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Douglas Holtz-Eakin
Syracuse University

John W. Phillips
University of California, Los Angeles

Harvey S. Rosen
Syracuse University

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**ESTATE TAXES, LIFE INSURANCE, AND
SMALL BUSINESS**

**Douglas Holtz-Eakin, John W. Phillips
and Harvey S. Rosen**

**Center for Policy Research
Maxwell School of Citizenship and Public Affairs
Syracuse University
Syracuse, New York 13244-1020**

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Abstract

One criticism of the estate tax is that it prevents the owners of family businesses from passing their enterprises onto their children. The problem is that it may be difficult to pay estate taxes without liquidating the business. A natural question is why individuals with such concerns do not purchase enough life insurance to meet their estate tax liabilities. This paper examines whether and how people use life insurance to deal with the estate tax. We find that, other things being the same, business owners purchase more life insurance than other individuals. However, on the margin, their insurance purchases are less responsive to estate tax considerations and they are less likely to have the wherewithal to meet estate tax liabilities out of liquid assets plus insurance.

1. INTRODUCTION

The United States estate tax raises little revenue. In 1999, it is projected to generate about \$24 billion from the 49,200 estates that are subject to the tax.¹ Nevertheless, the tax engenders a lot of complaints. Particularly vocal are the owners of family businesses, who bemoan the fact that estate taxes prevent them from passing their enterprises onto their children. Thus, for example, one Daisy Crowder, the owner of a small construction company with her husband, pointed out that they had “plowed the earnings from their business for years into equipment, building, land and other assets to help expand.” As a result they had little cash or other liquid wealth and she was fearful that her four children would be forced to sell some or all of the business to pay the [estate tax] bill when she and her husband died” (Stevenson [1997]). A case that recently made headlines concerned John Senstacke, the owner of the nation’s largest chain of African-American newspapers. Senstacke and his children all wanted to keep the business in the family. But when Mr. Senstacke died, his estate’s tax liability was \$4 million. The estate did not have enough cash to pay the bill, and the children feared that parts of the chain would have to be sold off in order to pay the taxes (Christian [1998, p. D1]).

The discussion sometimes becomes quite emotional. The president of the National Federation of Independent Business argued that because of the estate tax, people who “are dealing with the death of a loved one [also] have the IRS coming in and trying to rip what’s left out of the heart of the family”(Stevenson [1997]). Surveys of small businesses suggest that these concerns are widespread. For example, a survey by Travis Research Associates [1995, p. 13] said that 65 percent of the family business owners interviewed indicated that the federal estate tax would make survival of the family business significantly more difficult or impossible.

As one considers both the overheated rhetoric and the survey results, a natural question

arises: If the owner of a business is truly concerned that it will be difficult to pay estate taxes without liquidating the enterprise, then why not purchase enough life insurance to pay for the taxes? Indeed, a survey conducted by Arthur Andersen [1997] indicated that more than two-thirds of family business owners expected life insurance to be the primary source of funds to cover estate taxes. But the Andersen sample included only firms with annual sales in excess of a million dollars, and what is true for such large enterprises may not be true for smaller ones: “smaller businesses don’t generate the surpluses necessary to be socked away in life insurance policies” (Jenkins [1997, p. A19]). Even if a business owner purchases insurance, it may not be enough to cover the estate tax. After all, the market value of a business is often difficult to estimate, leading to problems in predicting estate tax liability (Bosland [1963, p. 161]). (Of course, such uncertainty could equally well induce business owners to purchase excessive life insurance). Indeed, even individuals who do not own businesses may also want to use life insurance to help pay for estate tax liability if there are illiquid assets in their estates.

To what extent do people use life insurance to provide the wherewithal to meet estate tax liabilities? We know of no econometric research aimed at answering this question.² The purpose of this paper is to examine whether and how people use life insurance to deal with the estate tax. We focus particularly on business owners because of the aforementioned concerns that the estate tax is particularly harmful to them due to the illiquid nature of their assets.

To proceed, in the next section we sketch the analytic underpinnings of our analysis. In the third section, we discuss the data and present some preliminary evidence. The fourth section motivates the econometric specification and reports our results. We find that, other things being the same, business owners purchase more life insurance than other individuals. However, on the margin, their insurance purchases are less responsive to estate tax considerations and they are

less likely to have the wherewithal to meet estate tax liabilities with only liquid assets plus insurance. The final section provides a summary and conclusions.

2. ANALYTIC PRELIMINARIES

Our focus is on the incentives to employ life insurance as a means to meet the cash-flow requirements of the estate tax. To fix ideas, suppose that the business owner has a total wealth of \bar{W} consisting of \bar{B} in business assets and \bar{L} of liquid assets; $\bar{W} = \bar{B} + \bar{L}$. The individual obtains utility both from passing along her wealth (including business assets) in the event of death and consuming her wealth during life. If π is the probability of death, the goal is to maximize expected utility:

$$(1 - \pi)U(W_l) + \pi V(W_d) \tag{1}$$

where W_l is wealth to be enjoyed if the individual lives and W_d is wealth transferred in the event of death. The presence of the estate tax raises the possibility that the individual will not be able to pass along the entire business as part of W_d . Specifically, if the tax liability, T , exceeds liquid assets, then the estate is forced to liquidate the business in order to meet the tax liability.

However, by their nature, the business assets are illiquid and have greater value in place than upon liquidation, requiring the sacrifice of more than a dollar of business value in order to obtain each dollar for the tax collector. Alternatively, the individual could purchase insurance, I , at a price p to meet the estate tax. In doing so, however, the individual reduces liquid wealth:

$$L = \bar{L} - pI \tag{2}$$

Thus,

$$W_l = \bar{B} + \bar{L} - pI . \quad (3)$$

While the purchase of insurance decreases W_l , it reduces cash flow constraints associated with the estate tax. Specifically,

$$W_d = \bar{B} + L + I - T - \psi[T - (L + I)] \quad (4)$$

where ψ is a positive constant that reflects the penalty for liquidating business assets.³ For simplicity, assume that the estate tax is levied at a proportional rate τ on a base that equals the sum of business assets (\bar{B}), liquid assets (L) and insurance (I)

$$T = \tau[\bar{B} + L + I] , \quad (5)$$

so that

$$W_d = \bar{B}(1 - (1 + \psi)\tau) + [\bar{L} + (1 - p)I](1 + \psi)(1 - \tau) . \quad (6)$$

The interior solution to the problem of optimal purchase of insurance is

$$(1 - \pi)U'(W_l)p = \pi V'(W_d)(1 + \psi)(1 - \tau)(1 - p) . \quad (7)$$

Assuming that insurance is priced on an actuarially fair basis ($p = \pi$) allows us to reduce this condition to⁴

$$U'(W_l) = V'(W_d)(1 + \psi)(1 - \tau) . \quad (8)$$

Intuitively, the left hand side of equation (8) is the utility lost by giving up a dollar to obtain insurance. This dollar of life insurance generates two benefits, which appear on the right hand side. The first is simply the transfer of \$1 to the beneficiary. The second is the value of relaxing the cash flow constraint.

In the empirical analysis to follow, we focus on the extent to which insurance is used to fill the “gap”, G , between tax liability and liquid assets, conditional upon the individual’s net wealth, health status, the structure of the estate tax, and so forth. In the terms of the simple

framework we have developed, we seek to estimate how the individual's insurance decision changes when the gap changes, for fixed values of \bar{W} , π , and τ . To interpret such a conceptual experiment within our framework, notice that a \$1 reduction in liquid assets that is offset by a \$1 increase in business assets leaves the individual's net wealth and estate tax liability unchanged, but generates a \$1 increase in the gap between tax liability and liquid assets plus insurance.

Thus, our interest is in

$$\frac{\partial I}{\partial G} \equiv \frac{\partial I}{\partial \bar{B}} - \frac{\partial I}{\partial \bar{L}} = \frac{(1 + \psi)(1 - \tau) V''(W_d) [(1 + \psi)(1 - \tau) - (1 - (1 + \psi)\tau)]}{U''(W_l)p + (1 + \psi)^2(1 - \tau)^2 V''(W_d)(1 - p)} \quad (9)$$

which is unambiguously positive under our assumption that $\psi > 0$.⁵

Our discussion has focused on the illiquid nature of business assets. But the same considerations apply to other illiquid assets, such as housing. Thus, while one might expect concerns about illiquidity and estate taxes to be most pronounced for owners of small businesses, they may be present more generally. At the same time, one must stress that it does not seem safe to *assume* that people deal rationally with estate tax matters. As Poterba [1997, 1998] and others have pointed out, for example, donors do not take full advantage of even simple estate tax avoidance strategies such as *inter vivos* transfers.

3. DATA

The basic idea behind our empirical strategy is straightforward. As shown above, to the extent individuals are concerned that their estates have insufficient liquidity to pay estate taxes, they will buy insurance to fill the gap. This suggests an empirical specification in which the amount of insurance demanded is a function of the gap between liquid assets and estate tax liability, *inter alia*. Estimating such a model allows us to find the marginal effect of an increase

in the gap on insurance demand. Further, with information on the ownership of business assets, one can determine whether those who own businesses and those who do not behave differently in this respect. A related but distinct issue is whether insurance and liquid assets are sufficient to cover the entire estate tax liability. That is, can estate taxes can be paid without the heirs having to sell any illiquid assets?

The starting point for finding an appropriate data set is the observation that the older segment of the population is particularly likely to be sensitive to estate tax issues. Thus, for our analysis we pool two nationally representative samples of older persons, the Health and Retirement Study (HRS) and the Asset and Health Dynamics among the Oldest Old Survey (AHEAD).

The HRS began in 1992 with a random sample of noninstitutionalized men and women aged 51 to 61 and their families. Respondents who are not in the age range of 51 to 61 can appear in the sample only if they are married to an age-eligible respondent. A reinterview will occur every two years for the next decade. Currently, the HRS has two waves of data available for public use; we study the 1992 wave. The baseline survey contains 12,652 respondents from 7,607 households, which includes an oversample of blacks, Hispanics, and residents of the state of Florida. The sample also includes a set of household and respondent level weights that make it possible to compute statistics that are representative of the national population of individuals aged 51 to 61. A more detailed discussion of the HRS can be found in Juster and Suzman [1995].

The AHEAD has 8,223 respondents aged 70 and older from 6,052 households who were surveyed between October 1993 and July 1994.⁶ Much like the HRS, oversampling of particular groups and exceptions to the age-eligibility screen influence the composition of the sample, and

the survey contains sample weights. (For further details, see Soldo, Hurd, Rodgers, and Wallace [1997].)

3.1 Key Variables

Although the two data sources focus on different populations, pooling them is not difficult because of substantial overlap in the questions that concern us. The combined sample provides information on 13,659 individuals who answered a quite complete set of questions on their financial circumstances. For our purposes, a critical question is “Do you [or your (husband/wife/partner)] own part or all of a business?” If the respondent responds affirmatively, he or she is classified as being a business owner.

The survey questions distinguish between two types of life insurance, *term insurance* and *whole insurance*.⁷ Term insurance offers coverage during a specific time period, and it pays a benefit only if the holder dies during the term. Premiums generally increase as one grows older. Whole insurance usually has cash surrender value, meaning that one can cancel all or part of the policy, and receive the cash value as a lump sum. Premiums for whole insurance are paid periodically, and generally are constant over the policy’s duration. Whole life policies earn annual dividends based on a variety of considerations, and these dividends are income tax deferred. Term insurance generally does not have any cash surrender value.

Which type of insurance is more relevant in our context? A whole life policy is an amalgam of insurance and a tax-preferred savings vehicle, while a term policy is more purely for insurance. Hence, we believe that term insurance offers a cleaner measure of insurance demand, and it will be our main focus.⁸ However, given that there is clearly an insurance component to whole policies, we examine them as well.⁹

As noted earlier, a critical question is the extent to which liquid assets plus insurance cover the expected estate tax liability. Our data ask about holdings of a variety of assets; deciding which ones are “liquid” is not obvious because there is a continuum with respect to how easy it is to convert assets into cash. Rather than commit ourselves to a single definition, we use three: 1) checking accounts, savings accounts, and CDs; 2) the assets included in (1) plus stocks; and 3) the assets included in (2) plus bonds. We create the variable GAP_i , which is the estimated estate tax liability minus the value of assets in group i , provided that the difference is positive. If the value is negative, then GAP_i is equal to zero. The reason for the truncation is that, in effect, GAP_i represents the component of life insurance demand generated by the estate tax, and this source of demand disappears when taxes are less than “liquid assets.”¹⁰

Because the proceeds from insurance policies are subject to the estate tax, the GAP_i variables are likely to be endogenous in any insurance demand equation. Hence, in all our empirical work, we compute GAP_i net of insurance. While solving the endogeneity problem, this slightly complicates the interpretation of the parameter estimates. Specifically, a \$1 increase in insurance raises the gap by an amount equal to the individual’s marginal estate tax rate. This, in turn, increases the amount of insurance to cover estate tax liability, with further repercussion on both the size of the gap and insurance demand. Because the marginal tax rate is less than one, the process converges. In Section 5 below, when we discuss the implications of our results, we take this process into account.

Computation of the various GAP variables requires an estimate of the respondent’s expected estate tax liability, which is not asked in the survey. We construct a simple tax calculator in which the taxable estate is computed as net worth (defined below) plus the value of all life insurance policies minus \$600,000 for single respondents and \$1,200,000 for married

respondents.¹¹ (These were the relevant exemptions in 1992.) The tax liability is then found by applying the relevant rate schedule. Marginal rates ranged from 37 percent to 55 percent, with the latter figure applying to the amount of the taxable estate exceeding \$3,400,000.¹²

This tax calculator is quite crude, but it is hard to know how great a handicap this creates. As is well known, there are many estate tax avoidance techniques, several quite exotic. Some commentators argue that business owners aggressively exploit such techniques: “Most owners of small businesses and firms do not pay the estate tax” (Burman [1997, p. 675]). To the extent this portrayal is accurate, our estimates of the gap become less valid. However, this view is not universally held. A number of stringent conditions must be met in order to qualify for various breaks (see Joint Committee for Taxation [1998, pp. 4-5]). Indeed, the Arthur Anderson [1997] study argues that “A significant number are missing out on estate-planning and tax-reduction opportunities, e.g., 43.4 percent do not routinely use the \$10,000 annual gift exclusion for their children.” As noted earlier, Poterba’s [1997, 1998] results support the notion that many individuals fail to exploit opportunities to reduce estate taxes. On this basis, we think that results generated by a simple tax calculator will provide useful information. That said, we discuss below an alternative specification that allows for the possibility that the calculation may be inappropriate for households with very high wealth.

3.2 A Preliminary Look at the Data

In our sample 10.7 percent of the respondents own businesses. (See Table 1 for means and standard deviations of the variables.) Forty-nine percent of the entire sample owns term insurance; the incidence is higher among business owners, 54.7 percent. Business owners are also more likely to buy whole insurance; 51.9 percent versus 32.2 percent of the entire sample.

Business owners are not only more likely to buy insurance; conditional on purchase, they buy a larger amount. The conditional mean of term insurance for business owners is \$113,000. In the sample as a whole, it is \$48,200.

Might some of this insurance be “for” meeting estate tax liabilities? One way to start answering this question is to see if there is, in fact, a gap between individuals’ estimated estate tax liabilities and their liquid assets. The figures in Table 1 indicate that for the sample as a whole, there is in fact such a gap: \$12,368 on average using a narrow definition of liquid assets; \$8,730 including stocks; and \$8,250 including bonds as well. For the sample of business owners, the gaps are considerably higher: \$77,290, \$60,900, and \$57,600, respectively, for the three definitions of liquid assets. It might appear, then, that some of the business owners’ higher demand for insurance is driven by a larger gap between liquid assets and estimated estate tax liability. But extreme caution is required because, as Table 1 indicates, business owners differ in other ways from the sample as a whole: they have higher net worth; higher income; and they are less likely to be female and more likely to be married, among other things.¹³ Hence, a multivariate approach is required when investigating the links between business ownership and the demand for insurance.

Thus far we have focused on the overall demand for insurance. A distinct but related question is whether the sum of insurance and liquid assets is enough to pay the estate tax liability. We define a set of dichotomous variables $COVER_i$, which take the value of one if the i^{th} concept of liquid assets is sufficient to cover the taxes, and zero otherwise. These variables are defined only for those individuals with positive tax liabilities. As the mean values of the $COVER_i$ variables in column (4) indicate, about 33 percent of the estates can pay estate taxes out of insurance plus narrowly defined liquid assets; 56 percent including stocks in liquid assets; and

60 percent including bonds as well. The figures are somewhat lower for business owners: 32 percent, 47 percent, and 51 percent, respectively. Again, however, one must take into account other variables before concluding that business ownership has an independent effect on the propensity to provide the means to meet an estate tax bill, a task to which we now turn.

4. A MULTIVARIATE FRAMEWORK

In this section we develop an empirical specification that allows us to investigate the extent to which the demand for life insurance depends on the gap between liquid assets and estate tax liability.¹⁴ As suggested above, to begin we must specify a set of variables other than the gap that potentially can influence insurance demand.

The individual's resources are likely to be important in this context—the greater one's assets, the easier it is to provide for one's heirs without recourse to insurance, *ceteris paribus*. Hence, we include the variable *NETWORTH*, defined as the sum of the net values of primary residence, all other real estate, transportation vehicles, businesses, IRA/Keogh accounts, stocks/mutual funds, checking/saving accounts, certificates of deposit, bonds, trust assets not included in other categories, and miscellaneous assets, all less debts.¹⁵ Since we are trying to explain holdings of insurance, we exclude the value of insurance from this calculation. Also, the calculation excludes the asset value of pensions, because this figure is not available in our data. Pension income, however, is included in our measure of household income (see below). The business value component of *NETWORTH* is ascertained by asking, "If you sold the business and paid off any debts on it, how much would you get?" Thus, the figure relates to the market value of the business, not the book value.

As is the case in most surveys of household wealth, respondents do not always provide a

value for one or more of their assets. The AHEAD and HRS surveys include a set of “categorical unfolding questions” to place nonresponses into bounded bracket values. The brackets bound the value of the particular asset to a known interval.¹⁶ Specific values are then imputed by the survey staff using a “hot deck” technique (see Smith [1995, 1997]). Basically, a set of covariates (including race, education, marital status, work status, income quintile, housing wealth quintile) is used to match individuals within a bracket who did not report a specific value to those who did.

A measure of the individual’s ability to pay for insurance is annual household income, *INC*. An alternative would be to include a measure of permanent or lifetime income. However, to do so requires a substantial number of assumptions and imputations (see, e.g., Auerbach and Kotlikoff [1987]), so we employ the reported annual measure.

We include a dichotomous variable *BUSINESS* which takes a value of one if the estate includes a business. As noted earlier, business owners may face more uncertainty when it comes to estate tax plans, which could affect their insurance demand, *ceteris paribus*. Also, business owners might be more sophisticated financially than other individuals. The *BUSINESS* variable captures these (and any remaining) differences.

Several demographic variables might affect an individual’s demand for life insurance. We have information on gender, marital status, number of living children, age, education and race. The dichotomous variables *FEMALE* and *MARRIED* take on values of one if the individual is female and married, respectively. *AGE* is the respondent’s age in years.¹⁷ One important reason for including the *AGE* variable is that individuals may become more sensitive to estate tax issues as they grow older, and re-arrange their financial affairs accordingly. In addition, life insurance becomes more costly to individuals as they age, *ceteris paribus*. We augment the age

variable with a dichotomous variable, *AHEAD*, that takes a value of one if the observation is from the AHEAD sample. Members of the HRS sample were born between 1931 and 1941; the AHEAD sample was born in 1923 or earlier. Therefore, the *AHEAD* variable roughly differentiates those born just prior to World War II and those born around World War I. Poterba and Samwick [1997] have shown that there are substantial differences in asset ownership probabilities across different birth cohorts; the presence of the *AHEAD* variable allows for the possibility that such differences may be present in life insurance decisions as well.

EDUCATION is years of education, and *CHILDREN* is the number of children. With respect to race, the dichotomous variable *BLACK* is equal to one if the individual is black, whites are the omitted group, and *OTHRACE* is the dichotomous variable for individuals who are neither black nor white. The racial issue is of some interest in this context—there have been claims that black businesses are particularly hard hit by the estate tax. A survey of the largest black-owned businesses indicated that “estate taxes make the continuation of the business significantly more difficult or impossible. More than 80 percent said they do not have enough assets to pay estate taxes” (Poole [1995, p. 3F]).

An individual’s health status may affect both his desire for life insurance and its availability. The data contain a self-reported measure of health status from which we create a set of dichotomous variables: *HLTHEXEL* is one if health is excellent; *HLTHVG* is one if health is very good; *HLTHFAIR* is one if health is fair; and *HLTHPOOR* if health if poor. (“Health is good” is the omitted category.)

The previous section suggested that the demand for term insurance depends on the variables just described as well as the gap between liquid assets and estate tax liability. The response of insurance demand to the size of the gap is of particular interest in our context,

because it indicates whether there is a component of demand driven by estate tax considerations. Our specification includes interactions that allow the effect of the gap to vary with age and with whether the individual owns a business. Further, we allow the effect of being in business to vary with age. Given that 51 percent of the respondents do not have term insurance, ordinary least squares is not an appropriate estimation technique. Instead, we employ a Tobit estimator.

5 RESULTS

5.1 Basic Estimates

The parameter estimates are presented in Table 2. We discuss first our main item of concern—the relationship among business ownership, the estate tax, and insurance demand. In terms of our theoretical framework, the key issue is the extent to which people purchase life insurance to fill the gap between expected estate tax liability and liquid assets. Recall, however, that there are several ways in which liquid assets can be defined. Column (1) excludes stocks and bonds; column (2) includes stocks; and column (3) includes bonds as well.

In column (1), the coefficients on the three variables involving GAP_1 (the direct effect, and interactions with *AGE* and *BUSINESS*) are jointly statistically significant at all conventional levels—a test of the hypothesis that all the coefficients are zero yields a chi-squared statistic with three degrees of freedom of 34.33. Thus, the gap between liquid assets and estate tax liability does affect insurance demand, other things being the same. The interaction of GAP_1 and *AGE* is negative, implying that the older the individual, the smaller the impact of a given value of GAP_1 upon insurance demand. The interaction of GAP_1 and *BUSINESS* is also negative—a given gap in the volume of liquid assets needed to meet the estate tax liability induces a *smaller* increase in insurance demand for business owners than for other individuals, *ceteris paribus*. This is at odds

with the conjecture that business owners use insurance as the marginal source of funds to pay the estate tax.

Assessing the quantitative significance of *GAP* is slightly complicated by the fact that it appears in several interactions. Evaluated at the mean age in the sample (65.5 years) and assuming that the individual is not a business owner, a dollar increase in GAP_1 increases the Tobit index by about \$0.05 ($= 0.489 - 0.0067*65.5$). To compute the change in expected insurance demand, the Tobit coefficients must be transformed using the normal distribution.^{18,19} (See Maddala [1983, p. 159].) This computation suggests that a one dollar in GAP_1 increases the expected amount of term insurance by \$0.029. As already noted, for a business owner the effect is less (because the interaction of GAP_1 and *BUSINESS* is negative). Conditional on *BUSINESS* being equal to one, a \$1 increase in GAP_1 leads to a \$0.018 increase in term insurance. In short, the data reveal a very small marginal propensity to purchase life insurance for estate tax reasons for non-business owners, and it is even smaller for business owners.

This does not, of course, mean that owners of businesses demand less insurance than other individuals, *ceteris paribus*. To investigate this issue, we must evaluate the impact of *BUSINESS* and its various interactions upon insurance demand. The main effect of business ownership is positive, but it decreases with age, and, as already noted, it decreases with the size of the gap between liquid assets and estate tax liabilities. As before, to find the impact of owning a business (i.e., changing *BUSINESS* from zero to one) upon expected insurance demand, we must use the appropriate Tobit transformation. This computation indicates that business owners have \$2,363 more insurance, *ceteris paribus*. Given that unconditional mean term insurance holdings are only about \$24,000 (see Table 1), this is a substantial amount.

Turning now to the other variables in the specification, we find that insurance demand

decreases with net worth and its square. (The linear and quadratic terms are jointly significant at the 0.03 level.) This is consistent with Bernheim's [1991] finding that the demand for term insurance falls with lifetime resources. The coefficient on *AGE* is negative—within this age group, an individual's insurance demand falls with age, a result found in both the Auerbach and Kotlikoff [1987] and Bernheim [1991] studies. Married individuals carry more life insurance, and females less, while the coefficients on the health variable suggest that the better an individual's health, the more life insurance he or she holds, *ceteris paribus*. Education and income are both positively related to insurance demand. The coefficient on the dichotomous variable for blacks is negative, but small in magnitude and statistically insignificant.

Columns (2) and (3) of Table 2 include stocks and the sum of stocks and bonds, respectively, in the computation of the gap between liquid assets and the estate tax. A glance at these results suggests that sensible modifications in the way liquid assets are measured affect neither the qualitative nor quantitative implications of our results. In particular, although the positive main effects of *GAP* are larger in columns (2) and (3), so are the absolute values of the negative coefficients on the interactions with age, leaving the net effect about the same. Regardless of how the gap between estate taxes and liquid assets is measured, business owners have more term insurance than other people, but do not respond to the gap as strongly as non-owners.

5.2 Alternative Specifications

In this section we examine a variety of specifications to assess the robustness of our results.

Whole Insurance. As stated earlier, we view term life as the type of insurance that

makes most sense to analyze in the context of estate tax planning.²⁰ This is because there are alternative incentives for purchasing whole insurance, such as the ability to save while deferring income taxes. That said, the existence of a type of policy called “survivor whole life insurance” blurs this distinction. Such a policy covers a married couple, but the benefit is not paid until the second person dies. In other words, a spouse cannot be the beneficiary of a survivorship whole policy, making it inferior to standard whole policies for purposes of providing wealth to a surviving spouse. However, the cost of a survivor whole life policy is lower than that of two whole policies to cover both members of the couple, making it an economical way to provide the means to pay estate taxes. Indeed, one company markets these as “estate saver policies.”

Unfortunately, our data do not differentiate between survivor whole life policies and standard whole life policies. Because we do not know the relative importance of the former and even conventional whole policies have an insurance component, we re-estimated our canonical equations using the sum of term and whole policies as the dependent variable. The results are reported in the first three columns of Table 3. To conserve space, we report only the coefficients on *BUSINESS*, the *GAP* variables, and their various interactions. The results are quite similar to those in Table 2. Hence, while there may be some conceptual ambiguity with respect to which type of insurance is appropriate to analyze, as a practical matter, it does not make much difference.

Tax Calculator. As noted earlier, the accuracy of our simple estate tax calculator may be affected by the existence of various tax avoidance schemes, although whether most individuals actually exploit such opportunities is unclear. To the extent various avoidance techniques are employed, they are probably more prevalent at the upper end of the wealth distribution. That is, if there is a problem with the tax calculator, it is likely to be affecting those

for whom our estimates of the various gaps are relatively large. To see whether large avoidance incentives affect our results, we deleted the 5 percent of the sample with the highest (positive) values of *GAP*, and re-estimated the canonical equations with the truncated sample.

The results are reported in columns (4), (5), and (6) of Table 3.²¹ The coefficients do not differ very much from their counterparts in Table 2. This gives us some confidence that our results are not an artifact of the crudeness of our estate tax calculator.

Uncertainties about business value. In Section 4 we noted that some respondents were unable to provide precise estimates of the values of various assets. In the case of business assets, the majority of business owners provided a value, but about 35 percent either refused to respond or were not sure of the value.²² As with other assets, the survey utilized categorical unfolding questions as the basis for an imputation of business value. If an answer of “not sure” reflects genuine uncertainty, it might have an independent effect upon insurance demand—an individual who is unsure about the value of his business, and hence the associated estate tax liability, may have a different demand than someone who is relatively certain, *ceteris paribus*. We therefore augmented the basic specification with a dichotomous variable *NOTSURE*, which takes a value of one if the imputation procedure was used and zero otherwise, and interacted it with *GAP* and *AGE*. The results in columns (7) through (9) of Table 3 imply that the overall impact of *NOTSURE*, taking account of all interactions, is modestly negative. To the extent that *NOTSURE* reflects uncertainty about estate value, it suggests that such uncertainty has little impact on insurance demand. We note, however, that this is not the only possible interpretation, because in some cases imputations were done simply because the respondent refused to answer the question.

5.3 Probability that Liquid Assets and Insurance Cover Estate Tax Liability

So far our focus has been on the amount of life insurance that people purchase. A related but distinct question is whether the sum of liquid assets and insurance covers the estate tax liability. In particular, does the probability that the estates of business owners contain the liquid assets and insurance needed to cover estate taxes differ from that of other individuals? To think about this issue, recall from Table 1 the $COVER_i$ variables, which take the value of one if the individual has enough insurance plus liquid assets (of type i) in the estate to cover estate taxes, and zero otherwise. A natural strategy is to investigate whether the probability that $COVER_i$ is one differs between business owners and the rest of the sample. Specifically, we use the sample of individuals with positive estate tax liabilities to estimate regressions of $COVER_i$ on the right hand side variables in our canonical model (without the GAP variables). Given that the $COVER_i$ variables are dichotomous, we use a probit statistical model.

The results are reported in Table 4. They reveal a number of interesting tendencies. As net worth increases, the likelihood that there are sufficient liquid assets and insurance to cover estate tax liability falls. (The negative coefficient on the linear term dominates throughout 99 percent of the distribution of values for net worth.) Conditional on net worth, though, an increase in income increases the probability. Being married increases the probability that one's estate will contain the resources needed to pay estate taxes, while the number of children and years of education do not exert a statistically significant effect. Neither does being black, which is noteworthy given the above cited concerns that blacks are particularly likely to be hurt by the estate tax.

Our main concern is the impact of business ownership on the probability of being able to pay the estate tax. In all three specifications in Table 4, $BUSINESS$ and its interaction with AGE

are individually insignificant. However, a test of *BUSINESS* and *AGE*BUSINESS*, reveals they are jointly significant in all three specifications.²³ With respect to the quantitative implications of the estimates, we first note that, evaluated at the mean value of *AGE*, the impact is negative—the estates of business owners are less likely to be able to meet estate tax liabilities than those of other people, *ceteris paribus*. As a qualitative matter, this result is not surprising. After all, we know from Table 1 that business owners have larger gaps between liquid assets and estate taxes. Further, as Table 2 indicates, even though business owners purchase more insurance on average, their propensity to make additional purchases as the gap grows is lower. The end result is that business owners are less likely to cover their estate tax liabilities.

A possible problem with the estimates in Table 4 is that they ignore information with respect to the *amount* by which liquid assets plus insurance fall short of estate tax liability. The dichotomous left hand side variable treats as equivalent one estate in which the shortfall is a few dollars and another in which it is thousands. We therefore estimate a continuous version of the model, in which the left hand side variable is the difference between estate tax liability and the sum of liquid assets and insurance.²⁴ The qualitative results are quite similar, and are not reported here to conserve space. (The only difference is that in the specification with the narrowest definition of liquid assets, *BUSINESS* and *AGE*BUSINESS* are jointly insignificant.²⁵) Further, evaluated at the mean value of *AGE*, the effect of business ownership is negative. Hence, whether we view the ability to meet estate tax liabilities as a dichotomous or continuous variable, the outcome is the same—the estates of business owners are less likely to have the wherewithal to pay estate taxes.

6. SUMMARY AND CONCLUSIONS

In this paper we have examined the extent to which life insurance plays a role in dealing with estate tax burdens, particularly for owners of possibly illiquid business assets. Our results suggest that owners of businesses buy more insurance than other individuals, but even together with the liquid assets in their portfolios, there is insufficient money to cover estate taxes. This finding has several interpretations. One is that there are other means to cover estate taxes that do not show up in our data. The heirs, for example, might have substantial liquid assets. A second possibility is that, contrary to the popular view that keeping a business in the family is very important to business owners, they make no special efforts in this respect. These results complement other findings that, when it comes to estate tax issues, it is hard to explain behavior using any simple model.

Endnotes

1. See Joint Committee on Taxation [1998]. Indeed, Bernheim [1987] suggests that the tax is actually a net revenue loser because of the interaction with the charitable deduction of the individual income tax.
2. Auerbach and Kotlikoff [1987] and Bernheim [1991] estimate models of insurance demand, but do not consider estate tax issues.
3. If $T < (L + I)$, then there are no cash flow constraints. Here we focus exclusively on the case where $T > (L + I)$. Our empirical work considers both regimes.
4. The qualitative nature of our conclusions is unaffected by the actual pricing of insurance. We make this assumption for expositional clarity alone.
5. Note that as ψ grows larger, the impact of the gap becomes greater. Indeed, for large enough penalties for liquidating assets, insurance purchases rise more than dollar-for-dollar with increases in the gap. That is
$$\lim_{\psi \rightarrow \infty} \frac{\partial I}{\partial G} = \frac{1}{(1 - \tau)(1 - p)} > 1$$
6. In our statistical analysis we take into account the fact that the AHEAD data are from a different year than the HRS data by allowing the intercepts to differ depending on whether the observation is drawn from AHEAD or HRS.
7. The survey question is, “Do you have any life insurance, including individual or group policies?” The question clearly asks for life insurance from any source and it is placed after the questions about assets, in which trusts are explicitly discussed. Hence, it is reasonable to assume that the figure reported includes insurance held in trust.
8. Another reason for focusing on term insurance relates to the fact that there is a minor difference in the insurance questions in the two surveys. AHEAD asks the value of the policy if the holder dies, while HRS asks for the face value of the policy. Term policies only have value when the policy holder expires, so the answer would be the same in both surveys. With whole insurance, if the policy holder has borrowed against the policy, the face value and the value at death could differ.
9. Indeed, as noted below, certain types of whole life policies are specifically intended to cover a couple’s estate tax liability.
10. For information about the portfolio holdings of entrepreneurs, see Gentry and Hubbard [1998].

11. During the time period of our data, if a member of a couple died, the survivor could receive the entire estate tax free and transfer up to \$600,000 of the estate to children tax free. When the survivor died, the remaining estate was taxed normally (i.e., \$600,000 threshold). Therefore, a married couple could shelter \$1,200,000 from estate tax. This accounts for the \$1,200,000 threshold for married respondents.
12. Beginning in 1998, up to \$1.3 million of the value of family-owned business may be excluded for the taxable estate.
13. Such tendencies have been observed in other data; see, for example, Fairlie and Meyer [1996].
14. For alternative specifications with a somewhat less extensive set of regressors, see Auerbach and Kotlikoff [1987] or Bernheim [1991].
15. Trust assets are included in both surveys. In the HRS, trusts are in a catch-all category with “valuable collections and miscellaneous assets.” Therefore, we cannot distinguish trusts from these other two categories. In AHEAD, the trust question is asked at the end of the asset section. After determining if the respondent has a trust and its value, the survey asks if the trust assets were already mentioned in the other asset questions. If the answer is yes, then the trust value is not added to net worth.
16. For example, if a respondent did not report an exact value, the interviewer asked if the value was \$50,000 or more. Based upon the answer, the respondent would be asked a second question to narrow the categorical amount. The final amount categories for business assets are \$0-\$9,999, \$10,000-\$49,999, \$50,000-\$499,999, and greater than \$500,000.
17. We experimented with a quadratic term in age, and found that it did not significantly increase the explanatory power of the equation.
18. We perform this calculation for each individual in the sample, and then take the mean.
19. As noted earlier, the purchase of insurance also affects the value GAP_i . Our calculations incorporate this feedback. Thus, for example, while the point estimate of the coefficient on the interaction between GAP_i and AGE is -0.00615, incorporating the feedback changes this to -0.0067.
20. The same distinction is made by Auerbach and Kotlikoff [1987], who focus on the demand for term insurance.
21. Note that the sample sizes increase as we move from column (4) to column (6). As the definition of liquid assets becomes more inclusive, the number of observations with a positive value of GAP_i decreases. Hence, 5 percent of that number decreases. With fewer observations discarded, the number of

observations used in the estimation increases.

22. Roughly 80 percent of respondents who did not report a value for their business provided a categorical value, while the remaining respondents refused to provide a categorical value.
23. In column (1), the chi-square test statistic with two degrees of freedom is 7.43; in column (2) it is 18.04; and in column (3) it is 14.75. The critical value at the 0.95 significance level is 5.99.
24. Note the difference between this variable and the *GAP* variables that are on the right hand side in the insurance demand equations of Table 3. The latter do not include insurance in them, and hence can be treated as exogenous. In contrast, the variable under consideration here does include insurance, and hence is endogenous.
25. With a narrow definition of liquid assets, the joint test for the significance of the two variables has a significance level of 0.2487; when stocks are included, it is 0.0001, and with stocks and bonds, it is less than 0.0001.

Table 1. Summary Statistics^a

Variable	Entire Sample (1)	Term Insurance Holders (2)	Business Owners (3)	Positive Estate Tax (4)
BUSINESS (=1 if business owner)	0.107 (0.310)	0.119 (0.324)	1 (--)	0.551 (0.497)
TERM (value of term insurance)	23,781 (73,612)	48,200 (99,000)	61,600 (153,000)	78,000 (218,000)
DTERM (=1 if term insurance)	0.494 (0.500)	1 (--)	0.547 (0.498)	0.440 (0.497)
WHOLE (value of whole insurance)	15,300 (64,200)	16,100 (63,600)	52,900 (142,000)	90,100 (227,000)
DWHOLE (=1 if whole insurance)	0.322 (0.467)	0.331 (0.471)	0.519 (0.500)	0.525 (0.499)
WHOLE + TERM (sum of whole and term)	39,100 (105,000)	64,200 (130,000)	114,000 (221,000)	168,000 (335,000)
D(WHOLE + TERM) (=1 if whole or term insurance)	0.686 (0.464)	1 (--)	0.815 (0.389)	0.741 (0.439)
GAP ₁ (difference between estate tax liability and “liquid assets”)	12,368 (145,343)	12,559 (139,100)	77,290 (370,031)	391,000 (722,000)
GAP ₂ (“liquid assets” include stocks)	8,730 (116,683)	9,590 (121,000)	60,900 (302,000)	276,000 (598,000)
GAP ₃ (“liquid assets” include bonds)	8,250 (114,000)	8,970 (116,000)	57,600 (294,000)	261,000 (587,000)
COVER ₁ ^b (=1 if estate tax liability can be met by “liquid assets” plus insurance)	--- ---	0.400 (0.491)	0.315 (0.466)	0.331 (0.471)
COVER ₂ ^b (“liquid assets” includes stocks)	--- ---	0.589 (0.493)	0.466 (0.500)	0.560 (0.497)
COVER ₃ ^b (“liquid assets” includes bonds)	--- ---	0.621 (0.486)	0.508 (0.501)	0.600 (0.491)
NETWORTH (net worth)	199,000 (468,000)	210,000 (473,000)	631,000 (101,000)	2,020,000 (1,560,000)
NOTSURE (=1 if imputation was used to estimate net worth)	0.0320 (0.176)	0.0320 (0.176)	0.298 (0.457)	0.238 (0.427)
INCOME (household income)	36,800 (42,700)	43,600 (45,500)	71,300 (77,600)	115,300 (131,000)

Table 1. Continued^a

Variable	Entire Sample (1)	Term Insurance Holders (2)	Business Owners (3)	Positive Estate Tax (4)
FEMALE (=1 if female)	0.553 (0.497)	0.510 (0.500)	0.395 (0.489)	0.394 (0.489)
MARRIED (=1 if married)	0.555 (0.497)	0.662 (0.473)	0.821 (0.383)	0.611 (0.488)
AGE (= age in years)	65.5 (12.0)	63.0 (11.1)	58.3 (8.63)	63.6 (10.7)
AHEAD (=1 if observation from the AHEAD sample)	0.443 (0.497)	0.348 (0.476)	0.162 (0.369)	0.338 (0.474)
EDUCATION (years of education)	11.5 (3.62)	12.0 (3.38)	13.3 (2.77)	14.2 (2.66)
BLACK (=1 if black)	0.170 (0.376)	0.172 (0.377)	0.0688 (0.253)	0.0347 (0.183)
OTHRACE (=1 if neither black nor white)	0.0969 (0.296)	0.0651 (0.247)	0.0620 (0.241)	0.0347 (0.183)
CHILDREN (= number of children)	2.98 (2.22)	3.06 (2.14)	3.10 (2.00)	2.67 (2.13)
HLTHEXEL (=1 if health is excellent)	0.168 (0.374)	0.192 (0.394)	0.301 (0.459)	0.319 (0.467)
HLTHVG (=1 if health is very good)	0.253 (0.435)	0.275 (0.446)	0.316 (0.465)	0.349 (0.477)
HLTHFAIR (=1 if health is fair)	0.184 (0.388)	0.163 (0.369)	0.104 (0.305)	0.0926 (0.290)
HLTHPOOR (=1 if health is poor)	0.106 (0.307)	0.0786 (0.269)	0.0320 (0.176)	0.185 (0.135)
Observations	13,659	6,746	1,467	432

^aFigures in cells are means; those in parentheses are standard deviations. Computations based on combined HRS-AHEAD sample.

^bIn column (2), based only on 190 observations that also have positive estate tax liability. In column (3), based only on 238 observations that also have positive estate tax liability.

Table 2. Demand for Term Insurance^a

Variable	(1)	(2)	(3)
GAP _i ^b	0.452 (0.776)	0.557 (0.104)	0.634 (0.111)
NETWORTH	-0.00202 (0.00480)	-0.000657 (0.00473)	-0.00105 (0.00472)
NETWORTH ² (x10 ⁻⁹)	-2.88 (1.32)	-2.88 (1.24)	-2.93 (1.19)
BUSINESS	109,000 (22,100)	110,000 (22,200)	110,000 (22,100)
AGE	-1,340 (186)	-1,340 (186)	-1,340 (186)
GAP _i xAGE	-0.00615 (0.00113)	-0.00798 (0.00164)	-0.00915 (0.00178)
GAP _i xBUSINESS	-0.0596 (0.0187)	-0.0567 (0.0225)	-0.0601 (0.0227)
CHILDREN	-52.5 (469)	-62.3 (469)	-68.5 (469)
MARRIED	26,200 (2,380)	26,000 (2,370)	26,000 (2,370)
FEMALE	-9,140 (2,160)	-9,070 (2,160)	-9,010 (2,150)
AHEAD	-9,950 (4,260)	-10,000 (4,260)	-9,920 (4,260)
HLTHEXCEL	13,400 (3,020)	13,300 (3,020)	13,300 (3,020)
HLTHVG	5,370 (2,672)	5,340 (2,760)	5,410 (2,670)
HLTHFAIR	-4,370 (3,030)	-4,370 (3,030)	-4,360 (3,030)
HLTHPOOR	-8,630 (3,800)	-8,720 (3,800)	-8,680 (3,800)
EDUCATION	1,870 (338)	1,860 (338)	1,860 (338)
INCOME	0.632 (0.0270)	0.634 (0.0275)	0.637 (0.0275)

Table 2. Continued^a

Variable	(1)	(2)	(3)
BUSINESSxAGE	-1,810 (379)	-1,840 (380)	-1,830 (380)
BLACK	-1,650 (2,800)	-1,540 (2,800)	-1,550 (2,800)
OTHRACE	-27,500 (3,800)	-27,500 (3,800)	-27,400 (3,800)
CONSTANT	12,600 (12,700)	12,800 (12,700)	12,800 (12,700)
Log likelihood	-90,873	-90,874	-90,871
Observations	13,659	13,659	13,659

^aLeft hand side variable is the value of term insurance. Estimation by Tobit. Standard errors are in parentheses. Variables are defined in Table 1.

^bIn column (1), GAPi excludes stocks and bonds from the computation of liquid assets. Column (2) includes stocks, and Column (3) includes stocks and bonds.

Table 3. Demand for Insurance: Alternative Specifications^a

Variable	Include Whole Insurance			Delete Returns with Highest Tax			Include NOTSURE Variable		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
GAP _i ^b		0.380	0.448	0.417	0.689	0.772	0.489	0.635	0.702
	(0.0534)	(0.0878)	(0.0925)	(0.0934)	(0.146)	(0.157)	(0.0782)	(0.107)	(0.113)
BUSINESS	158,000	152,000	150,000	109,000	107,000	107,000	138,000	138,100	139,000
	(22,800)	(22,900)	(22,900)	(22,000)	(22,200)	(22,100)	(27,500)	(27,500)	(27,500)
GAP _i *AGE	-0.00266	-0.00645	-0.00738	-0.00591	-0.0104	-0.0117	-0.00670	-0.00921	-0.0102
	(0.000810)	(0.00143)	(0.00151)	(0.00139)	(0.00246)	(0.00268)	(0.00114)	(0.00170)	(0.00182)
GAP _i *BUSINESS	0.0320	0.00511	0.00420	-0.0286	-0.0392	-0.0438	-0.0330	-0.0281	-0.0324
	(0.0185)	(0.0244)	(0.0244)	(0.0244)	(0.0271)	(0.0276)	(0.0198)	(0.0245)	(0.0248)
BUSINESS*AGE	-2,320	-2,210	-2,170	-1,790	-1,770	-1,770	-2,210	-2,220	-2,230
	(387)	(388)	(388)	(378)	(380)	(379)	(478)	(478)	(477)
NOTSURE	--	--	--	--	--	--	-106,000	-107,000	-110,000
							(44,300)	(44,400)	(44,400)
GAP _i *NOTSURE	--	--	--	--	--	--	-0.0754	-0.0739	-0.0706
							(0.0195)	(0.0214)	(0.0222)
AGE*NOTSURE	--	--	--	--	--	--	1,470	1,450	1,490
							(751)	(753)	(753)
Log Likelihood	-119,063	-119,061	-119,000	-90,714	-90,788	-90,786	-90,855	-90,857	-90,854
Observations	13,659	13,659	13,659	13,641	13,646	13,647	13,659	13,659	13,659

^aIn Columns (1) through (3), the dependent variable is the sum of whole and term insurance. In columns (4) through (6), the dependent variable is the value of term insurance (as in Table 2), but the 5 percent of the sample with the highest values of GAP is deleted. In columns (7) through (9), the dependent variable is the value of term insurance and *NOTSURE* is included in the specification. All equations are estimated using Tobit and all equations include the same additional right-hand-side variables listed in Table 2. Figures in parentheses are standard errors.

^bGAP_i = GAP₁ in columns (1), (4), and (7); GAP₂ in columns (2), (5), and (8); and GAP₃ in columns (3), (6), and (9).

Table 4. Probability that Insurance Plus Liquid Assets Cover Estate Taxes^a

Variable	(1)	(2)	(3)
NETWORTH(x10 ⁻⁶)	-1.41 (0.307)	-0.775 (0.129)	-0.724 (0.122)
NETWORTH ² (x10 ⁻¹⁴)	8.54 (1.79)	4.11 (1.04)	3.80 (1.01)
BUSINESS	-1.18 (0.889)	-0.986 (0.889)	-0.594 (0.904)
AGE	-0.00725 (0.0156)	0.00414 (0.0157)	-0.000870 (0.0159)
CHILDREN	-0.0303 (0.0384)	-0.0256 (0.0386)	-0.0424 (0.0386)
MARRIED	0.910 (0.255)	0.678 (0.182)	0.664 (0.181)
FEMALE	-0.331 (0.148)	-0.398 (0.148)	-0.376 (0.151)
AHEAD	-0.109 (0.312)	0.164 (0.307)	0.403 (0.309)
HLTHEXCE	0.0448 (0.196)	0.0257 (0.189)	-0.0321 (0.190)
HLTHVG	0.0509 (0.186)	0.0701 (0.180)	-0.0405 (0.180)
HLTHFAIR	0.170 (0.284)	-0.155 (0.264)	-0.264 (0.263)
HLTHPOOR	0.0666 (0.485)	0.181 (0.588)	-0.0553 (0.565)
EDUCATION	0.0436 (0.0290)	0.0407 (0.0291)	0.0370 (0.0289)
INCOME(x10 ⁻⁶)	2.62 (0.878)	2.18 (0.612)	1.89 (0.582)
BUSINESSxAGE	0.0161 (0.0137)	0.00582 (0.0138)	0.000449 (0.0140)
BLACK	-0.790 (0.530)	-0.0462 (0.394)	-0.189 (0.390)

Table 4. Continued^a

Variable	(1)	(2)	(3)
OTHRACE	-0.284 (0.409)	-0.659 (0.385)	-0.800 (0.380)
CONSTANT	0.949 (1.09)	0.467 (1.11)	0.919 (1.13)
Log likelihood	-217.3	-242.9	-237.34
Observations	432	432	432

^aThe left hand side variable is a one if the sum of insurance (term plus whole) and “liquid assets” exceeds estate tax liability. Estimation is done with probit and figures in parentheses are robust standard errors. Variables are defined in Table 1.

^bIn column (1), GAP_i excludes stocks and bonds from the computation of liquid assets. Column (2) includes stocks, and Column (3) includes stocks and bonds.

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