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Is there a "dead-anyway" effect in willingness to pay for risk reduction?

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Abstract

In a recent paper, Pratt and Zeckhauser (JPE, 1996) discuss the measure of individuals' willingness to pay (WTP) for the reduction of risks to their lives which should be used for public decisions on risk-reducing projects. They suggest to correct observed WTP for the "dead-anyway" effect, which says that WTP increases with the level of risk to which the individual is exposed - an effect which is due to the imperfection of contingent-claims markets. We first discuss the theoretical foundations of the asserted effect and then propose a new empirical test based on the relationship between wealth, life satisfaction and exposure to risk of dying. Application of the test using two sets of survey data from Germany and Australia.yields no support for the asserted dead-anyway effect.

JEL-Classification: J17, H43.

Keywords: value of statistical life, mortality risk, contingent-claims markets

Zusammenfassung

In einem neueren Beitrag diskutieren Pratt and Zeckhauser (JPE, 1996), welches Maß der marginalen Zahlungsbereitschaft (WTP) von Individuen für die Reduktion ihrer Sterbewahrscheinlichkeit bei öffentlichen Entscheidungen über gefahrenerhebliche Projekte verwendet werden sollte. Sie schlagen vor, die gemessene WTP um den so genannten "Dead-anyway"-Effekt zu berichtigen, der besagt, dass die WTP mit dem Ausgangswert des Risikos zunimmt, dem das befragte Individuum ausgesetzt ist. Dieser Effekt beruht allerdings auf der Abwesenheit vollkommener Märkte für bedingte Güter. Wir diskutieren zunächst die theoretischen Grundlagen des "Dead-anyway"-Effekts und schlagen dann einen neuen empirischen Test mittels der Beziehung zwischen Vermögen, Sterberisiko und Lebenszufriedenheit vor. Eine Anwendung des Tests an Hand zweier Sätze von Umfragedaten aus Deutschland und Australien ergibt keine Bestätigung für den von Pratt und Zeckhauser behaupteten Effekt.

1. Introduction

In a recent paper in the JPE, Pratt and Zeckhauser (1996) discuss the measure of individuals' willingness to pay (WTP) for the reduction of risks to their lives which should be used for public decisions on risk-reducing projects. One of their suggestions is to correct observed WTP for what they call the "dead-anyway" effect, which says that WTP increases with the level of risk to which the individual is exposed, which in turn is true if marginal utility of wealth when dead (or, marginal utility of bequest) is lower than marginal utility of wealth when alive (or, marginal utility of consumption). The latter assumption, however, is really not a claim on a characteristic of preferences but rather an assertion on the imperfection of contingent-claims markets because with perfect markets the individual should be able to equalize his marginal utility of wealth across survival states (ibid., p.750, see also Zweifel and Breyer 1997, p.28).

In order to assess the validity of the claim made by Pratt and Zeckhauser it is therefore important to know whether a dead-anyway effect exists at all, and if so, if it is systematically related to the kind of market imperfection which would be able to account for this effect, given rational behavior of consumers. Although these questions can ultimately only be answered empirically, we shall first elaborate on the theoretical issues underlying it before we attempt to formulate the empirical questions in more detail.

This paper is organized as follows. In Section 2 we shall restate the "dead-away" effect and examine what types of failures of contingent-claims markets would lead to its occurrence. In Section 3 we review the existing empirical evidence. In Section 4 we develop a new empirical test, which is based on the relationship between the marginal utility of wealth and the exposure to risk of dying, and we apply this test to two sets of survey data from Germany and Australia. Finally, Section 5 concludes.

2. Theory

2.1 The Dead-anyway Effect Restated

We consider a timeless model with an individual who has initial wealth *Y* and is exposed to a risk of immediate death with probability $\pi\,(0<\pi<1)$. Let *s* be a dummy variable which equals 0 (1) when the individual is dead (alive). Then his preferences among conceivable pairs of survival-final wealth combinations (s,y) can expressed by a von Neumann-Morgenstern utility function U so that his expected utility in the absence of contingent-claims markets can be written as

$$EU=\pi\cdot U(0,y)+(1-\pi)\cdot U(1,y)\,, \qquad (1)$$

from which marginal WTP for risk reductions, $m(y,\pi)$ can be derived as

$$m(y,\pi):=\frac{dy}{d\pi}\Big|_{dEU=0}=\frac{U(1,y)-U(0,y)}{\pi\cdot U_y(0,y)+(1-\pi)\cdot U_y(1,y)}=\frac{U(1,y)-U(0,y)}{EU_y(y)}\,, \qquad (2)$$

and clearly,

$$\frac{\partial m(y,\pi)}{\partial\pi}>0 \qquad \Leftrightarrow \qquad U_y(1,y)>U_y(0,y) \qquad (3)$$

because then the denominator of (2) declines when π is raised. The inequality on the LHS of (3), however, is interpreted by Pratt and Zeckhauser as "dead-anyway" effect, which says that when the exposure to risk rises, so does the probability that the price for the risk reduction has to be paid from one's estate when one does not care as much for wealth anyway.

In a recent paper, Eeckhoudt and Hammitt (2001) have analyzed the impact on WTP for reducing a given risk if a *different* source of risk of dying (a so-called background risk) is increased. They show that in this case, WTP for the change in the (unrelated) risk in question should *fall* rather than rise, what they term the "why bother?" effect.

It should be also noted in passing that the "deadanyway" effect claimed by the authors is in no way confined to WTP for risk reductions but should apply to all areas of public spending. If marginal utility of wealth is biased downward, then willingness

to pay for any public good is inflated relative to a situation with a more "normal" marginal utility of wealth. Therefore, what Pratt and Zeckhauser essentially claim is that in basing public spending decision on the WTP of a sample of citizens for the respective project, the sample should be representative in all relevant aspects, which is really a trivial assertion. The more substantive part is that the probability of dying within a foreseeable time span should be considered one of the relevant aspects in a world where financial markets are imperfect.

2.2 The Dead-anyway Effect and Market Failure

What the dead-anyway effect implies, in any case, is that the typical individual would like to shift income from the state of death to the state of survival if this were possible at actuarial terms, but is unable to do so. In order to inquire into the reasons for such a situation, we will first distinguish two kinds of contingent-claims contracts that a perfect market would offer, and then distinguish between types of households according to which of these contracts they possess.

The contracts are

1. life insurance, which promises to pay x dollars to the heirs in case of the death of policyholder in return to a fixed premium P, and the contract is called "actuarially fair" if $P = \pi \cdot x$,
2. a life annuity, which promises to pay z dollars to the individual in case he is alive in return to a fixed premium Q, and the contract is fair if $Q = (1-\pi) \cdot z$.

If we consider a multi-period world, the premium for the life insurance can be split up in per-period payments which are due as long as the policyholder lives, and so is the payment to the individual in case of a life annuity.

The types of individuals are

A: individuals who hold (at least) one life insurance contract but no annuity contract,

B: individuals who holds neither contract,

C: individuals who hold only (one or several) annuity contracts, and

D: individuals who hold both types of contracts.

Given that there are even very small transaction costs involved in signing any of these contracts, we can immediately dismiss type *D* individuals as being irrational because they hold contracts which at least partly cancel each other out.[1]

Of the two probably most frequent types, *B* characterizes the group of individuals for whom the imperfect-markets argument is the most relevant. If transaction costs in signing either type of contract, including the loading on insurance premia, are significant, this alone would explain why people choose this corner solution of no contract. On the other hand, there is no a priori presumption which type of contract any of these individuals would choose if the transaction costs were zero, and thus no presumption on the likely comparison between the two marginal utilities of wealth involved.

Turning to *A*, the other frequent type, it seems to be unlikely that for such an individual a fair shift of wealth from the state of death to the state of survival was desirable because this could be accomplished simply by reducing the amount of life insurance protection. The only reason why this argument may be wrong is the favorable tax treatment of these contracts. If, as is the case in Germany, insurance premia were tax deductible, whereas the corresponding returns were tax free, then there would be an incentive to buy these contracts up to a point where $U_y(1, y)$ exceeded $U_y(0, y)$. However, even under the German tax law, for the majority of taxpayers the marginal expenditure on life insurance premia is not tax deductible, and moreover the loading on "capital" life insurance seems to be excessively high (see Adams 1997), so that these two effects might cancel. If this were true, then type *A* individuals would typically not display the "dead-anyway" effect.

Finally, type *C* is the clearest case of somebody for whom this effect should be present because transaction costs would prevent these individuals from buying even higher annuities.

We conclude that if the "dead-anyway" effect plays a role, then for all of type *C* and part of type *B* individuals, but not for type *A* unless the transaction costs were outweighed by the tax subsidy. We thus formulate the following

[1] Even this statement we can not be so sure of if life insurance contracts are implicitly subsidized through the tax system, as they are in Germany. On the other hand, if one could

Hypothesis 1: Marginal WTP should be independent of the risk level for persons who hold life insurance contracts.

Hypothesis 2: Marginal WTP should be increasing in the level of risk exposure for individuals who possess annuities but no life insurance contracts.

Apart from transaction costs may there be other reasons for imperfections in either of the two contingent-claims markets which would explain the presence of a "dead-anyway" effect? The main reason for the imperfection of insurance markets is adverse selection, which is empirically most relevant if the share of low-risk individuals is large and so is the difference between the highest and the average risk.

If we apply this reasoning to the life insurance market we find that both conditions are fulfilled: the distribution of health risks is broadly characterized by a vast majority of people of moderately good health and a very small proportion of people at excessively high risk (e.g. persons who have already had a myocardial infarction or cancer or have been tested as HIV positive). Assuming that the techniques of the insurance companies for detecting high-risk individuals are imperfect and costly, this would explain why less life insurance contracts are sold than would be the case in a perfect market.

For the same reason this does not apply to the annuities market because here the characteristics of low and high risks are exactly reversed: a majority of moderately bad risks exists besides a small number of extremely good risks, but these are ideal conditions for an insurance market to function. Therefore, the apparent non-existence of such markets presents a puzzle which can only be explained by transaction costs which are high relative to the extent of risk spreading an individual could achieve through such a market. A typical case would be that of an individual which is neither married nor has a partner or any other close relative to which it would like to bequeath money: under expected utility maximization and perfect markets such an individual should convert all his liquid assets into annuities. Similarly, parents should buy annuities for their children which expire at an age where the children can be expected to care for themselves.

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make a profit by holding both types of contracts, then one would have to wonder why this possibility was not used by everybody else on as large a scale as possible.

Thus, the absence of these kinds of contracts, presumably due to transaction costs, leads us to

Hypothesis 3: For individuals who possess neither annuities nor life insurance contracts, marginal WTP should be increasing in the level of risk exposure if they are single and do not have close relatives to care for.

Empirically, it is not even true that annuity markets are absent or highly inefficient under all circumstances. A recent survey by James and Vittas (1999) shows that in several OECD countries (Australia, Canada, Israel, Switzerland and U.K.) life annuities for people aged 65 actually offer quite attractive returns to policy-holders, comparable to investing the money in risk-free government bonds. However, this does not tell us whether similar options are available for members of younger age groups. Moreover, holders of annuity contracts must be distinguished according to whether they were forced to hold the policy or do it voluntarily. This leads us to Hypothesis 4, which is a corroboration of Hypothesis 2:

Hypothesis 4: For individuals over 65 years who possess annuities of higher value than legally enforced, marginal WTP should be increasing in the level of risk exposure.

This theoretical reasoning forms the starting point for an empirical analysis of the prevalence of a "dead-anyway" effect in individual WTP and its being related to the status of the individual with respect to contingent-claims contracts. Together with the elicitation of WTP for a reduction of a given risk-to-life by a fixed margin (e.g. 1 percentage point) one should be interested in

- the degree of exposure to life-risk of the individual,
- age, marital status and presence or absence of own children or other persons for whom the respondent is financially responsible,
- the possession of life-insurance contracts, specifically if purchased voluntarily (i.e. not in connection with the purchase of a home)
- the possession of life annuities, especially if not legally enforced.

It should also be mentioned that the "pure" contingent-claims contracts examined above are not necessarily the only way of transferring wealth across survival states. As in many countries for the majority of persons in their second half

of life, a substantial share of wealth is invested in their own house, another way of reducing unplanned bequests is to reduce the value of one's ownership in the house. This can be done in two different ways. Firstly, one can put a mortgage on the house, invest the amount of the mortgage in more liquid types of assets and begin spending it down. Secondly, one can sell the house to a bank but secure for oneself the lifelong right to occupy it, and use the revenue from the sale in the manner described above.

Both strategies do not achieve a perfect hedge against unplanned bequests because they do not solve the problem that the time of death is uncertain and therefore - if annuities are imperfect - spending can not be optimally distributed over the remaining lifetime. The second alternative also suffers from the moral hazard problem that somebody who effectively no longer owns but rents a house will put a suboptimal effort into maintenance. But these strategies may still be better than doing nothing at all.

3. Existing Empirical Evidence

A large number of WTP assessments can be found in the existing literature, which can be grouped according to the method used into

a) revealed preference and

b) contingent-valuation

studies.[2] Few of these studies address the question of the effect of the level of exposure. Even then, the results are for at least two reasons not applicable to the specific question that we are asking. First, in all studies using type a) methods, such as compensating wage differentials in the labor market, the level of exposure to risks to life is invariably extremely small[3] so that any differences in the levels of π in (2) are too small to present conclusive evidence of a potential dead-anyway effect. Secondly, levels of risk exposure are not exogenous so that any findings are probably confounded with the reverse causality: for any given wage differential, persons with a lower WTP for increasing their length of life quite rationally choose

[2] Good reviews of the earlier studies can be found in Viscusi (1992), (1993).
[3] In the study reported by Viscusi (1992, Chap.3), the mean value is at 1 in 10'000 per year.

the riskier occupations, and the outcome of this selection process is even socially efficient.

The little empirical evidence that exists confirms this conjecture. In a regression explaining the 1976 wage rate of almost 4000 full-time workers in the U.S. (Viscusi, ibid., p.46), the square of the death-rate variable has a significantly negative coefficient, implying that the compensating age differential for a given increase in the risk of death *decreases* with the level of exposure. In the same vein, Hersch and Viscusi (1990) found that smokers on average received only about half the amount of compensation (per statistical injury) for working in a hazardous job than did non-smokers. Again, since being a smoker is not an exogenous trait, but an activity chosen by the respondent, the result is consistent with the hypothesis that people with a lower WTP for survival (as measured by their compensating wage differential) are more likely to choose the risky activity of smoking.

Type b) studies are based on questionnaires which present subjects with hypothetical situations and ask them directly for their willingness to pay for risk reductions. Of these, until recently, the only one that addressed the question of different levels of risk was Smith and Desvousges (1987) who claim to have found that "in the majority of cases … the bids are larger at smaller baseline risks" (p.99). Although this could be taken to be a solid refutation of the postulated dead-anyway effect, such an interpretation suffers from two important flaws.

First, there is as yet no theoretical explanation for such a behavior on the part of rational decision-makers. Secondly, the setup of the questionnaire was so complicated that it seems much more likely that the respondents were confused and thus gave unreliable answers. In particular, the total risk had to be inferred as the product of two independent components, a "risk of exposure", R, and a "risk of death if exposed", q. In the questions, only the former risk was varied, and comparisons were made between different levels of the latter. But what does not become clear in the above quotation, when q is halved, this means not only a halving of the baseline risk but also a halving of the effective risk change for which the WTP was elicited. Thus, effectively, the subjects made higher bids for smaller reductions in the risk of dying. If anything, this shows that they have not understood the question properly so that on the basis of this evidence alone, the presence of a dead-anyway effect can not be refuted with confidence.

In a very recent study, Krupnick et al. (2000) asked over 900 Canadians for their WTP for two different magnitudes of changes in risk of dying due to air pollution and regressed the answers on respondents' characteristics, of which two types are relevant for our purpose, namely age and the presence of a chronic condition. Of the latter, only one turns out to be barely significant: people with cancer have higher WTP than others. But this result is incompatible with theoretical predictions because having cancer is unrelated to the risk of dying due to air pollution and thus, being a background risk, should *lower* the WTP for air quality, according to the "why bother" effect mentioned above. Similarly, people aged 70 and over have a lower WTP than younger persons, whereas the dead-anyway effect would predict the opposite because age is positively correlated with risk of dying.

Altogether, the evidence on the prevalence of a dead-anyway effect in WTP for risk reductions is negative, but at the same time, it is inconclusive because it is unclear how serious the results of these studies can be taken. In particular, contingent-valuation studies suffer from the lack of ability of respondents to handle small probabilities and their changes in a meaningful way (see, e.g. Hammitt and Graham 1999).[4]

4. New Evidence Using Marginal Utility-of-Wealth Estimates

4.1 Developing a new test

Given the difficulties encountered in testing for the presence or absence of a dead-anyway effect by measuring people's WTP for risk changes as such, we here propose to use a different, less roundabout approach, which consists in measuring the (expected) marginal utility of wealth, i.e. the denominator of the right-hand side of (2), directly. If it could be shown that such a measure was significantly smaller for persons with higher exogenous exposure to life risks, then this could be interpreted as evidence in favor of a dead-anyway effect.

To infer the *marginal* utility of wealth from existing survey research, we use the coefficient of the variable "wealth" in a regression equation explaining life satisfaction. To measure how this marginal utility depends upon the exposure to risks

[4] For example, in the study by Krupnick et al. (2000), the average WTP increases only by about 50 per cent when a five-fold change in the risk is offered.

of dying, we look at the interaction effects of the variable(s) measuring risk with wealth. A positive value means that marginal utility of wealth increases with exposure to risk. Furthermore, if no direct indicator of risk exposure is available, we use age as a proxy for probability of dying.

For the empirical investigation, we use data sets from two different countries, Germany and Australia.

4.2 Analyzing German Data

4.2.1 The Data Set

We are using the microdata from the German Socio-Economic Panel Study (GSOEP) for this paper (cf. Wagner et al., 1993). The GSOEP is a longitudinal sample of about 5,000 private households which encompass altogether 10,000 persons. The reference year is 1988, because information on life insurance and on wealth was gathered in a special section for that year.

The dependent variable for the regression analysis is current life satisfaction. This indicator is based on an 11 item scale from 0 (totally unsatisfied) to 10 (very satisfied). Missing values are excluded from the regression analyses. [5]

We used three different income types in logarithmic transformation: disposable household income in the previous year, capital gains including imputed rents, and the self estimated net worth of the entire household. Net worth is based on a 10 item scale, which was converted into a metric measure by using the mean of the category for each response. To adjust for differences in family size we use a common international equivalence scale in which weights are computed as the square root of household size for all three income types. For the first six regression models, we categorize the respondents as singles and others. Singles are defined as persons without a steady partner and without children under the age of 16 living in the household.

The information on life insurance (models 7 and 8) is restricted, because the type of insurance (term versus whole life insurance) could not be determined. Only information that a personal life insurance contract exists is given.

[5] On the measurement of life satisfaction in the GSOEP see Winkelmann and Winkelmann (1998).

In the last two models we also consider if voluntary contributions to the social security pension have been made. Such data apply in particular to self-employed persons who are seeking additional social protection which can be interpreted as a form of a life insurance.

4.2.2 Findings

Table 4.1 contains the results of OLS regressions for the dependent variable ”overall life satisfaction” in the 1988 wave of the GSOEP. In columns 1-6, different measures of income or wealth are used to assess ”marginal utility of income/wealth”: in columns 1 and 2 we use total disposable income, in columns 3 and 4 only capital income, and in columns 5 and 6 wealth. These variables are used in logarithmic transformation. In these estimations, singles and others are separated.

The results are plausible but the fit of these estimations is weak, even for individual data, only between 2 and 4 per cent of the variance in life satisfaction can be explained by the included variables. The general pattern is that satisfaction is a declining but convex function of age, and among singles, women are slightly more satisfied than men. Also, foreign residents are consistently more satisfied for given values of the other determinants. Individuals with a hospital stay of more than 14 days in the previous 12 months are significantly less satisfied with their life. Surprisingly, neither income nor wealth plays a significant role by itself.

To test Hypothesis 3, we first introduced interaction effects between age and the respective income measure. Taking age as an indicator of risk of dying, if the dead-anyway effect were present, then the coefficient of this variable should be negative, at least for singles. The findings in columns 1, 3 and 5 lend no support to this hypothesis since the coefficient is insignificant throughout. In contrast, in 2 out of 3 cases it is significantly *positive* for people who are married or live with a partner. As a further measure of risk, we create a dummy for people over 78 years who in the previous 12 months spent at least 15 days in the hospital, and again interact it with the income variable. Only in one of the six estimations (column 6), and then for married persons and not for singles, is this variable just significantly negative.

To test Hypothesis 1, in columns 7 and 8 we distinguish explicitly between individuals with and without life insurance contract, bearing in mind that only the

latter should exhibit a dead-anyway effect. While the overall pattern of coefficients remains the same as before, the interaction effect between age and income is still significantly positive for the larger of the two groups, namely persons without life insurance, whereas we find no support for Hypothesis 1 in the estimation for people with life insurance.

Finally, in column 9 we look at people who are paying voluntary contributions to social security and thus are acquiring higher annuities than legally enforced. By Hypothesis 2, this group should exhibit the dead-anyway effect, and by Hypothesis 4, this should be definitely the case for the aged. Unfortunately, the test is inconclusive in this particular case because due to multicollinearity, the interaction effect between age and income is negative but insignificant, whereas the other variable, which measures the interaction between very old age, hospital treatment and income, was eliminated from the equation due to rank restrictions.

4.3 Analyzing Australian Data

4.3.1 The Data Set

The Australian data are taken from the 1996 wave of the International Social Science Surveys Australia (IsssA) project. Subjects are a simple random sample of Australian citizens drawn by the Electoral Commission from the compulsory electoral roll. The survey is conducted by mail using up to 4 follow-up mailings over a six-month period. Completion rates run about 65 per cent.[6]

The questionnaire is a brochure of about 70 pages, containing about 400 questions regarding a broad array of economic and political attitudes as well as respondents' personal characteristics such as age, sex, family status, education, work status, income and wealth.

As an endogenous variable we used the response to the question „How do you feel about your income and financial situation?" The answers consisted in circling one of the numbers 1 to 8, which were verbally explained as „1 delighted, 2 very pleased, 3 pleased, 4 mostly satisfied, 5 mixed feelings, 6 mostly dissatisfied, 7 unhappy, 8 terrible".

[6] On a description of the survey, see e.g. Melbourne Institute (1999), p. 95.

Income data are taken from the response to the question „What is the gross income (including pension and allowances) that you and your husband or wife usually receive each week from all sources?“, where 20 income categories were provided, ranging from „none“ to „more than $ 4808 per week (§ 250.000 per year). An Australian dollar in 1996 was worth about DM 1,20. Wealth data are taken from the answer to the questions „a) Approximate value of your house, car, savings, investments etc.“, „b) Approximate value of your business or farm“ and „c) value of your superannuation, and your husband or wife's super, taken as a lump sum?“[7] For each of these question, six possible values were provided: none, $100.000, $250.000, $500.000, $750.000 and $1.000.000.

The question „do you smoke?“ allowed 5 categories, „1 no, never smoked, 2 ex-smoker, 3 occasional smoker, 4 regular smoker, 5 heavy smoker“. Exposure to certain life risks was measured by the answers to the 4 following question: „Do you think it is likely that you will a) get lung cancer, b) have a heart attack, c) get AIDS, d) get liver disease (cirrhosis)?“

4.3.2 Findings

Table 4.2 contains the results of OLS regressions for the above mentioned dependent variable, which we shall denote ”income satisfaction” for brevity, in the 1996 wave of the IsssA survey. In columns 1-3, age is measured by dummies for three age groups (under 30, over 65) with the 30-65 year group as the omitted category. In contrast, age is measured as a linear variable in columns 4 and 5. Risk of dying is measured using three different variables: a) age, b) a dummy for being a regular or heavy smoker and c) the dummy “at risk”, which has the value 1 if the respondent answered “yes” on any of the 4 life risk questions stated above.

The overall fit of these estimations is not only much better than in the German data, but with R^2 values around .2 comparatively good for individual data. The general pattern is that income satisfaction is a concave function of both income and wealth and, holding income constant, a decreasing function of the level of schooling. Gender and family status are in general not significant. The old and the young are significantly more satisfied with a given income than the middle aged, which is not

[7] The „superannuation“ is the Australian version of mandatory retirement savings.

surprising given the hump-shaped age-earnings profile in the general population. As can be expected, both smokers and people who consider themselves at risk are less satisfied with their income situation than others.

To test Hypothesis 3, we first look at the interaction effects between wealth and age, both in the linear and the dummy specification. The negative coefficient of these terms in columns 3 and 5 lends support to this hypothesis even though, surprisingly, the under 30 year olds have a lower marginal utility of wealth, as well. On the other hand, the interaction effects of wealth with both of the more direct risk measures, being smoker and being at risk, are not significant in either of the two estimations. Thus the overall support of the Australian data for the presence of a dead-anyway effect is fairly weak.

5. Concluding Remarks

Despite its a priori plausibility, a closer look at the assertion of a “dead-anyway” effect reveals that its prevalence requires a particular form of market failure in contingent-claims markets, which is not likely to exist in practice. Thus the theoretical foundation of this effect is much weaker than suggested by the authors who coined the term, Pratt and Zeckhauser (1996).

Moreover, the empirical support for the existence of the effect is rather weak, both in existing studies and in the analysis of survey data on life satisfaction from two countries, Australia and Germany. Most of the relevant coefficients are either insignificant or have the wrong sign.

Data limitations prevent us from providing fully conclusive tests of the dead-anyway effect, though. There is only indirect evidence on the subjective risk of dying of the respondents so that in most cases age had to be taken as a proxy. The possession of annuities and life insurance contracts could not be observed perfectly, and no distinction among different forms of life insurance was possible. Finally, the distinction between persons with and without a bequest motive is practically impossible. Thus better data could in principle change the results of this analysis. Nevertheless, the preliminary conclusion from our study is that the dead-anyway effect claimed by Pratt and Zeckhauser has not only a shaky theoretical foundation, but has no empirical support either.

References

Adams, M. (1997), Die Kapitallebensversicherung als Anlegerschädigung, *Zeitschrift für Wirtschaftsrecht,* 1857-1869.

Eeckhoudt, L.R. and J.K. Hammitt (2001), Background Risks and the Value of a Statistical Life, *Journal of Risk and Uncertainty,* forthcoming.

Hammitt, J.K. and J.D. Graham (1999), Willingness to Pay for Health Protection: Inadequate Sensitivity to Probability?, *Journal of Risk and Uncertainty* 18, 33-62.

Hersch, J. and W.K. Viscusi (1990), Cigarette Smoking, Seatbelt Use, and Differences in Wage-Risk Tradeoffs, *Journal of Human Resources* 25: 202-227.

James, E. and D. Vittas (1999), Annuities Markets: Do Consumers Get Their Money's Worth?, The World Bank, September.

Krupnick, A., A. Alberini, M. Cropper, N. Simon, B. O'Brien, R. Goeree and M. Heintzelmann (2000), Age, Health, and the Willingness to Pay for Mortality Risk Reductions: A Contingent Valuation Survey of Ontario Residents, Discussion Paper 00-37, Resources for the Future, September.

Melbourne Institute of Applied Social and Economic Research (1999), *Australian Social Monitor* Vol. 2, No. 4, October.

Pratt, J.W. and R.J. Zeckhauser (1996), Willingness to Pay and the Distribution of Risk and Wealth, *Journal of Political Economy* 104: 747-763.

Smith, V.K. and W.H. Desvousges (1987), An Empirical Analysis of the Economic Value of Risk Changes, *Journal of Political Economy* 95, 89-114.

Viscusi, W.K. (1992), *Fatal Tradeoffs. Public and Private Responsibilities for Risk,* Oxford University Press.

Viscusi, W.K. (1993), The Value of Risks to Life and Health, *Journal of Economic Literature* 31, 1912-1946.

Wagner, G.G., R.V. Burkhauser and F. Behringer (1993): The English Language Public Use File of the German Socio-Economic Panel, *The Journal of Human Resources* 28(2): 429-433.

Winkelmann, L. and Winkelmann, R. (1998): Why are the Unemployed so Unhappy? Evidence from Panel Data, Economica, 65: 1-16.

Zweifel, P. and F. Breyer (1997), *Health Economics,* Oxford University Press.

Table 1: Regression Results for Life Satisfaction in Germany (t-values in parentheses)

	1	2	3	4	5	6	7	8	9	10
	Singles	No Singles	Singles	No Singles	Singles	No Singles	Life Insurance	No Life Insurance	Voluntary contributions	No voluntary contributions
N	1802	7633	1802	7633	1802	7633	2944	6491	149	9286
Constant	4.8486 ** (2.822)	6.4896 (1.281)	7.4024 ** (18.112)	7.9271 ** (39.814)	7.0350 ** (20.077)	7.9709** (41.001)	4.9128 * (2.193)	5.4488 ** (4.730)	- 10.4395 (-1.140)	5.7487 ** (5.731)
Age	- 0.0453 (-1.199)	- 0.1579 ** (-5.417)	- 0.0466 ** (-3.159)	- 0.0505 ** (-6.748)	- 0.0371 ** (-2.654)	- 0.0452 ** (-5.990)	- 0.0817 (-1.449)	- 0.1128 ** (-4.489)	0.1359 (0.692)	- 0.1079 ** (-4.765)
Age squared	0.00043 ** (3.144)	0.00051 ** (6.316)	0.00041 ** (3.022)	0.00035 ** (4.358)	0.00039 ** (2.883)	0.00038 ** (4.808)	0.00062 ** (3.479)	0.00039 ** (5.252)	0.0016 * (2.454)	0.00034 ** (5.365)
Female	0.2276 * (2.296)	- 0.0338 (-0.775)	0.1994 * (1.965)	- 0.0556 (-1.277)	0.2088 * (2.061)	- 0.0552 (-1.264)	0.0745 (1.062)	0.0322 (0.638)	- 0.1045 (-0.428)	0.0301 (0.747)
Log income	0.2443 (1.502)	0.1847 (1.460)					0.3073 (1.418)	0.2352 * (2.098)	2.0135 * (2.255)	0.1988 * (2.039)
Log capital income			- 0.0043 (-0.117)	0.0370 (1.635)						
Log wealth					0.0357 (1.775)	0.0360 ** (2.655)				
Foreign resident	1.4321 ** (3.003)	0.1385 ** (2.813)	1.4380 ** (3.002)	0.3019 ** (5.659)	1.4274 ** (2.990)	0.0399 (0.826)	0.1118 (1.116)	0.2911 ** (5.157)	0.9629 * (2.443)	0.2266 ** (4.760)
Hospital days	- 0.9668 ** (-3.700)	- 0.8879 ** (-8.187)	- 0.9403 ** (-3.737)	- 0.8493 ** (-7.894)	- 0.9684 ** (-3.954)	- 0.8917 ** (-8.276)	- 0.7248 ** (-4.341)	- 1.0278 ** (-8.186)	- 2.1046 (-3.813)	- 0.9575 ** (-10.047)
Age*Income	0.00027 (0.082)	0.0104 ** (3.738)					0.0028 (0.547)	0.0072 ** (3.116)	- 0.0271 (1.427)	0.0072 ** (3.469)
Age*Cap. Income			0.00078 (1.038)	0.0018 ** (3.683)						
Age*Wealth					- 0.00031 (-0.763)	0.00039 (1.320)				
Very old* Hospital* Income	- 0.0456 (-0.987)	- 0.0369 (-1.053)					- 0.1444 (-1.590)	- 0.0243 (-0.830)	—	—
Very old* Hospital* cap.income			- 0.0851 (-1.301)	- 0.0982 (-1.916)						
Very old* Hospital* Wealth					- 0.0596 (-1.271)	- 0.0727 * (-2.041)				
R2 (adj.)	0.0287	0.0414	0.0252	0.0412	0.0265	0.0320	0.0199	0.0404	0.1894	0.0326

Table 2: Regression Results for Income Satisfaction in Australia
(t-values in parentheses)

	1	2	3	4	5
N	1803	1803	1803	1803	1803
Constant	59.917 ** (29.134)	58.4331 ** (27.722)	59.0158 ** (27.479)	59.3820 ** (20.296)	63.4471 ** (15.643)
Under 30	7.4440 ** (4.447)	10.9235 ** (5.272)	10.8796 ** (5.250)	-	-
Over 65	8.3292 ** (7.665)	11.5882 ** (7.299)	11.3029 ** (7.073)	-	-
Age				- 0.0453 (-1.130)	- 0.1732 * (-2.451)
Age sq.				0.0149 ** (8.000)	0.0251 ** (7.243)
Married	1.7423 (1.645)	2.0591 (1.940)	1.9640 (1.847)	1.9475 (1.851)	2.3160 * (2.182)
Education	- 0.4610 ** (-2.955)	- 0.4295 ** (-2.743)	- 0.4303 ** (-2.747)	- 0.3783 * (-2.383)	- 0.3482 * (-2.190)
Income	0.1170 ** (6.871)	0.1134 ** (6.653)	0.1142 ** (6.695)	0.1240 ** (7.254)	0.1225 ** (7.127)
Income sq.	- 0.00023 ** (-4.333)	- 0.00023 ** (-4.319)	- 0.00023 ** (-4.301)	- 0.00025 ** (-4.606)	- 0.00025 ** (-4.575)
Wealth	0.0195 ** (11.076)	0.0224 ** (11.406)	0.0210 ** (9.399)	0.0191 ** (10.748)	0.0077 (1.092)
Wealth sq.	- 0.000014 ** (-5.260)	-0.000015 ** (-5.847)	-0.000016 ** (-5.727)	- 0.000014 ** (-5.360)	- 0.000035 * (-2.495)
Smoker	- 1.5721 (-1.395)	- 1.5474 ** (-5.847)	- 3.3288 * (-1.969)	- 1.3003 * (-1.152)	- 3.1581 * (-1.876)
At risk	- 3.5212 ** (-3.953)	- 3.4505 ** (-3.883)	- 3.7727 ** (-2.792)	- 3.7478 ** (-3.773)	- 3.4724 ** (-2.586)
Under 30* Wealth		- 0.0188 * (-2.446)	- 0.0185 * (-2.409)	-	-
Over 65* Wealth		- 0.0094 ** (-2.723)	- 0.0086 * (-2.459)	-	-
Smoker* Wealth			0.0053 (1.416)	-	0.0058 (1.565)
At risk* Wealth			0.00084 (0.295)	-	0.00044 (0.154)
Age*Wealth					- 0.00033 * (2.243)
Age*Wealth Squared					$-3.8*10^{-7}$ (1.294)
Age Squared *Wealth					- 0.000028 ** (-4.451)
Age Squared *Wealth Sq.					$-1.2*10^{-8}$ (-0.731)
R^2 (adj.)	0.1872	0.1918	0.1920	0.1959	0.2048