that they traded very good states of the world in order to both insure against bad states of the world, and help maximize the chances of an individual being near their desired retirement income level.

### *Dimensional Managed DC: User Interface*

**Exhibit 8** shows an example of the user interface for an employee enrolled in the Dimensional Managed DC product. On the left of the screen, the employee had 4 options that she could adjust: i.) desired retirement income target, ii.) essential retirement income target, iii.) pre-tax contributions, and iv.) retirement age. The employee could choose as many of these four as she would like to be her “goals” and then change the other attributes to affect the likelihood of reaching those goals. For instance, assume, as illustrated in **Exhibit 8**, that the employee had current income of \$5,000 per month and desired a retirement income of \$2,850 per month. By contributing \$300 per month until retiring at age 65, Dimensional Managed DC estimated the employee would reach that \$2,850 per month goal with an 82% likelihood (shown with the “speedometer” graphic on the right of the screen). Given the \$300 per month contribution, the employee also had a 96% chance of achieving her essential income target (lower-bound necessary income level). Underneath the speedometer graphic was also listed other essential plan attributed (e.g., Employer Contributions), and employee characteristics (e.g., Other income sources) that went into Dimensional Managed DC’s calculation.

### *Dimensional Managed DC: Who was the ideal client?*

Stepping back, DFA faced another issue of the participant base it would likely attract with Dimensional Managed DC. As participants would essentially forego right-tail outcomes by signing up, DFA was unlikely to attract participants that placed a large weight on these high relative retirement income outcomes. Also, through its managed account structure, DFA was also likely to attract participants that were otherwise financially unsophisticated (or perceived themselves as such). This implied that certain clientele would gravitate toward Dimensional Managed DC, while others would shy away from it. DFA needed to carefully consider if it was attracting its target clientele, and what, if anything, it could do to market the product to increase the chances of attracting its target clients. One potential way to do this was through a “lifetime value of customer” calculation for each customer.<sup>9</sup>

## **Competition in the Retirement Space**

Although DFA was excited about their proposed retirement solution, they were under no illusions about the difficulties they faced in trying to launch and gain market share in this increasingly

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<sup>9</sup> See the tool developed by Harvard Business School Publishing:  
<http://hbsp.harvard.edu/multimedia/flashtools/cltv/index.html>.

crowded space. DFA was, undoubtedly, a late entrant to the game. Vanguard and Fidelity, in particular, had already offered competing retirement solutions into the marketplace, and had already gained traction in accumulating retirement assets.

Vanguard, for example, had introduced a set of “lifestyle funds” known as “Vanguard LifeStrategy Funds” in the mid-1990s. These were funds that targeted a specific risk (and resultant growth) level, and attempted to structure its underlying investments in a transparent way while keeping to that level of risk. The idea was that investors might switch from a more- to less-risky LifeStrategy fund as they aged, but each individual could choose the right time to switch based on their own risk tolerance (taking into consideration current and future capital needs).

Fidelity was the top provider of funds known as “target-date retirement funds.” They termed their offerings “Fidelity Freedom Funds.”<sup>10</sup> These target-date funds were very simple and easy-to-use: participants merely had to input their target retirement date, and the plan would output an initial asset allocation profile, and then adjust this allocation dynamically solely based on this target retirement date. DFA felt that such funds were flawed because they had no income or wealth goal, and their focus was solely on the volatility of the portfolio as opposed to the client’s desired retirement income. The idea that two people retiring on the same date might require very different investment strategies, because they might have very different ultimate income objectives, seemed quite important to DFA, and in their opinion made Vanguard’s and Fidelity’s approaches unattractive.

Of course a more crude alternative to both of these options were diversified stock and bond index funds. These had made their way into nearly all DC plans, and were low cost exposure options that DFA needed to contend with.

**Exhibits 9-11** provide evidence on the size of these three competitor investment options that were already in 401(k) plans. Together the three were a 1.6 trillion dollar market in 2010, of which 36% was held in DC retirement plans. Examining them separately, **Exhibit 9** shows that the most DC-plan centric of these products were the Target Date Funds. 72% of Target Date Fund Assets were held in DC plans. **Exhibit 10** and **Exhibit 11** show that 27% of both Lifestyle Fund assets and Index Fund assets were held in DC plans. Interestingly, while Index Fund assets were only 27% held in DC plans (vs. 72% for Target Date Funds), asset-wise Index Funds still made up the largest of the three categories in DC plans (270 billion vs. 246 billion for Target Date and 71 billion for Lifestyle).

As these products were all seen as diversified, reasonable stand-alone choices for retirement savings, DFA faced the challenge of convincing participants (and plan administrators) of SmartNest’s value-add. Additionally, Target Date funds not only had a growing toe-hold in the DC space, but following the Pension Protection Act of 2006, Target Date funds were fast being adopted as default options (which were incredibly salient given the lack of active decision making seen in the DC space). Lastly, the fact that these lower cost options were being so widely utilized caused DC mutual funds to on average have much lower fees than the average stock fund in the mutual fund industry (see **Exhibit 12**).

DFA partially combatted these trends by having gotten clearance for SmartNest as a Qualified Default Investment Alternative (QDIA) for 401(k) plans. However, it still faced the issue of cost difference between it and other alternatives. SmartNest was likely to cost (depending on plan size) roughly 75 basis points per year, while TDFs were in the range of 15 – 25 basis points.

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<sup>10</sup> Vanguard was a late entrant into the target-date retirement fund market, and its offerings were termed “Vanguard Target Retirement Funds.”

## Implementation Challenges

In addition to the growing list of competitors in the retirement market, DFA also needed to address a series of potentially thorny implementation issues that plagued most retirement solutions:

### *Employee Participation*

A key problem in the retirement space was quite basic: how to get employees to sign up for the product. The evidence on investor education in the 401(k) arena was not at all heartening. First and foremost, the level of participant inertia in most retirement plans was striking. For example, Madrian and Shea (2000) find that changing the “default” of a company from not being enrolled in the company’s 401(k) plan to automatically being enrolled (so the active decision is “opting out”) increased enrollment from 37.4% to 85.9% (nearly 50 percentage points!). Additionally, the median number of trades-per-year in a 401(k) plan was **zero** (no observed active decision making). Indeed, Choi et al. (2011) went so far as to show that many plan participants were unwilling to take essentially “free money” from their retirement plans. At age 59.5 and above, participants can withdraw money penalty-free from their 401(k) plans. Further, most 401(k) plans offer matches to employee contributions (i.e., if the employee saves \$1,000 the company will match this with an additional \$1,000 in the employee’s account). Thus, employees over the age of 59.5 can simply allocate \$1,000 to the 401(k) plan, then withdraw penalty-free \$2,000 (their \$1,000 + employer match \$1,000). However, a large fraction of employees fail to take advantage of this. This evidence all suggested that individuals were unlikely to be active consumers of the optimal retirement solution.<sup>11</sup>

The principals at Dimensional Managed DC claimed that their solution was designed specifically taking into account these well-known behavioral patterns. In fact, Merton argued that “a major design feature and selling point was that it was designed to work effectively if the participant never engaged throughout the *entire* accumulation period.” Dimensional’s product could set the desired income goal, the minimum income goal, the saving rate and the retirement date without any contact with the participant; all the information about the person used to optimize the dynamic strategy in a customized fashion (such as changes in salary, retirement age, DB accumulation, marital status, gender, etc.) was obtained from the plan sponsor either directly or from the record keeper for the plan. According to Merton, “nothing in the strategy depends on the participant providing any information or doing anything. I designed it this way even before the Pension Protection Act of 2006 because of this strong behavioral characteristic. With the Act [PPA of 2006] and the creation of a need for a Default, Dimensional Managed DC is an ideal default choice precisely because it was designed to work well with no active participation.”

### *Employer Resistance and Size of Plan to Target*

Potentially more problematic for Dimensional Managed DC was the issue of employer resistance. Would small companies be willing to implement DFA’s proposed solution, even if it required them to collect, organize, and input a non-trivial amount of data on each employee (e.g., marital status, age, etc.)? The potential burden (in terms of cost and time) on employers of having to deal with this added administrative hassle was not to be dismissed. **Exhibit 13** shows that the average employee account was \$48,522. However, this masked large variation across plan size. Average account balances showed a strong correlation with plan size: larger plans had significantly larger average

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<sup>11</sup> Madrian, Brigitte, and Dennis Shea, 2001, The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior, *Quarterly Journal of Economics*, 116, 1149-1187; Choi, James, David Laibson, and Brigitte Madrian, 2011, “\$100 Bills on the Sidewalk: Violations of No-Arbitrage in 401(k) Accounts,” *Review of Economics and Statistics*, forthcoming.

employee account sizes. For instance, employees in the smallest plans had account balances that were less than one-third the average size of those in the largest plans (\$24,410 vs. \$75,432). With such small account balances, would it make financial sense for DFA to implement SmartNest in the smallest plans? To shed further light into this, **Exhibit 14** then shows that these small plans had expenses over 4 times as large per participant than the largest plans (1.89% vs. 0.41%). Thus, these same small plans and their participants may be the most in need of a streamlined, low cost alternative such as SmartNest.

Meanwhile, larger companies often had mutual fund trustees (e.g., Fidelity or Vanguard) in charge of their plans and who helped select the fund menu. These fund trustees tended to massively tilt the 401(k) plan menus they oversaw to their own mutual funds (Cohen and Schmidt (2009)).<sup>12</sup> For instance, in 1997 T. Rowe Price was the trustee of CB Richard Ellis Services Inc.'s 401(k) plan. This plan offered 15 investment options: one was CB Richard Ellis company stock. The remaining 14 were T. Rowe Price mutual funds. Added to this was the fact that turnover in trustees happened very rarely (estimated at only once every 30 years on average). Was it reasonable to think that trustees would embrace Dimensional's new offering?

### *Practical Issues*

As was the case with virtually all retirement solutions, there were practical challenges as well. In the event that equity prices moved dramatically, there would likely be a large impact on the asset allocation and proposed savings decisions of participants. For example, if prices rose 30%, should the model encourage a substantial drop in savings? If prices then subsequently fell 20%, should it require participants to start saving exorbitant amounts? And given the overwhelming evidence on investor inertia in 401k plans, it was unlikely that investors would respond to large swings in asset prices with this type of dynamic savings behavior. But if the plan did not offer this type of dynamic flexibility, what advantage did it offer over simple, more traditional retirement solutions?

## **DFA's Distribution Channels**

A critical aspect of DFA's success over the years was its ability to tap into a powerful distribution network of registered investment advisors (RIAs). RIAs were intermediaries who advised high-net-worth individuals; they received no direct fees from DFA, but since DFA's products were relatively low-cost, RIAs were able to charge a modest advising fee to their clients while still keeping total fees low. Since high-net-worth individuals, or any individuals for that matter, could not access DFA products on their own, RIAs became the only channel through which retail investors could invest in DFA. This was intentional on the part of DFA, as the firm wanted to avoid building up a retail client base that might trade frequently, since some of DFA's holdings were illiquid in nature. DFA spent a considerable amount of time educating these RIAs about their philosophy, products, and research findings, which then enabled these RIAs to advise their clients accordingly.

By 2010, RIAs had become a very important distribution channel for DFA. With more of their assets under management coming from RIAs than from institutional investors, RIAs had become increasingly important to DFA over time. At the same time, DFA noticed that 75-80% of its advisors had not opted to work in the retirement space, even though they had opportunities to do so. The common reasons cited were that these advisors were unfamiliar with the service providers and the

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<sup>12</sup> Cohen, Lauren and Breno Schmidt, 2009, Attracting Flows by Attracting Big Clients, *Journal of Finance*, 64, 2125-2152.



fiduciary requirements that came along with ERISA (1974) plans, and that the fee structure was unfamiliar. Crucial to any messaging that DFA might do with its RIAs around this new opportunity was conveying the notion that DFA's proposed retirement plan would seek to complement, rather than compete with, the services that its advisors might already offer to their clients.

## Decision

As Booth sat back to reflect on the opportunity that lay ahead, he understood that the challenges his firm faced were real. Although the size of their target market was large, and projected to grow even further in the near future, there were powerful incumbents in the retirement space already. Booth knew that DFA's proposed retirement solution would have to be sufficiently differentiated in order to gain sufficient market share. Not to mention the fact that DFA would have to overcome a series of practical challenges in order to make their solution viable, and would have to confront the very real dilemma of exploiting their unique RIA distribution network without simultaneously cannibalizing these advisors' own services. But with every passing month, DFA fell further and further behind their competitors, and hence Booth knew that the time to make a decision as to whether to finally enter the retirement market was now.

**Exhibit 1** This table shows the evolution of the US retirement market's assets from 1990-2010

### U.S. Total Retirement Market Assets

*Billions of dollars, end-of-period, 1990–2010*

	IRAs	DC plans <sup>a</sup>	Private DB plans	State and local government pension plans	Federal pension plans <sup>b</sup>	Annuities <sup>c</sup>	Total
1990	636	892	922	742	340	391	3,923
1991	776	1,060	1,073	868	382	423	4,582
1992	872	1,161	1,098	957	426	473	4,988
1993	993	1,319	1,212	1,066	468	522	5,581
1994	1,056	1,406	1,303	1,117	512	526	5,920
1995	1,288	1,717	1,496	1,354	541	582	6,978
1996	1,467	1,961	1,623	1,538	606	626	7,820
1997	1,728	2,343	1,798	1,825	659	658	9,012
1998	2,150	2,640	1,948	2,063	716	818	10,335
1999	2,651	2,997	2,067	2,360	774	928	11,778
2000	2,629	2,869	2,020	2,340	797	951	11,606
2001	2,619	2,701	1,868	2,250	860	1,041	11,339
2002	2,533	2,475	1,656	1,974	894	1,001	10,532
2003	2,993 <sup>e</sup>	2,984	1,977	2,396	958	1,125	12,434
2004	3,299	3,306	2,126	2,621	1,023	1,332	13,708
2005	3,652 <sup>e</sup>	3,576	2,262	2,763	1,072	1,443	14,768
2006	4,207 <sup>p</sup>	4,084	2,493	3,157	1,141	1,521	16,603
2007	4,784 <sup>p</sup>	4,354	2,646	3,298	1,197	1,600	17,880
2008	3,585 <sup>e</sup>	3,379	1,979	2,415	1,221	1,376	13,954
2009	4,251 <sup>e</sup>	4,041	2,245	2,760	1,324	1,471	16,092
2010	4,710 <sup>e</sup>	4,486	2,410	3,024	1,425	1,593	17,649

Source: Investment Company Institute, Statistics: "The U.S. Retirement Market, Second Quarter 2011."

<sup>a</sup> This category includes 403(b) plans, 457 plans, and private employer-sponsored DC plans (including 401(k) plans).

<sup>b</sup> Federal pension plans include U.S. Treasury security holdings of the civil service retirement and disability fund, the military retirement fund, the judicial retirement funds, the Railroad Retirement Board, and the foreign service retirement and disability fund. These plans also include securities held in the National Railroad Retirement Investment Trust and Federal Employees Retirement System (FERS) Thrift Savings Plan (TSP).

<sup>c</sup> Annuities include all fixed and variable annuity reserves at life insurance companies less annuities held by IRAs, 403(b) plans, 457 plans, and private pension funds.

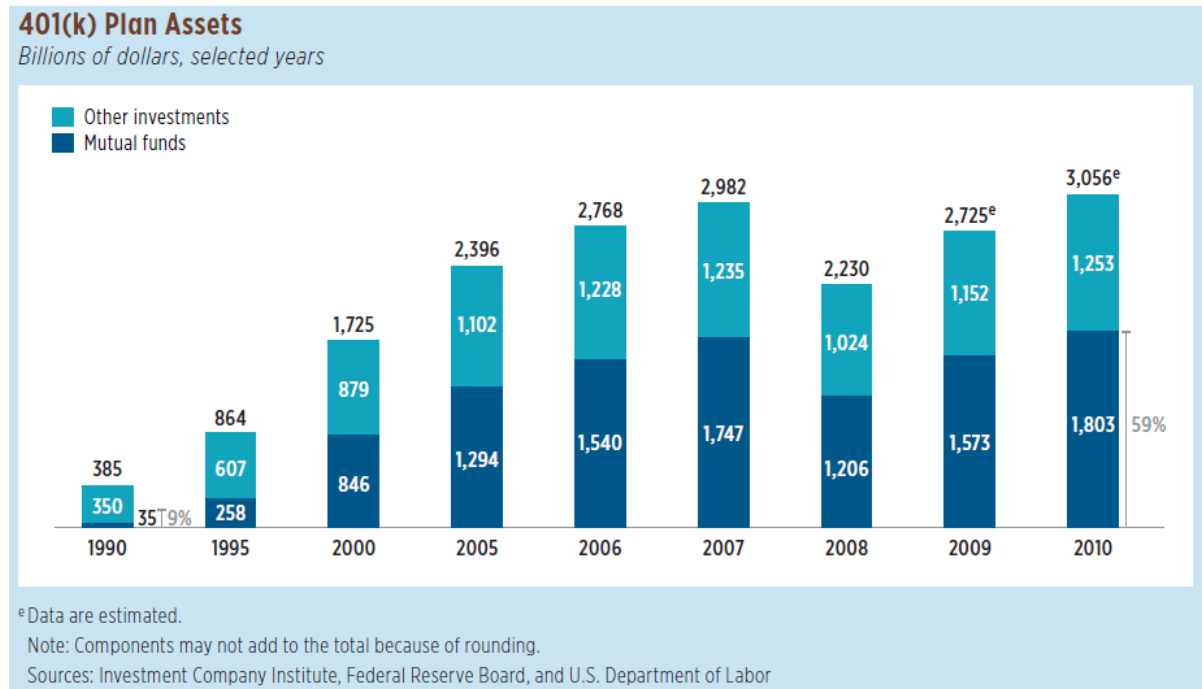
<sup>e</sup> Data are estimated.

<sup>p</sup> Data are preliminary.

Note: Components may not add to the total because of rounding.

Sources: Investment Company Institute, Federal Reserve Board, National Association of Government Defined Contribution Administrators, American Council of Life Insurers, and Internal Revenue Service Statistics of Income Division

**Exhibit 2** This figure shows the evolution of the composition of 401(k) assets, namely mutual funds vs. other assets, from 1990-2010



Source: Investment Company Institute, "The Economics of Providing 401(k) Plans: Services, Fees, and Expenses, 2010", ICI Research Perspective, June 2011, 17-4.

**Exhibit 3** This table shows a breakdown of the US mutual fund market, including the mutual fund assets in retirement plans, as of the end of 2010

<b>2010 Facts at a Glance</b>	
<b>Total worldwide assets invested in mutual funds</b>	<b>\$24.7 trillion</b>
<b>U.S. investment company total net assets</b>	<b>\$13.1 trillion</b>
Mutual funds	\$11.8 trillion
Exchange-traded funds	\$992 billion
Closed-end funds	\$241 billion
Unit investment trusts	\$51 billion
<b>U.S. investment companies' share of:</b>	
U.S. stocks	27%
U.S. municipal securities	33%
Commercial paper	45%
U.S. government securities	11%
<b>U.S. household ownership of mutual funds</b>	
Number of households owning mutual funds	51.6 million
Number of individuals owning mutual funds	90.2 million
Percentage of households owning mutual funds	44%
Median amount fund-owning households invested in mutual funds	\$100,000
Median number of mutual funds owned	4
<b>U.S. retirement market</b>	
Total retirement market assets	\$17.5 trillion
Percentage of households with tax-advantaged retirement savings	70%
IRA and DC plan assets invested in mutual funds	\$4.7 trillion

Source: Investment Company Institute, "The 2011 Investment Company Fact Book," 51st Edition.

**Exhibit 4** This table shows the evolution of retirement accounts as a percentage of the different categories of mutual fund assets from 1990-2010

**Mutual Fund Retirement Account Assets as a Share of Mutual Fund Assets**

*Billions of dollars, end-of-period, 1990–2010*

	All mutual funds			Long-term funds <sup>a</sup>			Money market funds		
	Retirement accounts <sup>b</sup>	Total	Share <sup>c</sup>	Retirement accounts <sup>b</sup>	Total	Share <sup>c</sup>	Retirement accounts <sup>b</sup>	Total	Share <sup>c</sup>
	\$	\$	%	\$	\$	%	\$	\$	%
1990	\$208	\$1,065	20%	\$146	\$567	26%	\$62	\$498	12%
1991	325	1,393	23	262	851	31	\$62	542	12
1992	423	1,643	26	357	1,096	33	66	546	12
1993	588	2,070	28	509	1,505	34	79	565	14
1994	672	2,155	31	572	1,544	37	100	611	16
1995	925	2,811	33	804	2,058	39	121	753	16
1996	1,199	3,526	34	1,044	2,624	40	155	902	17
1997	1,574	4,468	35	1,421	3,409	42	153	1,059	14
1998	1,990	5,525	36	1,797	4,174	43	193	1,352	14
1999	2,590	6,846	38	2,363	5,233	45	227	1,613	14
2000	2,558	6,965	37	2,323	5,119	45	236	1,845	13
2001	2,430	6,975	35	2,151	4,690	46	279	2,285	12
2002	2,169	6,383	34	1,866	4,118	45	303	2,265	13
2003	2,767	7,402	37	2,492	5,362	46	275	2,040	13
2004	3,191	8,095	39	2,945	6,194	48	246	1,901	13
2005	3,575	8,891	40	3,319	6,864	48	255	2,027	13
2006	4,228	10,398	41	3,929	8,059	49	300	2,338	13
2007	4,770	12,002	40	4,397	8,917	49	373	3,086	12
2008	3,290	9,604	34	2,821	5,771	49	469	3,832	12
2009	4,141	11,120	37	3,740	7,804	48	401	3,316	12
2010	4,686	11,821	40	4,334	9,017	48	353	2,804	13

Source: Investment Company Institute, Statistics: "The U.S. Retirement Market, Second Quarter 2011."

<sup>a</sup> Long-term funds include equity, hybrid, and bond funds.

<sup>b</sup> Retirement accounts include employer-sponsored DC plans and IRAs.

<sup>c</sup> Share is the percentage of total of that category of mutual fund assets.

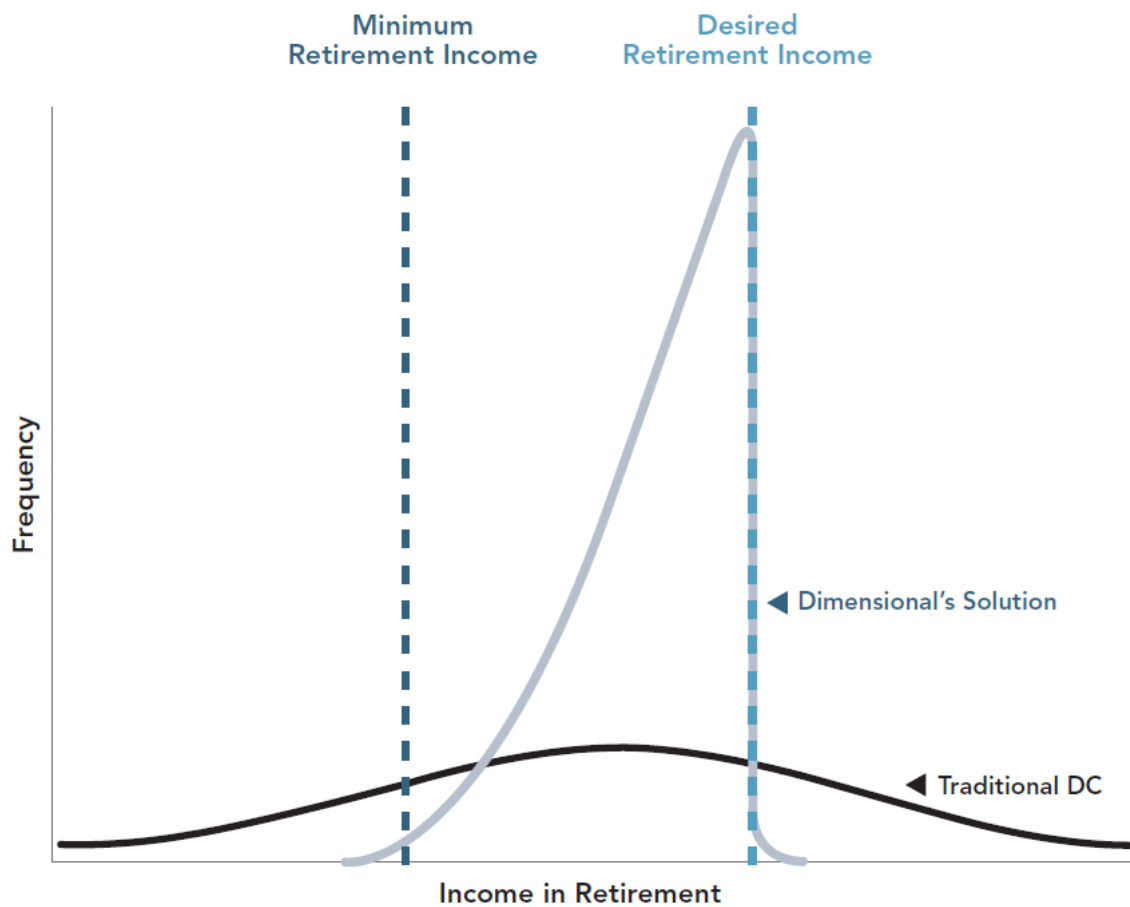
Note: Components may not add to the total because of rounding.

**Exhibit 5** Quarterly flow and return data for active equity mutual funds from January 1980- September 2009. The data are reported quarterly as of the 3<sup>rd</sup>, 6<sup>th</sup>, 9<sup>th</sup>, and 12<sup>th</sup> month of each year. Each quarter, all active equity funds above 10 million dollars of total net assets (TNA) were sorted into deciles based on previous year market-adjusted return. These deciles are shown in: Previous Return Decile. Previous Return shows the average market-adjusted return of funds in the given decile. Current Quarter % Flow shows the average flow into the given return decile's funds in the *current* quarter, as a percentage of total net assets. An excerpt of the data is shown here with the full data series in the Spreadsheet Supplement of the case.

Year	Month	Previous Return Decile	Previous Return	Current Quarter % Flow
1980	3	1	-6.92%	-2.23%
1980	3	2	-3.01%	-3.44%
1980	3	3	-0.73%	-4.39%
1980	3	4	1.64%	-4.81%
1980	3	5	4.06%	0.05%
1980	3	6	6.53%	0.12%
1980	3	7	9.60%	-3.62%
1980	3	8	13.62%	-2.22%
1980	3	9	20.90%	-2.47%
1980	3	10	30.87%	3.94%
1980	6	1	-5.99%	-4.14%
1980	6	2	-3.19%	-2.74%
1980	6	3	-1.42%	-3.83%
1980	6	4	0.18%	0.01%
1980	6	5	1.65%	-1.15%
1980	6	6	3.95%	-1.05%
1980	6	7	7.61%	3.70%
1980	6	8	11.08%	0.22%
1980	6	9	14.73%	5.61%
1980	6	10	22.99%	17.37%
...	...	...	...	...
2009	9	1	-18.37%	-3.67%
2009	9	2	-7.99%	-4.22%
2009	9	3	-3.64%	-2.65%
2009	9	4	-1.26%	-2.49%
2009	9	5	0.84%	-3.34%
2009	9	6	2.67%	-0.19%
2009	9	7	4.82%	1.81%
2009	9	8	7.83%	0.67%
2009	9	9	11.58%	1.85%
2009	9	10	22.49%	11.04%

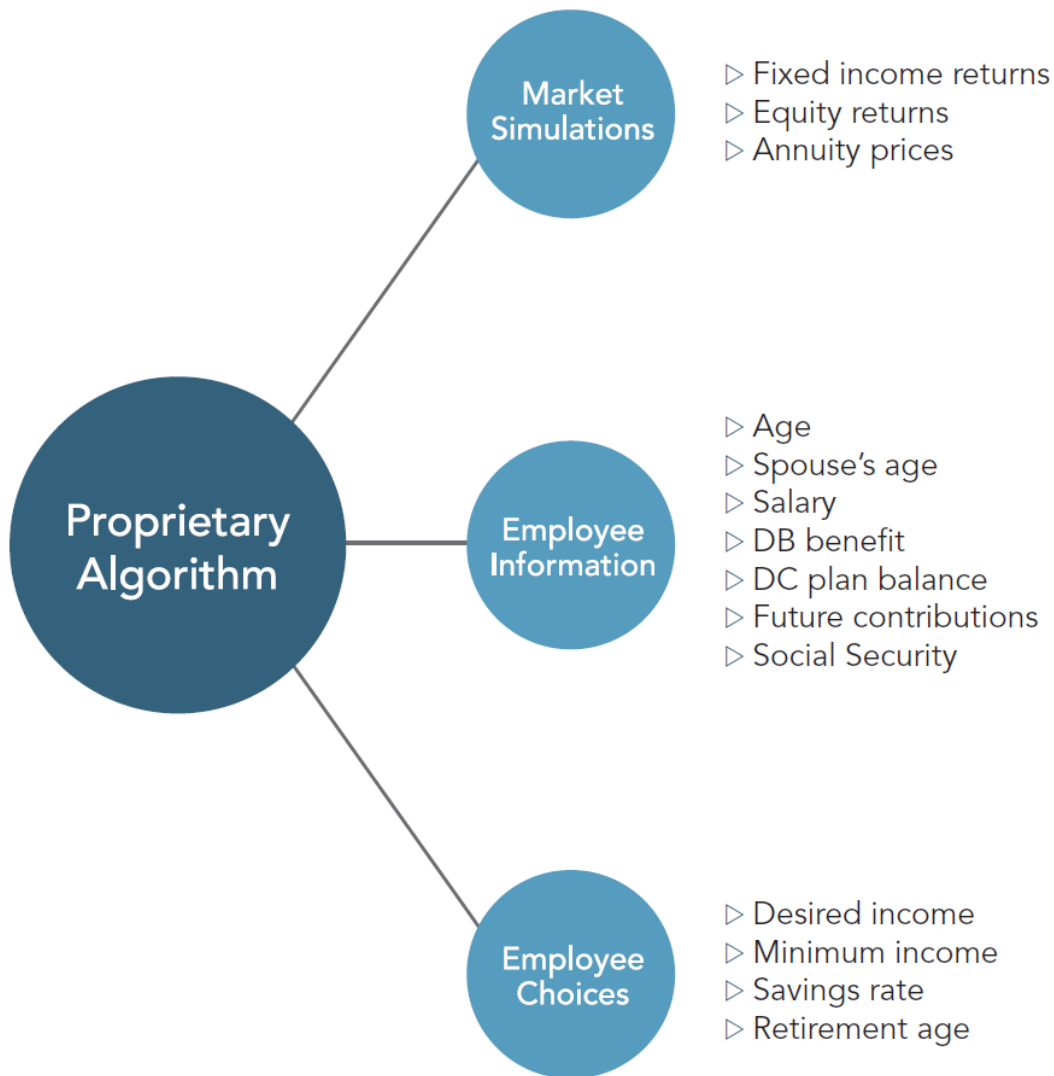
Source: Center for Research in Security Prices Mutual Fund Database.

**Exhibit 6** This table shows DFA's estimates of the level of income in retirement plotted against the frequency of obtaining each level



Source: Company documents.

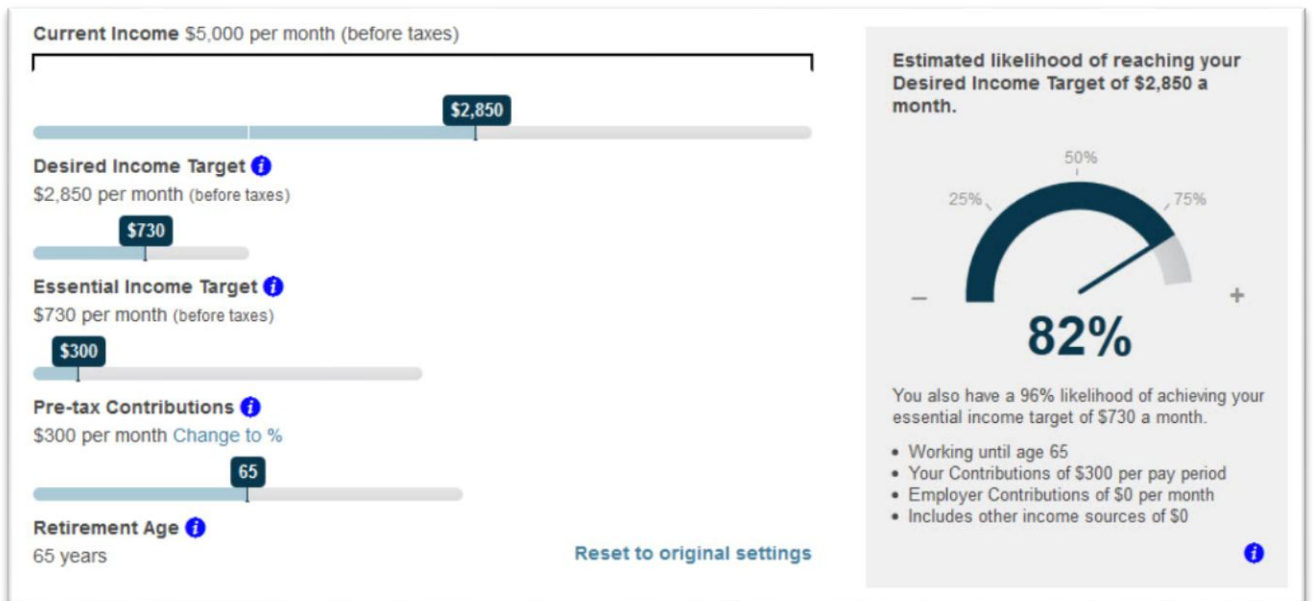
**Exhibit 7** This graphic shows the various inputs required for Dimensional Managed DC



Source: Company documents.



**Exhibit 8** This graphic shows an example of Dimensional Managed DC's user interface



Source: Company documents.

**Exhibit 9** This table shows the evolution of target-date mutual fund assets from 1996-2010

### Target Date Mutual Fund Assets

*Billions of dollars, end-of-period, 1996–2010*

	Target date mutual fund assets <sup>a</sup>						
	IRAs		Employer-sponsored DC plans		Other investors		Total
	Assets \$	Share <sup>b</sup> %	Assets \$	Share <sup>b</sup> %	Assets \$	Share <sup>b</sup> %	Assets \$
1996	(*)	33%	(*)	2%	\$1	65%	\$1
1997	(*)	33	(*)	14	1	53	1
1998	\$1	20	\$3	57	1	23	5
1999	1	15	5	66	1	19	7
2000	1	15	6	68	1	16	9
2001	2	16	9	74	1	10	12
2002	2	15	11	75	2	10	15
2003	5	20	19	73	2	8	26
2004	9	21	31	71	3	8	44
2005	15	21	51	72	5	7	71
2006	25	22	83	72	7	6	115
2007	38	21	131	72	13	7	183
2008	31	20	120	75	9	6	160
2009	48	19	190	74	18	7	256
2010	65	19	246	72	29	9	340

Source: Ibid.

<sup>a</sup> A target date (also known as lifecycle) mutual fund typically rebalances its portfolio to become less focused on growth and more focused on income as it approaches and passes the target date of the fund, which is usually included in the fund's name.

<sup>b</sup> Share is the percentage of total assets.

(\*) = less than \$500 million

Note: Components may not add to the total because of rounding.

**Exhibit 10** This table shows the evolution of lifestyle mutual fund assets from 1996-2010

**Lifestyle Mutual Fund Assets**

*Billions of dollars, end-of-period, 1996–2010*

	Lifestyle mutual fund assets <sup>a</sup>						
	IRAs		Employer-sponsored DC plans		Other investors		Total
	Assets	Share <sup>b</sup>	Assets	Share <sup>b</sup>	Assets	Share <sup>b</sup>	Assets
	\$	%	\$	%	\$	%	\$
1996	\$1	25%	\$2	39%	\$2	36%	\$6
1997	3	23	5	38	5	39	13
1998	4	21	8	37	9	42	21
1999	6	21	10	38	12	42	28
2000	6	20	12	40	12	40	31
2001	7	21	15	44	11	34	33
2002	7	20	14	42	13	38	35
2003	10	18	20	36	26	47	56
2004	15	17	25	29	46	54	85
2005	20	16	47	36	63	48	131
2006	32	17	61	32	96	51	189
2007	42	18	72	30	124	52	238
2008	30	17	49	28	97	55	176
2009	39	17	63	27	130	56	231
2010	45	17	71	27	148	56	264

Source: Ibid.

<sup>a</sup>A lifestyle mutual fund maintains a predetermined risk level and generally contains "conservative," "aggressive," or "moderate" in the fund's name.

<sup>b</sup> Share is the percentage of total assets.

Note: Components may not add to the total because of rounding.

**Exhibit 11** This table shows the evolution of index mutual fund assets from 1996-2010

**Index Mutual Fund Assets**

*Billions of dollars, end-of-period, 1996–2010*

	IRAs		Employer-sponsored DC plans		Other investors		Total
	Assets	Share <sup>2</sup>	Assets	Share <sup>2</sup>	Assets	Share <sup>2</sup>	Assets
	\$	%	\$	%	\$	%	\$
1996	\$11	11%	\$33	34%	\$53	55%	\$98
1997	21	12	55	33	94	55	170
1998	36	13	81	30	149	56	265
1999	65	17	118	31	204	53	387
2000	64	17	118	31	201	52	384
2001	61	16	115	31	195	53	371
2002	54	17	101	31	173	53	327
2003	79	17	136	30	240	53	455
2004	98	18	165	30	292	53	554
2005	107	17	186	30	326	53	619
2006	130	17	219	29	398	53	747
2007	146	17	243	28	465	54	855
2008	100	17	170	28	331	55	602
2009	130	16	224	27	481	58	835
2010	155	15	270	27	591	58	1,017

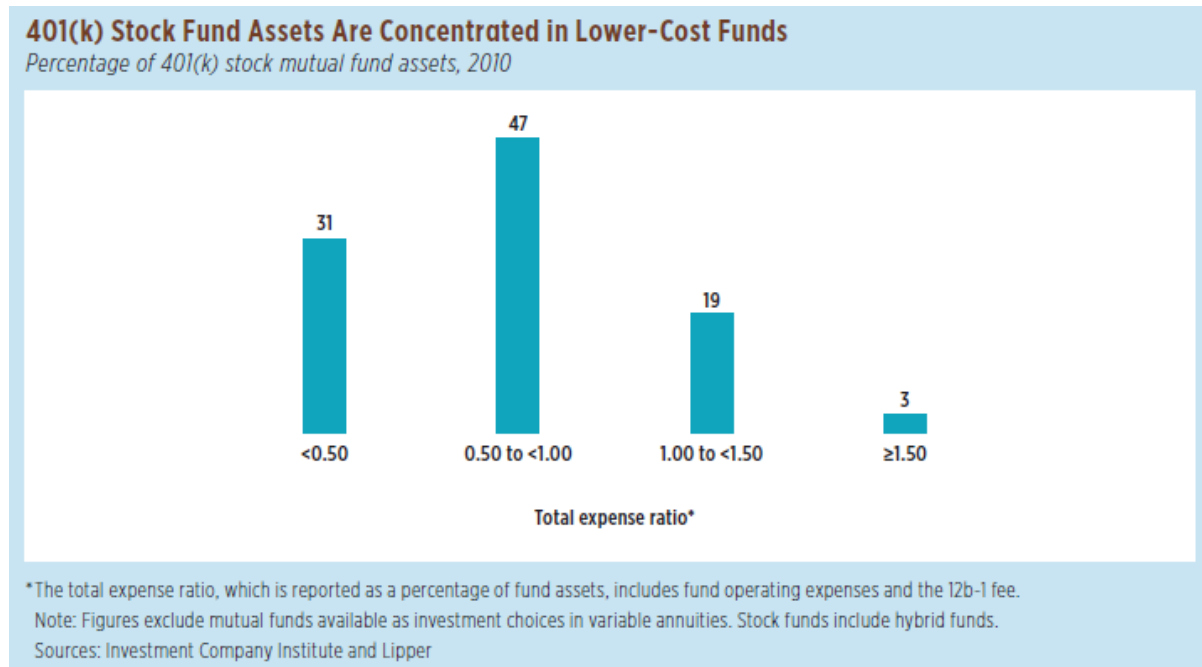
Source: Ibid.

<sup>1</sup> Index mutual funds are equity, bond, and hybrid funds that target specific market indexes with the general objective of meeting the performance of that index. Equity index funds are the most common type of index fund, accounting for 81% percent of the \$1,105 billion of index fund assets at the end of the second quarter of 2011.

<sup>2</sup>Share is the percentage of total index mutual fund assets.

Note: Components may not add to the total because of rounding.

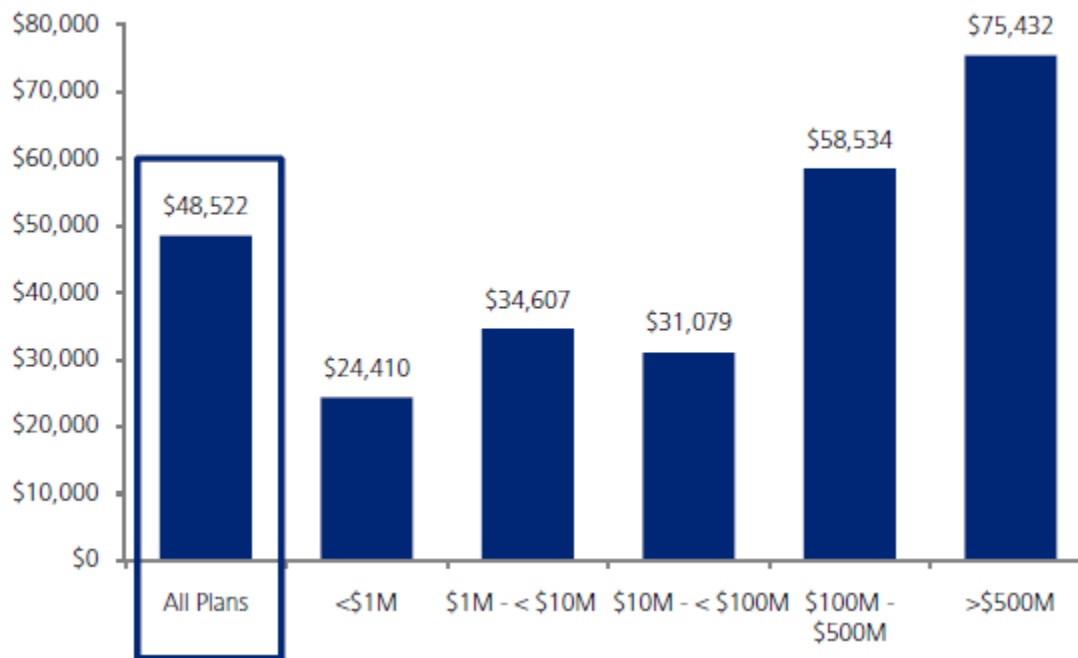
**Exhibit 12** This figure shows the percentage of stock mutual fund assets in 401(k) plans in each of a number of fees categories as of the end of 2010



Source: Investment Company Institute, "The Economics of Providing 401(k) Plans: Services, Fees, and Expenses, 2010", ICI Research Perspective, June 2011, 17-4.

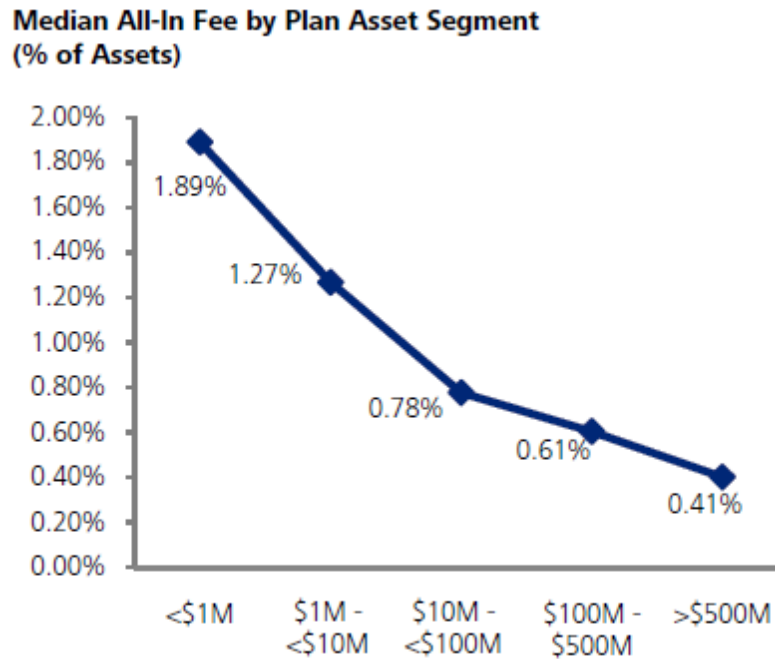
**Exhibit 13** This figure shows the median level of account balance of participants in 401(k) plans. It then splits the sample by multiple plan size categories to show the median account balance across these various plan size groups. The plan sizes and participant balances are as of the end of 2008

**Median of Plan-Level Participant Average Account Balances by Asset Segment**



Source: Deloitte and the Investment Company Institute, "The Defined Contribution/401(k) Plan Fee Study," June 2009.

**Exhibit 14** This figure shows the median “all-in fee” paid by participants in 401(k) plans, split by plan asset size. The plan sizes and participant fees are as of the end of 2008



Source: Ibid.

The “all-in fee” is comprised of fees for:

1. Investment management
2. Administration, recordkeeping, communication and education
3. Financial advice to participants
4. Plan sponsor investment consulting.