Distinguishing Income from Substitution Effects in Disability Insurance: *Preliminary* Evidence from the Veterans Disability Compensation Program*

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ABSTRACT

The vast majority of workers who receive a Social Security Disability (SSDI) award never reenter the labor force. While economists have typically regarded the substantial reductions in labor force participation associated with receipt of disability benefits as an incentive problem (i.e., a substitution effect), this paper investigates the hypothesis that a significant share of this response may be explained by the (non-incentive) income effect. Concretely, when granted permanent, inflation-indexed income and government-provided health insurance, many near-elderly adults in moderate to poor health may prefer an early retirement to continued labor force participation. To evaluate the size of this income effect, we exploit a unique 2001 policy change within the U.S. Department of Veterans Affairs' Disability Compensation program (VDC). This policy change unexpectedly extended cash disability benefits and enhanced medical care to approximately 180 thousand Vietnam veterans diagnosed with Type 2 Diabetes, a majority of whom were in their fifties and still in the labor force at the time of their benefit award. Using unique linked data provided by the U.S. Army, the Veterans Administration and the SSA on the military service, labor earnings, and receipt of disability benefits among Vietnam era veterans, we will exploit the policy-induced increase in VDC transfer income to measure the impact of unconditional permanent income grants on labor supply and retirement decisions of this relevant population of near-elderly beneficiaries in moderate to poor health. Preliminary evidence from the Current Population Survey is analyzed here.

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A series of studies conducted over the last fifteen years has produced a near-consensus that the Social Security Disability Insurance system (SSDI) has substantial disincentive effects on the labor supply of near-elderly males, diminishing labor force participation, increasing the sensitivity of labor force exit decisions to adverse economic shocks and encouraging those nearing retirement to claim disability benefits and subsequently transfer onto the Social Security retirement program.[1] Yet, efforts by the Social Security Administration (SSA) to encourage labor supply among the disabled by removing the work disincentives built into SSDI have been almost entirely unsuccessful. Most notably, Congress in 1999 authorized the Ticket to Work program, which provides an array of inducements for current SSDI beneficiaries to take up employment, including: permitting a "trial work period" of up to nine months, providing 7.75 years of ongoing Medicare eligibility following return to work, and providing three years of automatic benefit reinstatement when claimant's earnings workplace fall below a threshold level. Each of these steps reduces the implicit tax placed on labor supply by the SSDI program. Despite these lures, fewer than 1,400 tickets of 12.2 million tickets issued to date have led to successful workforce integration (0.01 percent).

This paper calls attention to, and presents preliminary evidence on, a neglected explanation for why efforts to encourage return-to-work among the disabled by reducing the implicit tax on labor supply have met with little success. Our core observation is that SSDI, and indeed all non-work-contingent retirement programs, discourages work through two channels. The first is the canonical substitution effect: because a return to work ultimately means sacrificing benefits (what SSDI beneficiaries call "the cash cliff"), SSDI recipients face a financial incentive to remain non-employed. A second is the income effect: given the transfer payments and in-kind services (particularly medical care) provided by SSDI, many beneficiaries may prefer leisure to labor—or, more precisely, an early retirement—even if work is not implicitly taxed by the SSDI program. Concretely, a hypothetical SSDI beneficiary granted $12,000 per year in income support plus Medicare benefits paying an average of $7,700 annually may prefer an early retirement over continued participation in the labor force. This scenario seems particularly plausible when one considers that the modal SSDI recipient is a near-elderly male with a high

[1] On the first point, see John Bound and Timothy Waidmann (1992) and David Stapleton and Richard J. Burkhauser (2003). On the second, see Daniel Black, Kermit Daniel, and Seth Sanders (2002) and David Autor and Mark Duggan (2003). On the third, see Duggan, Perry Singleton and Jae Song (forthcoming).

school education (thus, below-median potential earnings) and, possibly a significant degree of physical discomfort in performing workplace tasks.[2]

The distinction between these two channels—income and substitution effects—through which SSDI reduces labor supply and expedites early retirement is central to policy. To our knowledge, all prior efforts by the Congress and the SSA to increase labor force participation among SSDI recipients—including the Ticket to Work program—have precisely targeted the substitution effect; that is, they have reduced the implicit tax on work. Such policies rest on the assumption that, were it not for the implicit tax that SSDI levies on labor supply, many beneficiaries would prefer to work (i.e., while keeping their benefits). If, however, the primary means by which SSDI reduces labor force participation and hastens retirement is through an income effect, such efforts may be close to ineffectual.

The conceptual distinction between income and substitution effects is also central to welfare analysis: if SSDI reduces labor supply through the substitution effect, this implies a deadweight loss; in effect, SSDI is pays beneficiaries to *not* work. By contrast, reductions in labor supply that are due to the income effect do not imply a deadweight loss since there is no distortion of incentives.[3]

I. Estimating Income Effects of Disability Insurance Receipt on Labor Supply

We know of no research that attempts to distinguish income from substitution effects in the relationship between SSDI receipt and labor supply.[4] A likely reason is that, since its inception, the SSDI program has provided benefits exclusively on a work-contingent basis, so income and substitution effects cannot readily be separated. SSDI is not, however, the sole transfer program that provides income support to the non-elderly disabled. Though almost ignored by researchers, the U.S. Department of Veterans' Affairs Disability Compensation program (VDC) provides substantial cash benefits to more than 2.7 million disabled veterans of military service. Unlike SSDI benefits, VDC benefits are not work-contingent (nor are they means tested). Hence, any

[2] Reinforcing this point, Mark Aguiar and Erik Hurst (2005) demonstrate that the fall in living standards that worker experience at the time of retirement is much less precipitous than measured declines in expenditure would suggest.

[3] While either channel (income or substitution effect) through which transfer income alters labor supply is appropriately termed moral hazard, only the substitution effect is distortionary. Of course, the taxation required to fund transfer programs may generate deadweight losses.

[4] However, Dora L. Costa (1995) estimates sizable income effects of pension benefits on labor supply for Union Army Soldiers following the U.S. Civil War.

reduction in labor supply—generally in the form of early retirement or a shift to part-time work—caused by the award of VDC benefits is plausibly attributable to the pure 'income effect' of receiving an unconditional, lifetime grant of monthly income and healthcare.

The key requirement for VDC eligibility is that a veteran's disability must be caused or aggravated by military service. Due to this stipulation, veterans rarely qualify for VDC benefits for medical conditions that develop late in life, such as cancer or diabetes, since these conditions are rarely directly attributable to military service. However, in 2001, a unique policy change within the VDC program unexpectedly extended cash disability benefits and enhanced medical care to nearly-elderly veterans of the Vietnam era. In response to a National Institute of Medicine linking exposure to Agent Orange (an herbicide used extensively in Vietnam) to diabetes, the Department of Veterans' Affairs added diabetes to the list of conditions for which a veteran who served in Vietnam during the war could qualify for (or increase) his VDC benefits.

As Figure 1 demonstrates, the unanticipated extension of benefits in 2001 coincided with a sharp break in trend in VDC enrollment. While in the four years prior to the policy change (1997 though 2001), the number of VDC beneficiaries grew at only 0.6 percent annually, the annual growth rate jumped to 3.2 percent (i.e., five times as large) between 2001 and 2006. Estimates by Duggan, Robert Rosenheck and Perry Singleton (2006) suggest that the 2001 policy change increased the number of Vietnam veterans on the VDC program in September of 2006 by approximately 175,000 over what it would otherwise have been (7.6 percent of the Vietnam veteran cohort). An additional 75,000 Vietnam veterans who were already receiving VDC also received an increase in their benefits as a result of the policy change.[5] This policy change provides an opportunity to study the income effect of receipt of disability benefits on the labor supply and retirement decisions of a relevant population of near-elderly individuals, the majority of whom were work-capable at the time of benefit receipt though not necessarily in good health.

II. A Model of Early Retirement Decisions under Work-Contingent and Non-Contingent Transfer Programs

Though many features of the VDC and SSDI programs differ, the crucial distinction that we focus on here is that the SSDI program is work-contingent (thus, inducing both income and substitution effects) while the VDC program is not (thus, inducing only income effects). To

[5] In total, approximately 11 percent of individuals who had "boots on the ground" in Vietnam during the conflict were directly affected.

contrast the behavioral and welfare differences that follow from this distinction, we present a brief model of work and retirement decisions among the working-age disabled in which we compare two otherwise identical cash transfer programs that differ only in one respect: whether or not receipt of transfer income requires early retirement. We provide the main equations of the model below, with further details available in an online appendix (**link to online appendix)**.

Consider an economy composed of agents who live for three periods. In the first period, agents work with certainty and have the option to save. In the second period, they may continue to work and save or may choose to retire and consume out of savings. In the third period, they receive retirement benefits, $b > 0$, consume out of savings and do not work. All agents have the time-separable per-period utility of $u(c,\theta): u_{it} = \ln(c_{it}) - \theta_i$, where c_{it} is consumption in period t and θ_i is the disutility of work conditional on working. So that all agents work at least one period, we set the disutility of work to zero in period one for all agents. The wage of an agent if he participates in the labor market is $w_i > 0$. There is no discounting or uncertainty.

An agent's plan consists of a set of three consumption choices, $C_i = \{c_{i1}, c_{i2}, c_{i3}\}$ and an associated labor supply choice—in particular, whether to work in period two or to instead retire early. Let $R_i \in \{0,1\}$ be a dummy variable equal to one if the agent chooses an early retirement.

Suppressing individual subscripts, the agent's maximization problem is:

$$(1) \qquad \max_{c_1,c_2,c_3} U = \ln(c_1) + \ln(c_2) + \ln(c_3) - (1-R)\theta$$
$$s.t.\ c_1 + c_2 + c_3 \le w(2-R),\ R \in \{0,1\}.$$

Given non-satiation and state-independent utility, the agent's optimal consumption path is given by $c_1 + c_2 + c_3 = [w(2-R) + b]/3$. The agent chooses an early retirement iff:

$$(2) \qquad \theta > 3\ln\left(\frac{2w+b}{w+b}\right).$$

Early retirement is more likely if: (1) the disutility of work is high; (2) the retirement benefit is large; or (3) wage income is low (since, for low wage workers, the consumption gain from working is small relative to the disutility of labor).

A. An unanticipated non-contingent cash transfer

Consider a set of agents who at the start of period two receive an unanticipated *non-contingent* cash transfer of $v > 0$ for each of the remaining two periods, where v (loosely)

represents the Veterans Disability Compensation program. Because receipt of this transfer is unanticipated, it does not affect the initial consumption plan. Due to the rise in permanent income, some agents may change their retirement plans. In particular, agents for whom

$$\theta > 2\ln\left(\frac{v + 2w/3 + b/3}{v + w/6 + b/3}\right), \tag{3}$$

will choose to retire early upon receiving v, reflecting the pure income effect of transfer income on labor supply. This (unanticipated) early retirement is more likely if (1) the disutility of work is high; (2) the cash transfer is large; or (3) the wage is low.

B. An unanticipated work-contingent cash transfer

Consider now a set of agents who at the start of period two receive an unanticipated *work-contingent* cash transfer of $d > 0$ for the remaining two periods, where d (loosely) represents the SSDI program. Let the transfer payments from programs d and v be identical, so the sole distinction between the two programs is that receipt of d in the second period is contingent upon early retirement whereas receipt of v in the second period is unconditional. How do these two programs differ in terms of retirement outcomes and economic efficiency?

For two groups of agents, programs d and v are economically equivalent. Agents who would choose an early retirement upon receiving v will behave identically upon receiving d, since the work constraint will not bind. Similarly, agents who had planned an early retirement in the absence of d will not change their retirement plans upon receiving d.

There are, however, two groups of agents who will be differentially affected by the two programs. A first is the agents for whom the work constraint binds under d, leading to an early retirement. These agents are characterized by the following inequality:

$$2\ln\left(\frac{v + 2w/3 + b/3}{v + w/6 + b/3}\right) \geq \theta > 2\ln\left(\frac{d/2 + 2w/3 + b/3}{d + w/6 + b/3}\right). \tag{4}$$

Because these agents would otherwise work until the full retirement age if receipt of the transfer payment were not work-contingent, their early retirement represents a deadweight loss, (stemming from the substitution effect). Implicitly, these agents receive d as payment for retiring early. The likelihood that inequality (4) is satisfied is initially rising and then falling in the wage.

A second set of agents differentially affected by d and v are those who will choose to forfeit the transfer payment d in period two rather than retire early. These agents are characterized by the following inequality:

$$(5) \qquad 2\ln\left(\frac{d/2+2w/3+b/3}{d+w/6+b/3}\right) \geq \theta.$$

Although these agents would receive a period two transfer payment under the v program and not the d program, the lack of a behavioral effect of either program indicates that there is no efficiency loss from their *not* receiving this transfer payment. The likelihood that inequality (5) is satisfied is rising in the wage.

C. Behavioral and welfare consequences of transfer income

The results of the model are summarized in Figure 2. Holding benefit levels (b, v, d) and disutility of labor (θ) constant, the model allows us to divide the population into three distinct groups differentiated by potential earnings (w):

1. The lowest income workers, those in wage range A–B in Figure 2, will retire early under either the d or v program. Because labor supply decisions are not distorted for these agents, there is no deadweight loss from either program (except through taxation).[6]
2. Middle income workers, those in wage range B–C in the figure, will retire early to obtain d but would remain in the labor force if receiving v. Hence, the d program generates a deadweight loss by distorting retirement decisions for these agents.
3. High income workers, those in wage range C–D in the figure, will not retire early if offered *either* d or v. As with the first group of agents there is no behavioral distortion. But this high income group will forego receiving d in period 2, which is desirable if taxation incurs a deadweight loss.

The contrast between groups (2) and (3) highlights a trade-off in the design of income transfer programs. Imposing a non-work constraint (as in program d) increases deadweight losses by inducing early retirement among work-ready beneficiaries. However, the non-work constraint

[6] A subset of these workers (drawn from the bottom of the wage distribution) would retire early, absent d or v.

also increases target efficiency by reducing the incentive for high-income workers to claim transfer benefits.[7]

We emphasize that this illustrative model differs in two central respects from the VDC and SSDI programs. First, in practice, the size of Veterans Disability Compensation transfer payments are increasing in the severity of disability and are independent of past earnings. Thus, v is likely to depend positively on an agent's disutility of work, which should *increase targeting efficiency* of VDC relative to a similar program with a flat benefit. Second, under the SSDI program, the amount of the transfer benefit depends positively on past earnings but is independent of the degree of disability. This feature is likely to *increase labor supply distortions* from the SSDI program since, holding disutility of work constant, high income workers will face a stronger incentive to exit the labor force to qualify for SSDI benefits than they would under a similar program with a flat benefit.

III. Preliminary analysis using the Current Population Survey

The model suggests that unanticipated increases in unearned income caused by the change in the VDC program should reduce labor supply among a subset of individuals affected by the policy—*despite* the absence of non-work incentives in the VDC program. To provide initial evidence on whether such a labor supply effect occurred, we utilize data from the annual March Supplement to the Current Population Survey (CPS) for calendar years 2000 through 2006 (earnings years 1999 through 2005). The March CPS has a number of virtues for our analysis: it offers detailed individual-level information on labor supply measures; it collects information on each person's veteran status and lists their service era if relevant (e.g. Vietnam, Korea, etc.); and it provides detailed self-reported information on numerous components of unearned income, including benefits from the Veterans Administration (VA), Social Security and all other retirement and disability income.

Because 97 percent of Vietnam era veterans are males according to the March 2001 CPS, we focus exclusively on males in our empirical analyses. Additionally, nearly 78 percent of Vietnam era veterans were born between 1941 and 1952, the twelve most common birth cohorts for

[7] It is immediate from our model that the social gains from transfers are smaller for high than low earnings workers, since high earnings workers will have lower marginal utility of consumption. Albert L. Nichols and Richard J. Zeckhauser (1982) discuss the tradeoff between increasing targeting efficiency of transfer programs and restricting the behavior of beneficiaries.

Vietnam era veterans. And as shown in Table 1, more than 15 percent of all men born in each of these twelve years and still alive in 2001 are Vietnam era veterans, with a maximum of 44 percent for the 1947 birth cohort. We therefore further restrict attention to Vietnam era veteran males born between 1941 and 1952.

To provide preliminary estimates of the impact of the change in the VDC program, we compare the average change in labor supply measures for Vietnam era veterans with the corresponding change for observably similar individuals who were not directly affected by the policy change. The use of an appropriate control group should serve to capture the effect of other factors—such as aging and macroeconomic conditions—that might also have influenced the labor supply decisions of near elderly men during our study period. Perhaps the ideal control group would be Vietnam era veterans who did *not* serve in Vietnam, as these individuals served in the military during the same period as "boots on the ground" veterans but their VDC coverage was not similarly expanded by the Agent Orange policy. Unfortunately the March CPS does not provide information on where veterans actually served (only when), so we must select an alternative control group.

There are two obvious candidate control groups: other veteran males born between 1941 and 1952, and non-veteran males born during this same period. As Table 1 demonstrates, there are relatively few veterans from other service eras in these twelve birth cohorts. Most strikingly, in the 1946 to 1949 birth cohorts, the ratio of Vietnam era veterans to all other veterans is 14.4 to 1. Most men born in one of these four years who did not report serving in the Vietnam era (August of 1964 to April of 1975) presumably either misreported or differed in important ways from Vietnam era veterans (e.g. by enlisting later in life).[8] In contrast, the number of non-veteran males born during this period is substantial and exceeds the number of Vietnam era veteran males in every one of our twelve birth cohorts of interest. We therefore use non-veteran males as our control group when estimating our models below, but we emphasize that this control group is not ideal. For example, according to the March 2001 CPS, just 4 percent of Vietnam era veterans born between 1941 and 1952 are high school dropouts versus 15 percent of non-veteran males born during these same years. Interestingly, non-veteran males are much more likely to have a college degree (35 percent versus 28 percent). Recognizing that our treatment and control groups

[8] A veteran whose period of service overlapped only partially with the Vietnam era (e.g. from 1970 to 1978 or from 1960 to 1968) would typically be defined as having Vietnam as their service era.

differed in potentially important ways prior to the policy change, we view this CPS-based analysis as *exploratory*, with definitive evidence awaiting better data.[9]

We estimate specifications of the following type:

$$(6) \qquad Y_{it} = \beta_0 * VEV_{it} + \beta_1 * VEV_{it} * POST_t + \gamma * X_{it} * \sum_{t=1999}^{2005} \lambda_t + \varepsilon_{it}.$$

In this equation, i and t index individuals and years, respectively. The variable VEV_{it} takes on a value of one if individual i is a Vietnam era veteran and zero otherwise. We define the variable $POST$ to equal zero in both 1999 and 2000, prior to the policy change, and to equal one in 2002 through 2005. We set the $POST$ variable to 0.5 in 2001, since the policy change occurred in July of 2001. We also control for a vector of background characteristics (denoted by X_{it}) including twelve single year of age indicators, four education indicators, and three race indicators, each interacted with seven year indicators.

The coefficient of interest in this equation is β_1, which measures the differential change in the outcome variable of interest, Y, for Vietnam era veterans following the policy change. The identifying assumption of this model is that, absent the policy change, the change in Y would have been comparable for Vietnam era veteran males and non-veteran males after controlling for the interactions of race, education, and single year of age with year. Under these assumptions, β_1 measures the average causal effect of the change in the VDC program on Vietnam era veterans.

Table 2 presents estimates of equation (6) for eight components of income which, added together, equal the person's total income. The outcome variables used in the first panel are indicators for whether the person receives any strictly positive income of each type while those in the second panel represent the amount of that income. We estimate the first set of specifications as linear probability models and multiply each dependent variable by 100 so that coefficients can be read as percentage points. The significant estimate of -3.58 for β_1 in the first specification suggests that the likelihood of having any earnings declined by more than three percentage points more for Vietnam era veteran males relative to similarly aged non-veteran males between 2001 and 2005. Interestingly in the pre-policy period, there was not a significant veteran-non-veteran difference in the (conditional) mean of this outcome variable. Consistent

[9] Our in-progress work on this topic exploits detailed data from the U.S. military to individually identify both soldiers who had "boots on the ground" in Vietnam and an appropriate control group of Vietnam era veterans who did not.

with the results for any earnings, we find a differential earnings decline of 1,802 dollars for Vietnam era veterans relative to non-veterans. This contrast is not significant, however ($p = 0.18$).

Columns (2A) and (2B) show that both the likelihood of receiving VA benefits and the average amount of VA benefits received increased by significantly more for Vietnam era veterans during the post policy period. This pattern is perhaps not surprising given that the control group was not eligible for these benefits, though it is worth noting that Duggan, Rosenheck and Singleton (2006) estimate a similarly large increase in VA benefits for Vietnam era veterans relative to veterans from other eras given stable rates of benefit receipt for these other groups. Notably, the point estimate for β_1 in the Any VA benefits receipt of 1.54 percentage points in column (2A) is considerably smaller in absolute magnitude than the corresponding decline in the probability of Any Earnings (-3.58 percentage points). Thus, the relative decline in labor force participation among Vietnam vets was larger than the increase in their probability of VDC receipt. While this could partially be explained by the fact that many existing VDC recipients experienced an increase in their benefits because of the policy change, it is also plausible that some other factor is exerting a differential effect on their labor supply as well (again, highlighting the preliminary nature of our analysis).

In columns (4) through (8), we consider all other major components of income. The most important finding here is that the probability and amount of any Social Security benefits or of any other retirement income increased by substantially more for Vietnam era veterans than for their counterparts born in other eras. This may indicate that individuals applied for SSDI, claimed early Social Security retirement benefits, or initiated withdrawals from a 401k or private pension plan when leaving the labor force. One item of concern in this table is that Vietnam era veterans were significantly more likely to be receiving some form of retirement income (specification 4A) prior to the policy change and the amount of this income was both statistically and economically significant (specification 4B). While this pattern is readily explained by the fact that many veterans receive a military pension while participating in the civilian labor force, it further underscores that non-veterans are an imperfect comparison group for veterans.

Table 3 presents similar specifications for several more direct measures of labor supply. The first column of results shows that labor force non-participation increased by significantly more for Vietnam era veterans than for the non veteran males in our control group, with this increase

almost equally split between retirement and disability as shown in columns (2) and (3). Notably, there is no significant change in the treatment-control contrast in the probability of being out of the labor force for reasons other than retirement or disability (column (4)). Finally, columns (5) and (6) show that weeks worked declined significantly for Vietnam era veterans while the probability of zero work hours significantly increased. The results in column (7), where the outcome variable is an indicator for the presence of a work-limiting disability or health condition, suggest that Vietnam era veterans were more likely to be disabled prior to the policy change and that this difference increased in more recent years.

IV. Conclusions

Our results above provide initial evidence that the increase in unearned income resulting from the expansion of the VDC program's medical eligibility criteria in 2001 substantially lowered labor supply among Vietnam era veterans. Such large behavioral responses to the VDC program are noteworthy given that the program does not affect the incentive to work as do the SSDI and SSI programs. These findings therefore highlight the possibility that income effects on labor supply may be sizable for nearly-elderly adults in moderate to poor health.

We stress that these results must be viewed as preliminary. Perhaps the most important limitation of our analysis is that non-veteran males differ in many observable and presumably unobservable ways from Vietnam era veteran males. Thus the differential declines in labor supply observed here may have occurred even in the absence of this policy change. A definitive test of the labor supply response to the extension of VDC benefits awaits better data (which we are currently compiling).

Accurately measuring the magnitude of income and substitution effects of receipt of transfer income on labor supply is critical for improving U.S. disability policy. While economists have typically regarded the substantial reductions in labor force participation associated with receipt of disability benefits as an incentive problem (i.e., a substitution effect), it appears plausible to us that a significant share of this response is explained by the (non-incentive) income effect. When granted permanent, inflation-indexed income and government-provided medical insurance, many near-elderly adults in moderate to poor health may prefer an early retirement to continued labor force participation. If so, there may be limited scope for public policy to increase return-to-work among non-elderly disability recipients by reducing the implicit tax on labor income as, for

example, is done by the Social Security Administration's Ticket-to-Work program. For this reason and the others outlined above, further study of the effect of the labor supply effects of the VDC program—which currently provides cash benefits and health insurance to more than 11 percent of military veterans—is warranted.

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Figure 1. Number of Veterans Disability Compensation Recipients, 1976 - 2006

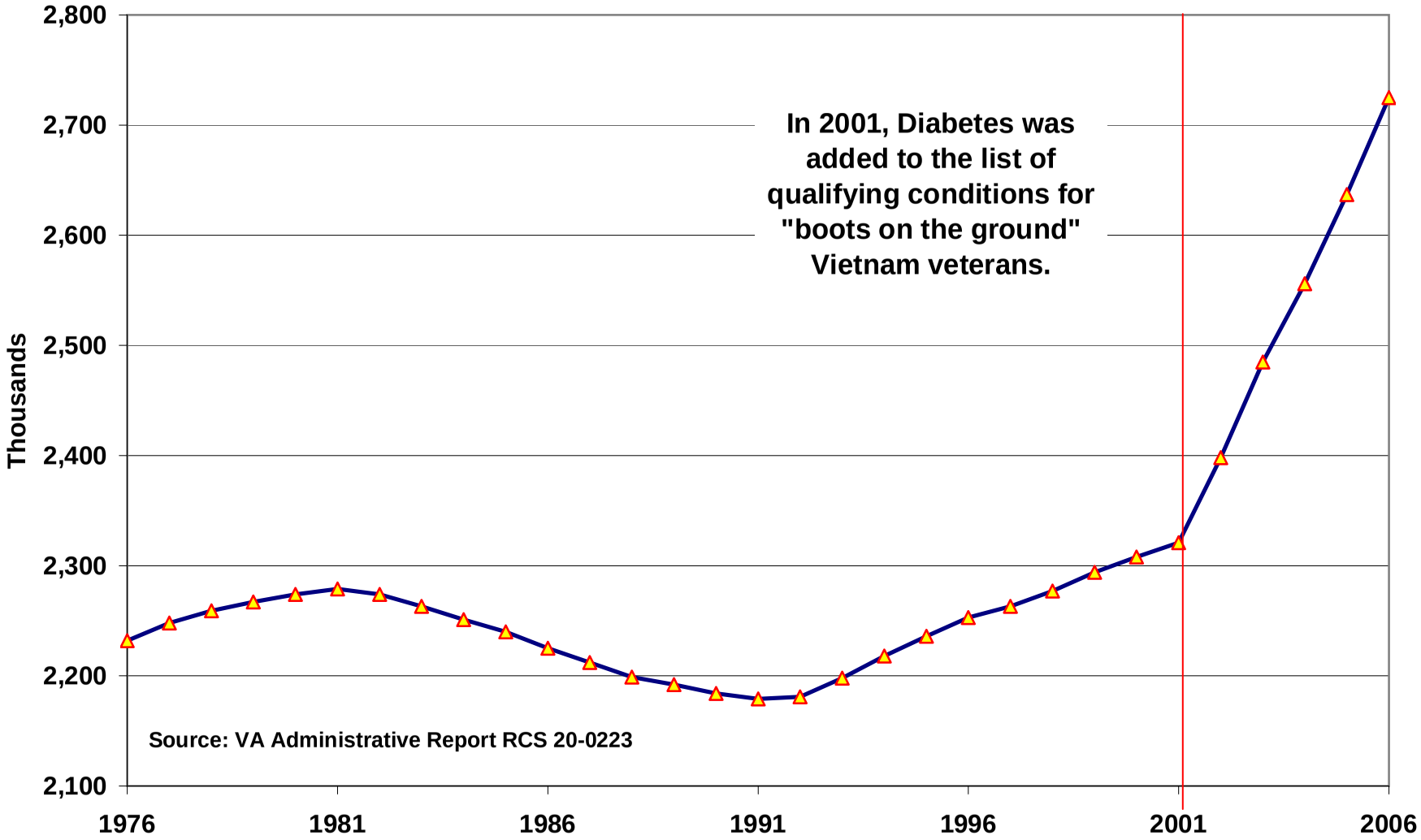

Figure 2. Utility Value of Early and Normal Retirement as a Function of Potential Earnings and Disability Program: Retirement Contingent and Non-Contingent

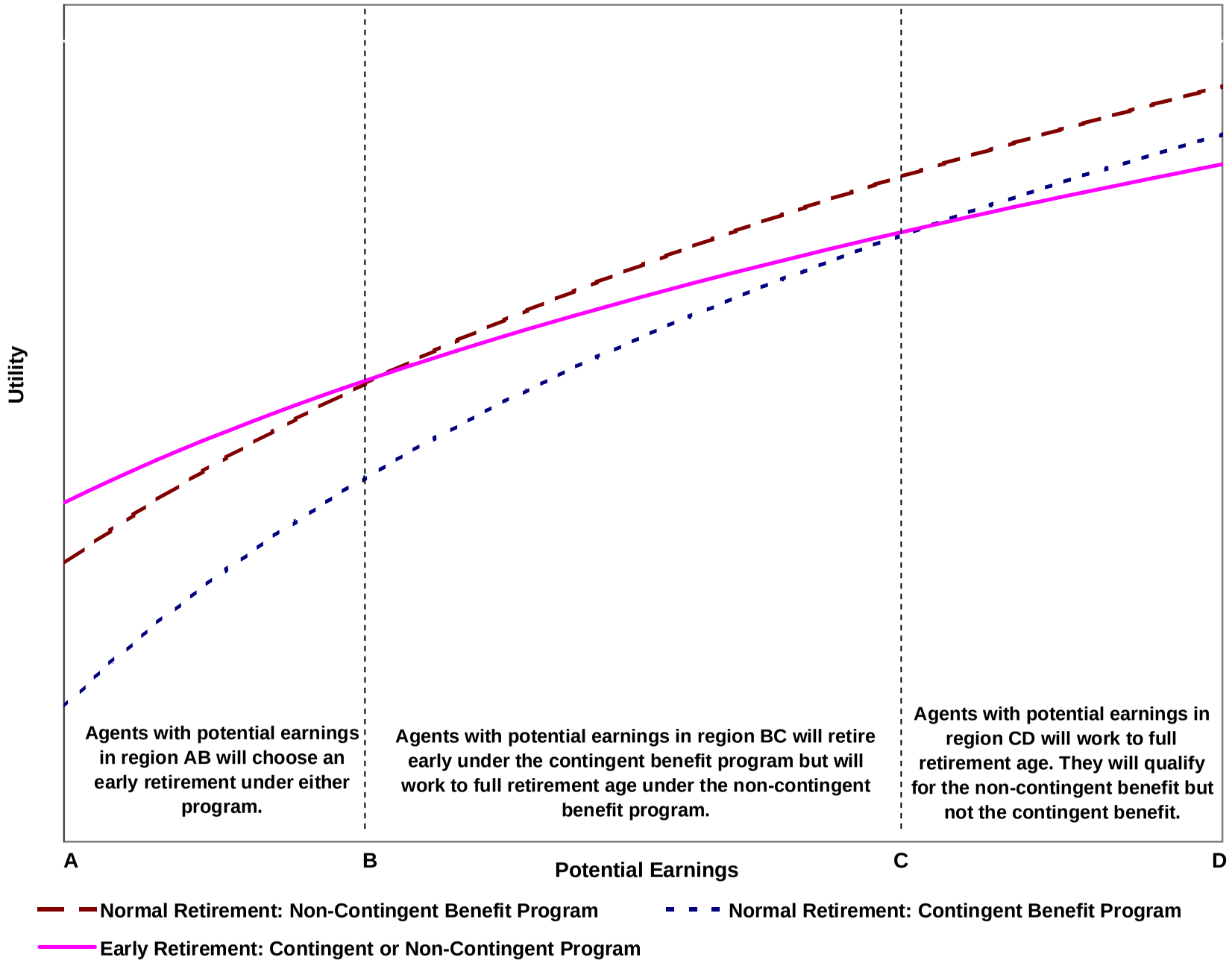

Table 1: Veteran Status of Men by Year-of-Birth in the March 2001 CPS

Year-of-Birth	% of Vietnam Era Veterans	Fraction of Men: Vietnam Era	Other Vet	Non Veteran	# of Obs
< 1936	3.6%				
1936	0.9%	7.2%	40.5%	52.3%	405
1937	1.1%	8.2%	35.0%	56.8%	463
1938	1.2%	8.9%	31.4%	59.7%	460
1939	2.1%	13.7%	24.6%	61.7%	502
1940	2.0%	14.2%	18.6%	67.2%	474
1941	**3.3%**	**22.0%**	17.0%	61.0%	510
1942	**4.9%**	**27.5%**	10.3%	62.2%	604
1943	**6.0%**	**32.3%**	9.5%	58.3%	604
1944	**6.4%**	**32.5%**	6.7%	60.8%	658
1945	**7.0%**	**38.3%**	4.7%	57.0%	600
1946	**9.4%**	**41.3%**	2.6%	56.1%	789
1947	**10.1%**	**43.7%**	3.2%	53.2%	798
1948	**8.1%**	**34.6%**	2.6%	62.9%	808
1949	**7.3%**	**30.2%**	2.0%	67.8%	824
1950	**6.2%**	**23.9%**	3.1%	73.0%	866
1951	**4.7%**	**18.1%**	2.0%	80.0%	855
1952	**4.2%**	**16.0%**	3.6%	80.5%	895
1953	3.2%	12.0%	4.5%	83.5%	904
1954	3.0%	10.1%	7.3%	82.6%	975
1955	2.7%	8.8%	5.2%	86.0%	987
> 1955	2.6%				

Table summarizes data by year-of-birth for men from the March 2001 CPS. The second column represents the fraction of Vietnam era veterans with each year-of-birth (estimated as 2001 - age - 1). The next three columns list the fraction of men with each year-of-birth who are Vietnam era veterans, veterans from other eras, or non-veterans, respectively. The final column lists the number of men in the March 2001 CPS with each year of birth. All fractions are weighted by March CPS person weights.

Table 2: Sources of Income Before and After the 2001 Policy Change: Vietnam Era Veteran vs. Non-Veteran Males

Panel A: 100 x Dummy Variable Indicating Receipt of Positive Income in Category

	(1A)	(2A)	(3A)	(4A)	(5A)	(6A)	(7A)	(8A)
	Any Earnings	Any VA	Any SocSec	Any Oth Ret	Any Oth Dis	Any Oth Govt	Any Inv Inc	Any Oth Inc
Vietnam Era Vet	0.73	7.23***	-0.60	3.75***	0.22	-0.37	2.09***	0.22
	(.61)	(.40)	(.39)	(.50)	(.39)	(.34)	(.83)	(.24)
VEV * Post	-3.58***	1.54***	1.77***	1.75**	-0.50	.76*	-0.29	-0.15
	(0.82)	(.51)	(.54)	(.69)	(.49)	(.44)	(1.04)	(.29)
Mean	81.7%	3.2%	8.0%	10.0%	5.2%	4.5%	58.8%	1.8%
R-squared	0.084	0.053	0.096	0.065	0.027	0.009	0.144	0.004

Panel B: Amount of Income of Each Component

	(1B)	(2B)	(3B)	(4B)	(5B)	(6B)	(7B)	(8B)
	Earnings	VA Income	Soc Sec Inc	Oth Ret Inc	Oth Dis Inc	Oth Govt Inc	Inv Income	Oth Income
Vietnam Era Vet	-2175**	919***	-52	1100***	133*	-38*	134	-24
	(1081)	(82)	(51)	(162)	(76)	(21)	(236)	(25)
VEV * Post	-1802	220**	208***	389*	-37	72**	-307	17
	(1341)	(102)	(75)	(223)	(97)	(31)	(275)	(34)
Mean Value	50,477	389	956	2,443	605	215	2,805	116
R-squared	0.138	0.026	0.071	0.047	0.007	0.005	0.040	0.002

Panel A presents the coefficient estimates from linear probability models, with each dependent variable multipled by 100. Panel B presents the results from specifications in which the dependent variable is the dollar amount (adjusted to 2005 dollars) of each income type. The dependent variable for each specification is listed at the top of each column. All specifications include race (3 categories) by year interactions, education (4 categories) by year interactions, and age (12 single year categories) by year interactions. The number of observations is 75,952 in all specifications. Sample includes all Vietnam era veteran males and all non-veteran males born between 1941 and 1952 inclusive (with year-of-birth approximated as survey year - 1 - age). Seven years of the March CPS (2000-06) are used. The sum of the income measures in the second panel equals PTOTVAL - the total persons income. Specifications are weighted by person weights (scaled by the inverse of the sum of person weights for the sample) and robust standard errors are included in parentheses.

Table 3: Labor Force Attachment Before and After the Policy Change: Vietnam Era Veteran vs. Non-Veteran Males

Dependent Variable: 100 x Dummy Variable Indicating Receipt of Positive Income in Category

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	NILF?	NILF - Retired?	NILF - Disabled?	NILF - Other?	Zero Work Hrs	Weeks Worked	Any Disability?
Vietnam Era Vet	0.36	.92**	0.09	-.66**	0.17	0.41	1.47**
	(.64)	(.41)	(.47)	(.27)	(.72)	(.32)	(.59)
VEV * Post3	3.21***	1.77***	1.31**	0.12	3.52***	-2.11***	1.30*
	(.85)	(.59)	(.61)	(.34)	(.94)	(.43)	(.75)
Mean	20.1%	8.6%	8.6%	2.8%	25.8%	4028.0%	13.5%
R-squared	0.091	0.086	0.068	0.008	0.080	0.091	0.062

The dependent variable for each specification is listed at the top of each column. All specifications except for (6) are estimated as linear probability models, with each dependent variable multipled by 100. All specifications include race (3 categories) by year interactions, education (4 categories) by year interactions, and age (12 single year categories) by year interactions. The number of observations is 75,952 in all specifications. Sample includes all Vietnam era veteran males and all non-veteran males born between 1941 and 1952 inclusive (with year-of-birth approximated as survey year - 1 - age). Seven years of the March CPS (2000-06) are used. Specifications are weighted by person weights (scaled by the inverse of the sum of person weights for the sample) and robust standard errors are included in parentheses.

Distinguishing Income from Substitution Effects in Disability Insurance.

Appendix: A Model of Early Retirement Decisions under Work-Contingent and Non-Contingent Benefit Programs

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1 A three period model of early retirement decisions under work-contingent and non-contingent benefit programs

1.1 The initial consumption path

Though many features of the VDC and SSDI programs differ, the crucial distinction that we focus on here is that the SSDI program is work-contingent (thus, inducing both income and substitution effects) while the VDC program is not (thus, inducing only substitution effects). To contrast the behavioral and welfare differences that follow from this distinction, we present a brief model of work and retirement decisions among working-age disabled in which we compare two otherwise identical cash transfer programs that differ only in one respect: whether or not receipt of transfer income requires early retirement.

Consider an economy composed of agents who live for three periods. In the first period, agents work with certainty and have the option to save. In the second period, they may continue to work and save or may choose to retire and consume out of savings. In the third period, they receive retirement benefits, $b > 0$, consume out of savings and do not work. All agents have the time-separable per-period utility of $u(c, \theta)$: $u_{it} = \ln(c_{it}) - \theta_i$, where is consumption in period and is the disutility of work conditional on working. So that all agents work at least one period, we set the disutility of work to zero in period one for all agents. The wage of an agent if he participates in the labor market is $w_i > 0$. There is no discounting or uncertainty.

An agent's plan consists of a set of three consumption choices, $C_i = \{c_{1i}, c_{2i}, c_{3i}\}$ and an associated labor supply choice—in particular, whether to supply labor in period 2 or instead retire early. Let $R_i \in \{0, 1\}$ be a dummy variable equal to one if the agent chooses an early retirement.

Suppressing individual subscripts, the agent's maximization problem is:

$$\begin{aligned} \max_{c_1, c_2, c_3, R} U &= \ln(c_1) + \ln(c_2) + \ln(c_3) - (1 - R)\theta, \\ s.t.\ c_1 + c_2 + c_3 &\leq w(2 - R) + b \\ R &\in \{0, 1\}. \end{aligned}$$

Since the retirement choice is discrete, this problem is solved by computing the agent's optimal consumption path under each retirement choice and then comparing utility levels. Given non-satiation and state-independent utility, the agent's optimal consumption path will be given by $c_1, c_2, c_3 = [w(2 - R) + b]/3$.

The agent choose an early retirement iff:

$$\theta > 3 \ln\left(\frac{2w + b}{w + b}\right) \tag{1}$$

Early retirement is more likely if: (1) the disutility of work is high; (2) the retirement benefit is large;[1] or (3)

[1] Note that $\partial \ln[(2w + b)/(w + b)]/\partial b < 0$.

wage income is low (since, for low wage workers, the consumption gain from working is small relative to the disutility of labor).[2]

1.2 An unanticipated non-contingent cash benefit

Consider a set of agents who at the start of period two receive an unanticipated non-contingent cash transfer of $v > 0$ for each of the remaining two periods, where v (loosely) represents the Veterans Disability Compensation program. Because receipt of this transfer is unanticipated, it does not affect the initial consumption plan.

Due to the rise in permanent income, some agents may change their retirement plans. Consider an agent who had originally planned to work until the full retirement age. If he continues with this plan and receives v, his sum of periods two and three utility is $2\ln\left(v+\frac{1}{3}(2w+b)\right)-\theta$.If the agent instead choose an early retirement, the sum of periods two and three utility becomes $2\ln\left(v+\frac{1}{2}\left(w+b-\frac{1}{3}(2w-b)\right)\right)$.Thus, receipt of v causes an agent who was *not* planning to retire early to change his plan iff:

$$\theta > 2\ln\left(\frac{v+\frac{2}{3}w+\frac{1}{3}b}{v+\frac{1}{6}w+\frac{1}{3}b}\right).$$

This change of plans reflects the pure income effect of transfer income on labor supply. An (unanticipated) early retirement is more likely if (1) the disutility of work is high; (2) the cash benefit is large;[3] or (3) the wage is low.[4]

Note that receipt of v weakly increases the likelihood of retirement for all agents. Consider an agent who had initially planned to retire early (thus, $\theta > 3\ln\left(\frac{2w+b}{w+b}\right)$ in equation (1)). It is helpful to first establish that, absent v, this agent will not change his plan to retire in period two. The sum of periods two and three utility given early retirement is $2\ln\left(\frac{1}{3}(w+b)\right)$.If the agent instead chooses *not to* retire in period two, the sum of periods two and three utility will be $2\ln\left(\frac{1}{3}(2w+b)-\frac{1}{3}(w+b)\right)-\theta$.We have already established that for this agent that $\theta > 3\ln\left[(2w+b)/(w+b)\right]$.To demonstrate that the agent will not deviate from the initial plan, we need to show that

$$\begin{aligned}\theta \quad &> \quad 3\ln\left(\frac{2w+b}{w+b}\right) \Longrightarrow \theta > 2\ln\left(\frac{\frac{5}{6}w+\frac{1}{3}b}{\frac{1}{3}(w+b)}\right),\\ &\Longrightarrow \quad 3\ln\left(\frac{2w+b}{w+b}\right) > 2\ln\left(\frac{\frac{5}{6}w+\frac{1}{3}b}{\frac{1}{3}(w+b)}\right).\end{aligned}$$

Rearranging the prior inequality, we obtain:

$$3\ln\left(\frac{1}{3}(2w+b)\right) > 2\ln\left(\frac{5}{6}w+\frac{1}{3}b\right)+\ln\left(\frac{1}{3}(w+b)\right). \tag{2}$$

[2] Note that $\partial\ln\left[(2w+b)/(w+b)\right]/\partial w > 0$.
[3] Note that $\partial\ln\left[\left(v+\frac{2}{3}w+\frac{1}{3}b\right)/\left(v+\frac{1}{6}w+\frac{1}{3}b\right)\right]/\partial v < 0$.
[4] Note that $\partial\left[\left(v+\frac{2}{3}w+\frac{1}{3}b\right)/\left(v+\frac{1}{6}w+\frac{1}{3}b\right)\right]/\partial w > 0$.

Since $3\left(\frac{1}{3}(2w+b)\right) = 2\left(\frac{5}{6}w + \frac{1}{3}b\right) + \frac{1}{3}(w+b)$, this condition is satisfied by Jensen's inequality.

Given inequality (2), it is immediate that receipt of v will *also* not cause this agent to change his retirement plan since:

$$\theta > 2\ln\left(\frac{\frac{5}{6}w + \frac{1}{3}b}{\frac{1}{3}(w+b)}\right) > 2\ln\left(\frac{v + \frac{5}{6}w + \frac{1}{3}b}{v + \frac{1}{3}(w+b)}\right).$$

Thus, receipt of v will induce early retirement among those with high disutility of work and low income. The larger is v, the larger is the share of the working population that will choose an early retirement.

1.3 An unanticipated work-contingent cash benefit

Consider now a set of agents who at the start of period two receive an unanticipated work-contingent cash transfer of $\dot{d} > 0$ for the remaining two periods, where d (loosely) represents the SSDI program. Let the transfer payments from programs d and v and be identical, so the sole distinction between the two programs is that receipt of d in the second period is contingent upon early retirement whereas receipt of v in the second period is unconditional. How do these two programs differ in terms of retirement outcomes and economic efficiency?

For two groups of agents, programs d and v and are economically equivalent. Agents who would choose an early retirement upon receiving d will behave identically upon receiving v, since the work constraint will not bind. Similarly, agents who had planned an early retirement in the absence of d will not change their retirement plans upon receiving d.

There are, however, two groups of agents who will be differentially affected by the two programs. A first is the group of agents for whom the work constraint binds, leading to early retirement under d. These agents are characterized by the following inequality:

$$2\ln\left(\frac{v + \frac{2}{3}w + \frac{1}{3}b}{v + \frac{1}{6}w + \frac{1}{3}b}\right) \geq \theta > 2\ln\left(\frac{\frac{1}{2}d + \frac{2}{3}w + \frac{1}{3}b}{d + \frac{1}{6}w + \frac{1}{3}b}\right).$$

Because these agents would otherwise work until the full retirement age if receipt of the transfer payment were not work-contingent, their early retirement represents a deadweight loss, stemming from the substitution effect. Implicitly, these agents are paid d to retire early. The likelihood that this inequality is satisfied is initially rising and then falling in the wage.

A second set of agents differentially affected by d and v are those who will choose to forfeit the transfer payment d in period two rather than retire early. These agents are characterized by the following inequality:

$$2\ln\left(\frac{\frac{1}{2}d + \frac{2}{3}w + \frac{1}{3}b}{d + \frac{1}{6}w + \frac{1}{3}b}\right) > \theta.$$

Although these agents would receive a period two transfer payment under the v program but not the d program,

the lack of a behavioral effect of either program indicates that there is no efficiency loss from their *not* receiving this transfer payment. The likelihood that this inequality holds is rising in the wage.[5]

2 Summarizing

The key results of the model are summarized in Appendix Figure 1.[6] Holding benefit levels (b, v, d) and disutility of labor (θ) constant, the model allows us to divide the population into four distinct groups differentiated by potential earnings:

1. The lowest wage group of agents, those in wage range $A - A'$ in Appendix Figure 1 (satisfying $\theta > 3\ln\left[(2w+b)/(w+b)\right]$), will retire early independent of receipt of d or v.

2. The next lowest wage group of agents, those in wage range $A' - B$ in Appendix Figure 1 (satisfying $3\ln\left[(2w+b)/(w+b)\right] > \theta > 2\ln\left[\left(v+\frac{5}{6}w+\frac{1}{3}b\right)/\left(v+\frac{1}{3}(w+b)\right)\right]$), will retire early upon receiving either d or v but would otherwise work. Because labor supply decisions are not distorted for these agents, there is no deadweight loss from either program (except through taxation).

3. Middle income workers, those in wage range $B - C$ in Appendix Figure 1 (satisfying $2\ln\left[\left(v+\frac{5}{6}w+\frac{1}{3}b\right)/\left(v+\frac{1}{3}(w+b)\right)\right]) \geq \theta > 2\ln\left[\left(\frac{1}{2}d+\frac{5}{6}w+\frac{1}{3}b\right)/\left(d+\frac{1}{3}(w+b)\right)\right]$), will choose to retire early to obtain d but would remain in the labor force if receiving v. Hence, d the program generates a deadweight loss by distorting retirement decisions for these agents.

4. High income workers, those in wage range $C - D$ in Figure 2 (satisfying $2\ln\left[\left(\frac{1}{2}d+\frac{5}{6}w+\frac{1}{3}b\right)/\left(d+\frac{1}{3}(w+b)\right)\right] > \theta$), will not retire early if offered either or d or v. As with the first two groups of agents there is no behavioral distortion. But this high income group will forego receiving d in period 2, which is desirable if taxation incurs a deadweight loss.

The contrast between groups (3) and (4) highlights a trade-off in the design of income transfer programs. Imposing a non-work constraint (as in program d) increases deadweight losses by inducing early retirement among work-ready beneficiaries. Simultaneously, it increases target efficiency by reducing the incentive for high-income workers to claim transfer benefits.[7]

We finally emphasize that this illustrative model differs in two central respects from the VDC and SSDI programs. First, in practice, the size of Veterans Disability Compensation transfer payments are increasing in

[5] Note that $\partial \ln\left[\left(\frac{1}{2}d+\frac{2}{3}w+\frac{1}{3}b\right)/\left(d+\frac{1}{6}w+\frac{1}{3}b\right)\right]/\partial w > 0$.

[6] Parameter values used to create this figure are $b = d = 0.4$, $\theta = 0.4$, $w \in [0, 1]$.

[7] It is immediate from our model that the social gains from transfers are smaller for high than low earnings workers, since high earnings workers will have lower marginal utility of consumption. Albert L. Nichols and Richard J. Zeckhauser (1982) discuss the tradeoff between increasing targeting efficiency of transfer programs and restricting the behavior of beneficiaries.

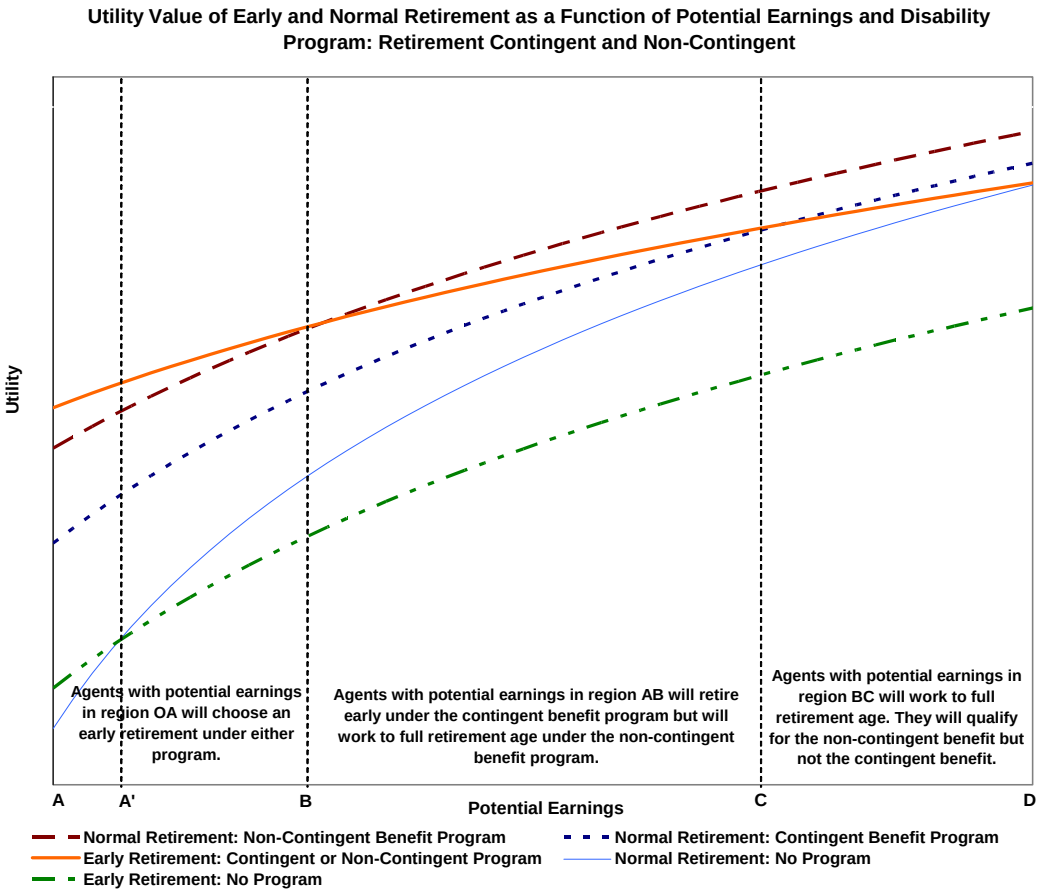

Figure 1: Appendix

the severity of disability but independent of past earnings, meaning that v is likely to depend positively on an agent's disutility of work. This feature should *increase targeting efficiency* of VDC relative to a similar program with a flat benefit. Second, under the SSDI program, the amount of the transfer benefit depends positively on past earnings but is independent of the degree of disability. This feature is likely to *increase labor supply distortions* from the SSDI program since, holding disutility of work constant, high income workers will face a stronger incentive to exit the labor force to qualify for SSDI benefits than they would under a similar program with a flat benefit.