How Much Money Could a Person Donate by Having a Conventional Job?

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Abstract

I examine how much donatable wealth someone could accumulate by taking a conventional job and investing his earnings. In current dollars, this figure ranges from just a few million dollars for most careers to around 30 or 60 million dollars. These figures assume a 12% expected return on wealth, and (due to oversight on my part) ignore capital-gains tax. Other findings:

- It's better to save one's wealth and donate it all at the end of one's life than to give it away periodically. This is true even when we account for the fact that waiting longer increases the risk of losing everything. This conclusion may not apply, however, in cases where the causes to which one might donate have "rates of return" of their own comparable to or higher than those of capital-market investments.
- For those with moderate to high annual incomes, the opportunity cost of exercise is more than paid back by the expectation of being able to work for a few more years as a result.

1 Introduction

Our hero Paul plans to take a conventional salary-paying job. He intends to live as frugally as possible and invest his earnings. Periodically, he will donate his money to reducing suffering.

I do not claim that this is the best strategy Paul could adopt. Perhaps it would be better for Paul to become an entrepreneur, or to gain influence over funding and grantmaking, or to do something else entirely. In this essay, I merely consider how much donatable income Paul could make with this approach.

2 Model

2.1 Without Inflation

First, imagine that there is no inflation. All money has units of current dollars.

Divide time t into years. Let $t = 0$ represent the current year. Paul starts work at $t = 0$ and gives away his money for the last time at $t = f$. Between now and f, Paul donates all of his current savings a total of n equally spaced times. That is, he donates money at $t = \lfloor \frac{f}{n} \rfloor$, $\lfloor \frac{2f}{n} \rfloor$, $\ldots$, $\lfloor \frac{nf}{n} \rfloor = f$. ($\lfloor x \rfloor$ means "the greatest integer less than x." I include this function merely to keep my values of t integers.) To reduce clutter, I introduce the following notation:

$$\tau_k := \left\lfloor \frac{kf}{n} \right\rfloor. \tag{1}$$

As a special case of this definition, $\tau_0 := -1$, not 0.[1]

Define $A(t)$ to be the amount of money that Paul accumulates by time t. Then Paul donates a total of D dollars:

$$D \equiv \sum_{k=1}^{n} A(\tau_k). \tag{2}$$

At his job, Paul earns $I(t)$ dollars per year; he annually pays $T(t)$ dollars in income taxes and $C(t)$ dollars in living costs. (I define $C(t)$ to include property taxes, sales taxes, and other taxes that don't depend on income.) The remaining money, $I(t) - T(t) - C(t)$, Paul puts into aggressive-growth investment options,[2] returning an annual interest rate r (which I assume to be constant in time). Paul saves the money until $t = \tau_k$, when he gives it away for the kth time. If all goes well, Paul will give away

$$A(\tau_k) = \sum_{t=\tau_{k-1}+1}^{\tau_k} \Big(I(t) - T(t) - C(t)\Big)(1+r)^{\tau_k - t}. \tag{3}$$

However, there's a nontrivial chance that all will not go well. For instance, the stock market might crash, or Paul might change his mind about giving away money and decide to keep it for himself. It's even somewhat likely that humanity will go extinct within the next few decades [9, 4, 3, 7].

Suppose there's some constant probability p that one of these disasters will *not* happen within one year. The probability that none of these disasters will have happened by $t = \tau_k$ is then p^{τ_k}. The new, appropriately discounted form of (3) is thus

$$A(\tau_k) = p^{\tau_k} \sum_{t=\tau_{k-1}+1}^{\tau_k} \Big(I(t) - T(t) - C(t)\Big)(1+r)^{\tau_k - t}. \tag{4}$$

Combining (2) and (4),

$$D = \sum_{k=1}^{n} p^{\tau_k} \left[\sum_{t=\tau_{k-1}+1}^{\tau_k} \Big(I(t) - T(t) - C(t)\Big)(1+r)^{\tau_k - t} \right]. \tag{5}$$

[1] I do this so that the term $t = \tau_{k-1} + 1$ for $k = 1$ in (3) gives $t = 0$ (the year when Paul starts working) instead of $t = 1$.

[2] See "The Case for Risky Investments," (http://utilitarian-essays.com/risky-investments.html).

2.2 With Inflation

Now I modify (5) to account for inflation. Suppose inflation happens at constant rate of i percent annually. By $t = \tau_k$, a dollar will be worth only $\frac{1}{(1+i)^{\tau_k}}$ as much as it is currently. So we should reexpress D in terms of actual buying power:

$$D = \sum_{k=1}^{n} \frac{p^{\tau_k}}{(1+i)^{\tau_k}} \left[\sum_{t=\tau_{k-1}+1}^{\tau_k} \Big(I(t) - T(t) - C(t) \Big) (1+r)^{\tau_k - t} \right]. \tag{6}$$

Because we've adjusted for inflation, D is still in current dollars.

Of course, we also need to account for the effect of inflation on $I(t)$, $T(t)$, and $C(t)$. If we let those variables represent what income, taxes, and cost of living, respectively, would have been without inflation, and if we assume that those variables keep pace with inflation, then (6) becomes

$$\begin{aligned} D &= \sum_{k=1}^{n} \frac{p^{\tau_k}}{(1+i)^{\tau_k}} \left[\sum_{t=\tau_{k-1}+1}^{\tau_k} (1+i)^t \Big(I(t) - T(t) - C(t) \Big) (1+r)^{\tau_k - t} \right] \\ &= \sum_{k=1}^{n} p^{\tau_k} \left[\sum_{t=\tau_{k-1}+1}^{\tau_k} (1+i)^{t-\tau_k} \Big(I(t) - T(t) - C(t) \Big) (1+r)^{\tau_k - t} \right] \\ &= \sum_{k=1}^{n} p^{\tau_k} \left[\sum_{t=\tau_{k-1}+1}^{\tau_k} \Big(I(t) - T(t) - C(t) \Big) \left(\frac{1+i}{1+r} \right)^{t-\tau_k} \right]. \end{aligned} \tag{7}$$

2.3 Further Modifications

Assume $I(t)$ can be represented by a straight line. The line has slope $\frac{I(f)-I(0)}{f-0}$ and passes through $t = 0$ at $I(0)$, so that

$$I(t) = I(0) + \frac{I(f) - I(0)}{f} t. \tag{8}$$

Assuming a constant tax rate, $T(t) = hI(t)$ for some h, $0 < h < 1$. Suppose $C(t)$ is constant: $C(t) = C$.

Now (7) becomes

$$\boxed{D = \sum_{k=1}^{n} p^{\tau_k} \left[\sum_{t=\tau_{k-1}+1}^{\tau_k} \left((1-h) \Big(I(0) + \frac{I(f) - I(0)}{f} t \Big) - C \right) \left(\frac{1+i}{1+r} \right)^{t-\tau_k} \right].} \tag{9}$$

3 Analysis

3.1 Introduction and Constants

In this section, I examine how D varies when different parameters vary. Since it would be difficult to do this for all of the parameters at once, I do so for only one or two at a time. The rest I hold constant at the following plausible values:

- $f = 40$.

  In 2005, the average American life expectancy was 78 years [2]. If Paul is 25 years old at $t = 0$, and if Paul is unable to work after age 65, then $f = 65 - 25 = 40$.

- $p = 0.99$.

  This parameter is, unfortunately, fairly uncertain. The following approach produces only a highly rough figure.

  Here are some predictions of the probability that humans survive the next few centuries:

  - 0.5 [9].
  - < 0.75 [4], and perhaps 0.5 [3].
  - 0.7 [7].

  Let's take 0.7 as our estimate that humans survive the next 200 years. If the probability that humans survive for 40 years, p_{s40}, is constant for the 5 periods of 40 years that will happen over the next two centuries, then

  $$(p_{s40})^5 = 0.7 \Longrightarrow p_{s40} = 0.931.$$

  Suppose the probability of surviving the other possible disasters—a stock-market crash, an economic collapse, loss of interest by Paul in donating the money—over the next 40 years is, say, 0.75. Assuming these other disasters are statistically independent of the disaster of human extinction, the probability of surviving both is simply $(0.931)(0.75) = 0.70$.

  Since p represents the probability that humans survive for a *year*,

  $$p^{40} = 0.70 \Longrightarrow p = 0.99.$$

- $r = 0.12$.

  Ibbotson Associates has calculated that the average rate of return of all stocks between 1926 and 2004 was 10.4% [13]. Aggressive stocks presumably had a slightly higher expected value—say 12%.

- $i = 0.03$.

  The Consumer Price Index was 100.0 in mid-1983 [6]. By mid-2006, it was 200.6 [6].

  $$100.0(1+i)^{2006-1983} = 200.6 \Longrightarrow i = 0.03.$$

- $h = 0.27$.

  Of course, the income tax rate is not flat, but I've assumed that it is for ease of computation. For an income of \$80,000, the rate is 22.5% [1]. At \$200,000, the rate becomes 26.3% [1]. Choosing $h = 0.27$ (that is, 27%) makes my calculations generally conservative but not unreasonable.

- $C = \$35,000$.

  This is just a somewhat-high guess for the cost of living and fixed taxes that a single person might face.

- $I(0) = \$48{,}000$ [12] and $I(f) = \$200{,}000$ [10].

  The specific values here don't particularly matter, since I'll eventually calculate D for various values of $I(0)$ and $I(f)$. These salaries are typical for an actuary.

- $n = 1$

  I explain the rationale for this in the following section.

3.2 Effects of n and p

Is it better for Paul to donate his money periodically, or to wait and donate it all at once? How does that depend on p?

Figure 1 gives the answer. It shows that, for all values of p considered, D decreases with increasing n. As one might expect, the rate of decrease is smaller when p is smaller.

Since D was always highest for $n = 1$, I consider only that case from now on. This nicely simplifies (9) down to

$$D = p^f \sum_{t=0}^{f} \left((1-h)\Big(I(0) + \frac{I(f)-I(0)}{f} t\Big) - C \right) \Big(\frac{1+i}{1+r}\Big)^{t-f}. \tag{10}$$

In this analysis, I've neglected the possibility that the cause(s) to which Paul would donate might have their own "rates of return." For instance, if Paul starts an advocacy organization that grows over time, Paul will have achieved a return on his investment even though he didn't put his money in the capital markets. If this rate of return is greater than the market rate,

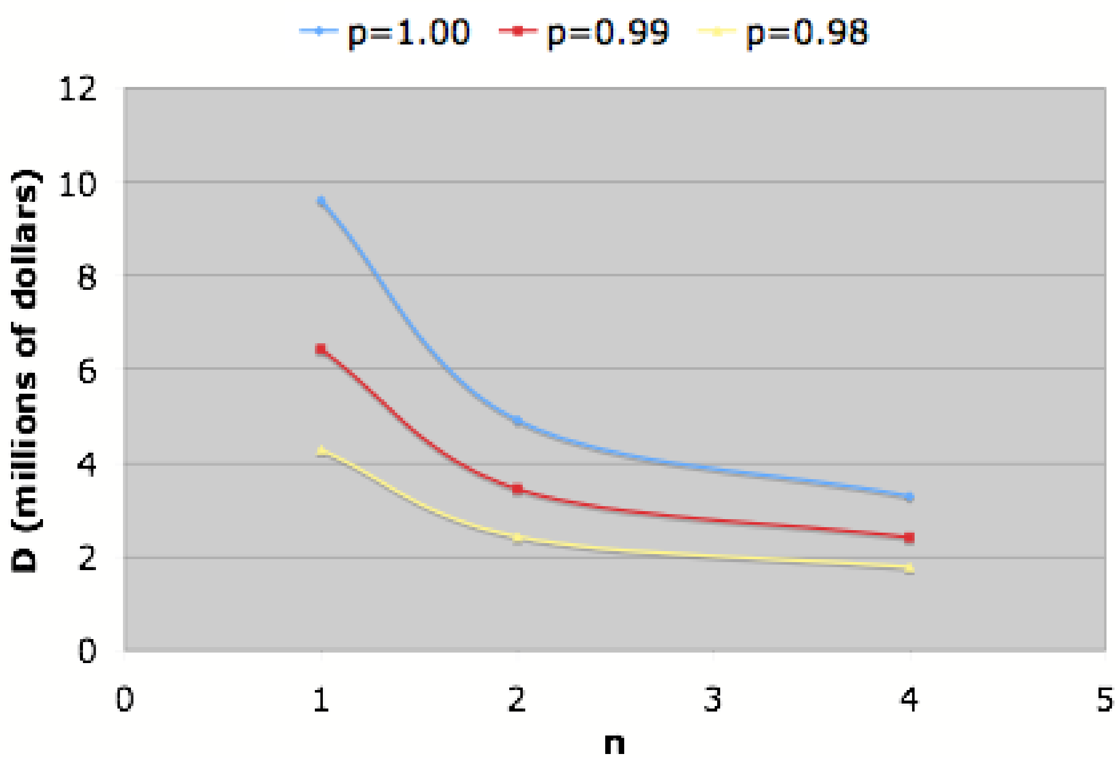

Figure 1: D vs. n for several values of p.

Paul might do better to donate his annual income to such causes and ignore the capital markets entirely.

One problem with the immediate-donation approach is that Paul must know right away which causes are best to support. This is a very hard thing to do, and Paul might need the wisdom of many years (perhaps several decades) to decide.

3.3 Effects of $I(0)$ and $I(f)$

$$R := \frac{I(f)}{I(0)}. \tag{11}$$

Figure (2) shows D as a function of $I(0)$ for several values of R.

3.4 Effect of f

Perhaps my estimate of $f = 40$ was too conservative. After all, medical technology should substantially improve in the coming decades. In addition, Paul will presumably live a healthy lifestyle, so that his life expectancy should be somewhat higher than the nationwide average. Figure 3 shows the effect of f on D for several values of $I(0)$; I assume $R = 3$.

Actually, the numbers in Figure 3 may be too small. I'm using the same figures for $I(f)$ and $I(0)$ for all f, but in (10), those numbers are divided by f. So I'm probably *underestimating* Paul's actual income, since higher values of f make $I(t)$ smaller than it actually would be.

3.5 Stress, Longevity, and Income

In general, jobs that pay higher are also more stressful. That stress might reduce f—the expected number of years for which one could work.

Suppose Paul currently has $I(0) = \$50,000$ with $R = 4$. Should Paul pursue a more stressful job that has $I(0) = \$55,000$ and $R = 4$? How about $I(0) = \$60,000$ or $I(0) = \$70,000$ with $R = 4$?

Define $D(s)$ as the value that D will have if Paul takes a more stressful job; $D(ns)$ is the value of D if Paul doesn't take the new job. Paul should change to the more stressful job if and only if $D(ns) - D(s) < 0$.

Suppose that, if he takes the stressful job, Paul will be able to work for 40 years (f=40). If he stays at his less-stressful job, he'll be able to work for 40+m years, where m represents the number of years of health that Paul gains by having lower stress.

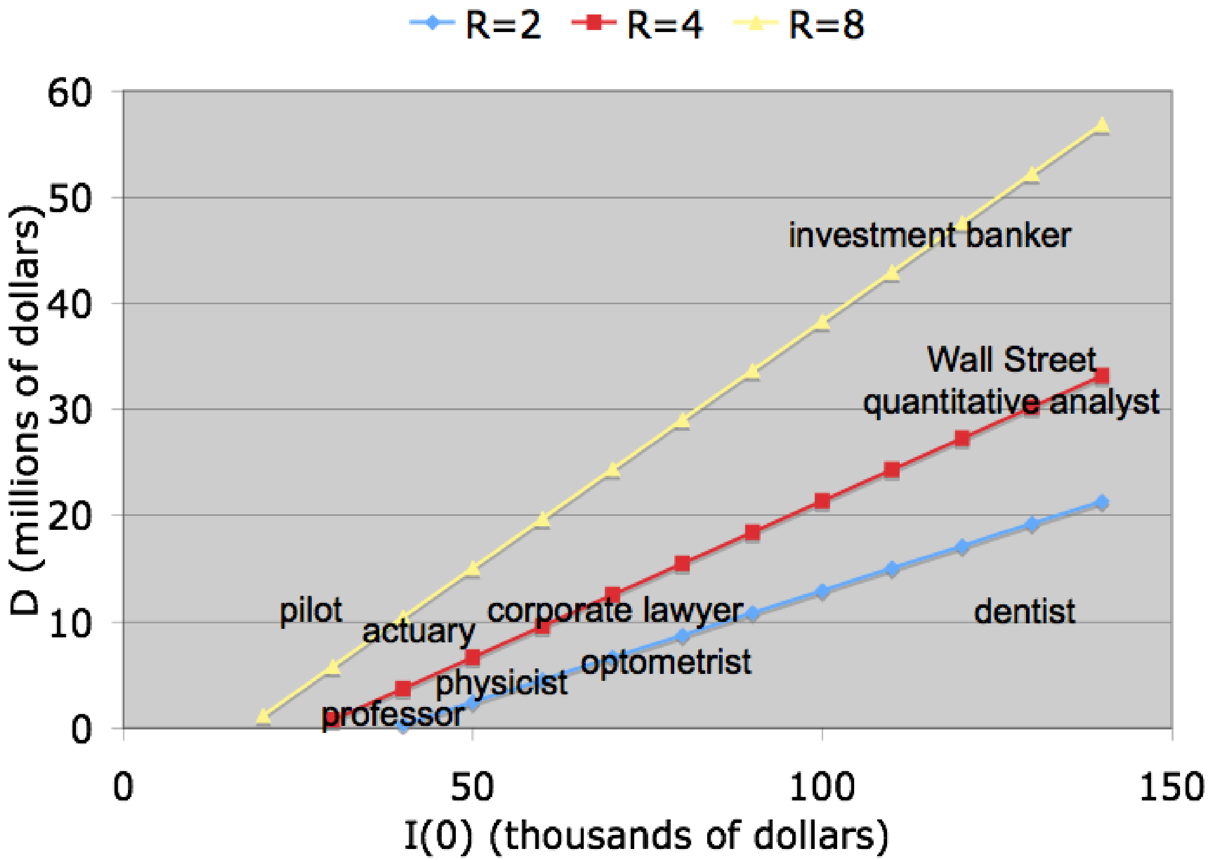

Figure 2: D vs. $I(0)$ for several values of R. I based the locations of the various careers mostly on salary information from [5] and [8].

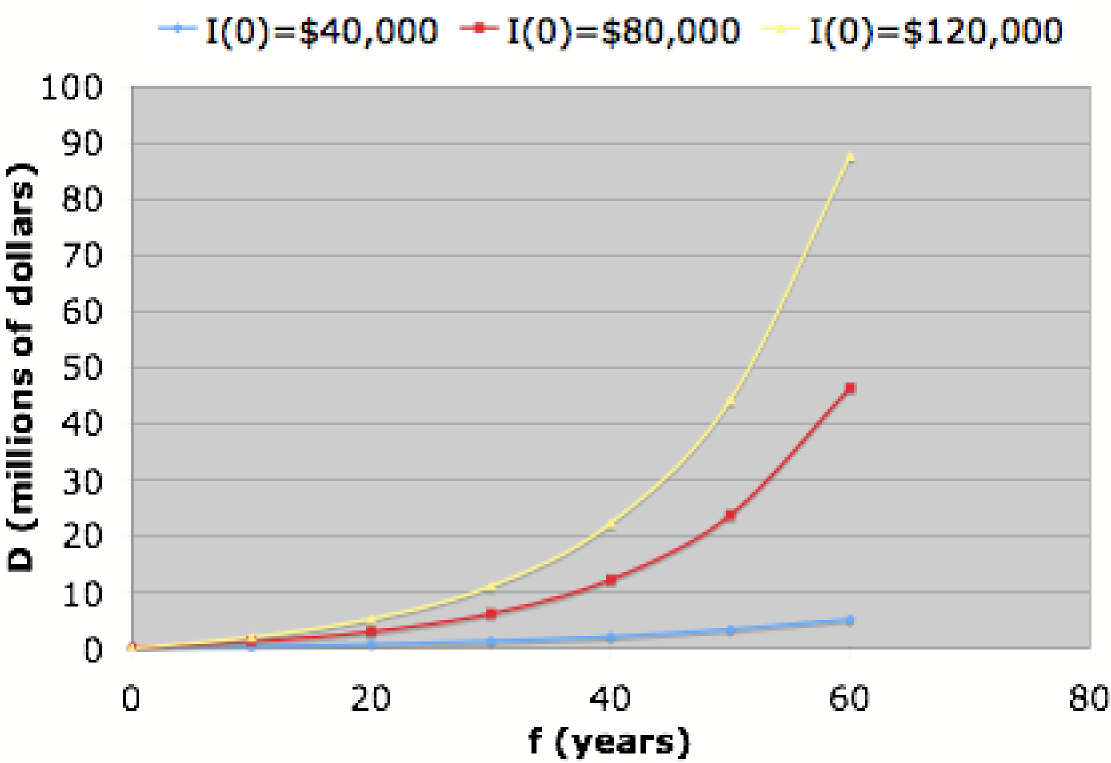

Figure 3: D vs. f for several values of $I(0)$.

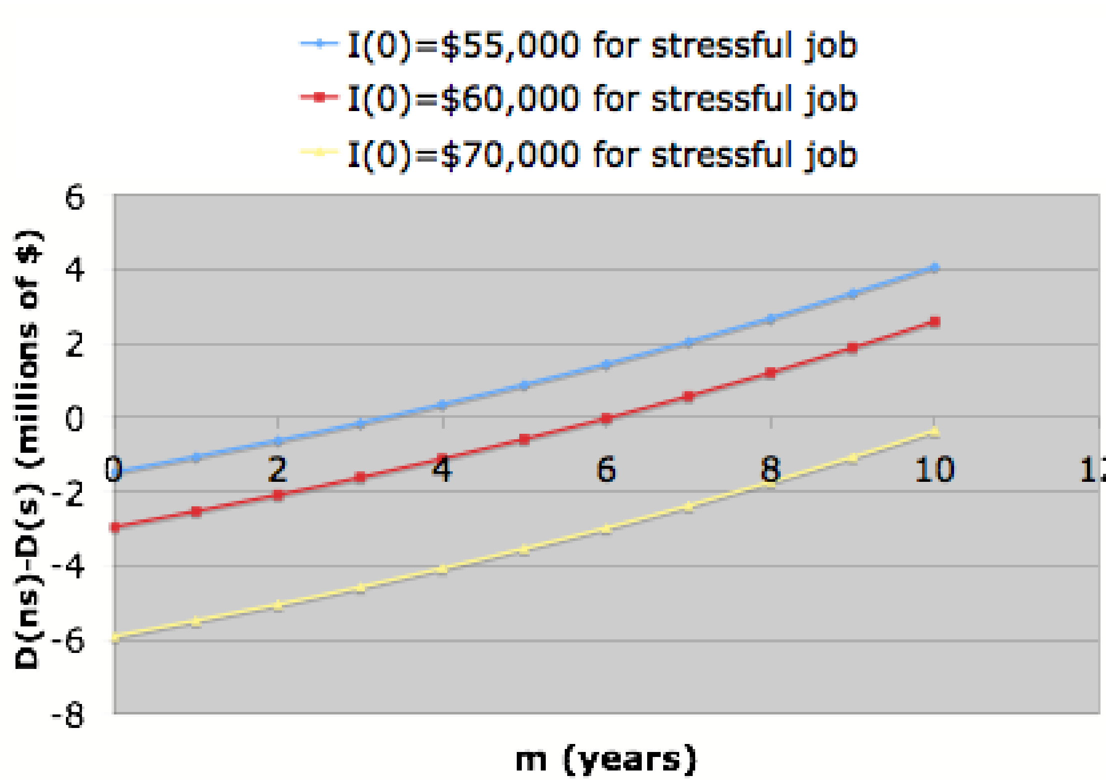

Figure 4: $D(ns) - D(s)$ vs. m for several values of the $I(0)$ for the more stressful job.

Figure 4 plots $D(ns) - D(s)$ against m. The points at which the curves rise above zero represent the values of m beyond which Paul *shouldn't* take the more stressful job.

3.6 Is Exercise Worth the Cost?

According to one 2005 study, running for half an hour five days a week extends life expectancy by 3.5 to 3.7 (average = 3.6) years. Suppose that, if Paul exercises, he'll only have 11, rather than 12, hours per day to spend on work, and that his salary will correspondingly be only $\frac{11}{12}$ as high. Is it cost-effective to exercise?

Call $D(e)$ the value of D if Paul exercises and $D(ne)$ the value if he doesn't. Figure 5 plots $D(e) - D(ne)$ against $I(0)$ (assume $R = 4$). The different curves show different values of $f(ne)$—which I define to mean the number of productive years that Paul would have if he *didn't* exercise. (If he does exercise, I assume he will be productive for $f(ne)$+3.6 years.)

Figure 5 shows that, for all of the $f(ne)$s considered, exercise is cost-effective for values of

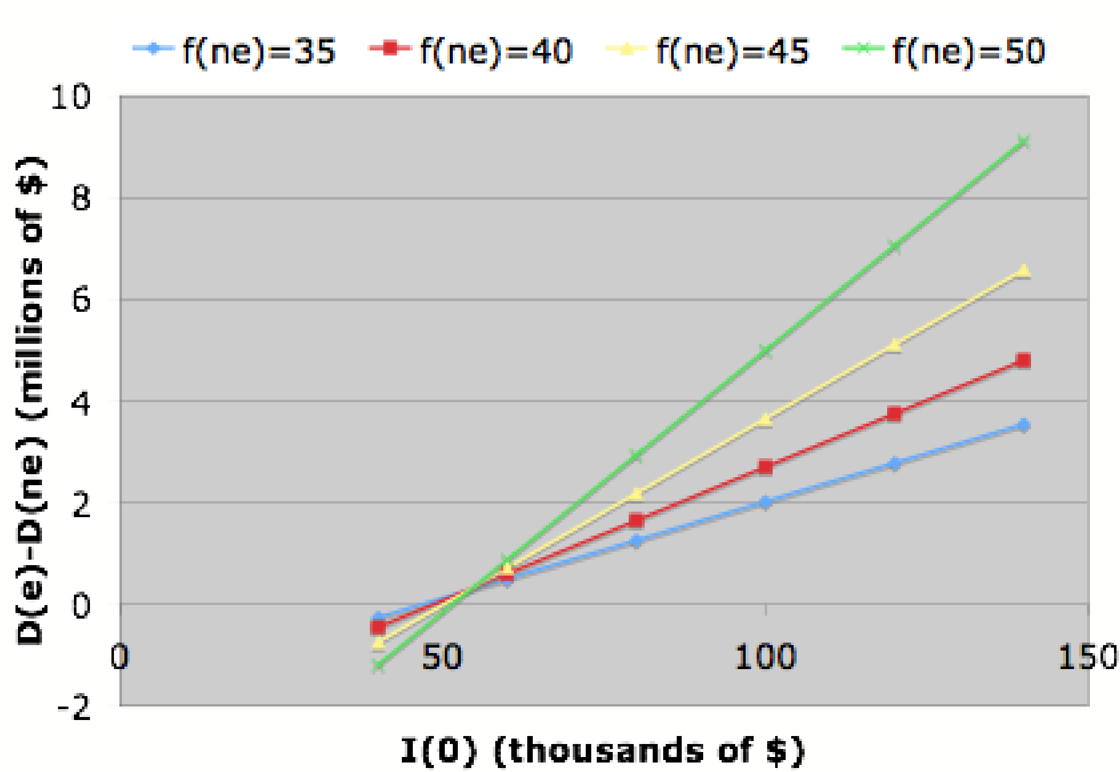

Figure 5: $D(e) - D(ne)$ vs. $I(0)$ $(R = 4)$ for several values of $f(ne)$.

$I(0)$ above roughly \$50,000. Of course, these calculations probably significantly *understate* the benefits of exercise. They don't count the salutary influence of exercise on mood, motivation, and productivity.

Moreover, these numbers are based on an *average value* (3.6 years) of the amount by which exercise extends f, rather than the *distribution of possible values* multiplied by their probabilities. But according to Figure 3, D grows exponentially with f, so that a wider variance in the amount by which exercise extends f actually *increases* the expected value (i.e., the exponential function is convex). The benefits of exercise would only have been higher if I had taken this into account.

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