How do fixed costs affect a survivor's welfare in Germany?

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Introduction

The death of a spouse constitutes a serious economic risk (income loss) not only but most notably for single-earner households. In a social security system without any compensation for such an income loss, those with no own income or with very low income struggle to survive after the spouse's death. Many studies have analysed the economic consequences of a spouse's death. A large decline in the survivor's income occurs because in most social security systems survivor benefits are only a particular part of the retirement benefits the deceased spouse received before his or her death.

Income loss most often causes poverty for the concerned person. The data from the Retirement History Survey between 1969 and 1979 reveal that 30 percent of single elderly were poor, while only about 9 percent of married elderly were poor. Although the widows of previously poor families were very likely to remain poor, more than three quarters of poor widows had not been poor before the husband's death ([5]). [7] used the U.S. Health and Retirement Study to examine the economic status of widowed women in the 1990s. They found that women widowed at earlier age suffered a greater loss of assets compared with women widowed after the age of 70. [7] point out the difficulties in compensating income loss after the spouse's death. Widowhood mainly occurs at higher age. However, labor force participation of older workers is subject to many constraints.

On counting all sources of income [12] shows that survivor's income equals 71 –73 % of the related income for the couple, depending on the survivor's age. However, when only social security income alone is considered, survivor income falls to about 65 % of the income for the couple. This result agrees with the findings by [1] who show for some OECD member states that income of elderly women falls by about 20 % to 33 % after the death of their spouse. [12] points out that this value is below the equivalence ratio of 0.79, used as a benchmark in the USA for official statistics on income and poverty. In fact, three quarters of all widows are below the equivalence scale [12, p. 96].

Survivor with no own income are most affected financially by the death of a spouse. For this group, income would fall to zero without any benefit protection. Besides survivor benefits, other forms of protection that replace survivor benefits may exist. For example, in Germany spouses can opt for earnings sharing, i.e. for the purpose of benefit calculation both spouses' incomes during marriage is splitted equally between them. This entitles each spouse to a primary benefit. When high own income reduces the amount of survivor benefits significantly, this option can be advantageous.

The extent to which survivor benefits compensate for the reduction of income resulting from the death of a spouse determines whether a survivor suffers poverty or not. Women who did not participate in the labor market due to child care, are normally hardest hit. The 2007 EUROSTAT labor force study on the inactive population in EU member states ([3]) shows that the assumption of family responsibilities is the main cause of inactivity in women aged 25–54. This complies with the findings of national studies such as the Austrian Labor Force Survey [9, p. 72], or the German Micro Census 2008 ([6]). It was seen that women often decide to leave gainful activity in order to take up child care, and thus face reduced retirement benefits. However, even when at low levels, own income can still reduce the negative effects of the spouse's death in Austria and Germany ([4]).

This raises the economic and social question of how high a reduction in the standard of living

can be tolerated for such people. It is beyond dispute that survivor benefits should suffice to cover all elementary needs. However, disadvantages derive from the impact of fixed costs. Fixed costs such as cost of shelter, electricity and heating make up a large part of expenditure, in particular for people in the low income segment. With increasing household net income the part of income that is spent on such fixed cost decreases. Consumer surveys show that this phenomenon holds across various countries ([8]; [10]; [11]).

The present paper investigates the question on how fixed costs such as costs on shelter, electricity and heating affect financial vulnerability of survivors with no own income in Germany. For this purpose the fixed costs are estimated by a linear regression using data from the Micro Census 2006 [10, Table 5.8] for retiree households in Germany. The household's net income serves as predictor of the fixed costs.

The manuscript is organized as follows: First, a brief overview of the survivor's benefits in Germany is presented. The next section then addresses the economic consequences of the death of a spouse in single-earner households and discusses the effect of fixed cost on poor houeholds. All the calculations were carried out using MATLAB.

Survior's benefits in Germany

The present analysis compares households of retirees who have reached full retirement age. Thus, the terms income and retirement benefits are used synonymously. Survivor benefits, b_g, are derived as a particular part, p, of the deceased spouse's retirement benefits, d_g, i.e. $b_g = p\,d_g$. The index g indicates gross amount. d_g is assumed to be $d_g > 0$, since no survivor benefits are available otherwise.

Since survivor benefits aim to compensate for the loss of maintenance, their amount depends on the relation between the survivor's own gross income, s_g, and that of the deceased spouse, d_g. The present analysis addresses single-earner households, i.e. we assume $s_g = 0$. The amount of the survivor benefits is defined as a specific percentage, p, of the deceased spouse's retirement benefit that he or she was entitled to before death, or the potential retirement benefit the deceased spouse would have been entitled to if he or she had applied for it at the moment of death. For $s_g = 0$ this percentage equals $p = 55\%$ in Germany.

Social security provisions for old age are designed to eliminate extremely low incomes. If the appropriate cost for shelter and heating exceeds income minus € 359, the difference is provided as additional social benefit.

Social insurance benefits are subject to social insurance deductions (8.95 % for retirees) and to taxation. For income above € 3750 no social insurance contribution needs to be paid. Marginal income, i.e. income below 365 €, is not subject to social insurance. A non-contributory co-insurance is possible, if a spouse has no income, or an income below € 365. A couple can choose joint taxation.

German tax rates 2010: Total tax for an income x is found from the corresponding row.

Income [€]	Tax [€]
$x \leq 8004$	$0,$
$8005 \leq x \leq 13469$	$\left(912.17\frac{x-8004}{10000} + 14000\right)\frac{x-8004}{10000},$
$13470 \leq x \leq 52881$	$\left(228.74\frac{x-13469}{10000} + 2397\right)\frac{x-13469}{10000} + 1038,$
$52882 \leq x \leq 250730$	$0.42x - 8172,$
$x > 250730$	$0.45x - 15694.$

Income taxes are applied to the gross income net of social insurance and additional deductions (additional expenses). The standard deductions considered here are € 36 for special expenses and € 102 for professional outlay. These deductions are doubled when joint filing is chosen. Total income

minus social security contribution and additional deductions is divided by 2 for joint filing. The German tax rates are summarized in Table above.

Fixed Costs

When quantifying standard of living after the death of a spouse, it has to be considered that a two-person household benefits from economies of scale in consumption, i.e. the needs of a household do not increase proportionately to the size of the household. Thus, fixed costs in a 2-persons houshold, such as shelter, electricity, heating, etc., are not simply twice those of a single-person household. The OECD-modified equivalence scale (see [2]) accounts for this phenomenon and assigns a factor to each household that is proportionate to the household's needs. The scale assigns a factor of 1 to the household head and 0.5 to each additional adult member. For a 2-person-household we thus have a factor of 1.5. This equivalence scale justifies a 30 % loss in net income.

However, the equivalence scale is only a rough measure of needs across household size. It certainly does not take into account variation in needs caused by differences in household net income. For small income households fixed costs such as those for housing, heating and electricity form the major part of expenses. However, these costs do not grow proportionately as income rises. This raises the question of the extent to which income loss remains after such costs have been removed. Such analysis requires estimating fixed costs in relation to the household income. For this purpose the expenses of retirees on housing, heating and electricity were taken from the Micro Census 2006 [10, Table 5.8] for Germany. Figure 1(a) shows these costs in dependence of the household's net income.

The expenses are estimated by a linear model of the form

$$C = \beta_0 + \beta_1 \ N$$

where C stands for the expenses in question, and N is the household net income. Since the expenditure figures on housing are given for certain income intervals, the total net income observed for this interval (including loans or savings) is chosen as predictor. The the three largest income interval were not taken into account since the types of benefits considered in the present paper do not apply, i.e. are smaller, i.e. deceased spouse's net income is assumed to be smaller than € 2600. The following Table summarizes the estimation results.

Regression cofficients

	Estimate	Std. Error	t value	Pr($>$|t|)
Intercept β_0	251.1175	11.6763	21.51	0.0002
Total household's net income β_1	0.1508	0.0051	29.51	0.0001
Adjusted R^2	0.9954			

The linear model in the Table above is used to estimate the fixed costs, C, in a single-earner household with a given gross income d_g and corresponding net income d_n. Expenditures on housing, i.e. shelter, electricity and heating, are refered to as fixed costs in the present analysis. To quantify net income loss net of fixed costs, the survivor's net benefits b_n as derived from d_g are reduced by the fixed cost amount C. The ratio

$$ANL = 1 - \frac{b_n - C}{d_n - C} = \frac{d_n - b_n}{d_n - C}$$

is referred to as adjusted net income loss (ANL). It gives information on what part of the household net income net of costs on housing remains available to the survivor for discretionary use.

Figure 1(b) depicts this ratio in relation to the deceased spouse's net income before death. The cost of housing is less than 50 % of the survivor benefits only when the household's net income

Left Figure: Costs depending on houshold's net income.
Right Figure: Adjusted net income loss (solid line), i.e. net income loss after deduction of fixed cost, proportion of household net income spent on fixed cost before the death of the spouse (dotted line), proportion of survivor's net benefits spent on fixed cost after the death of the spouse (dashed line).
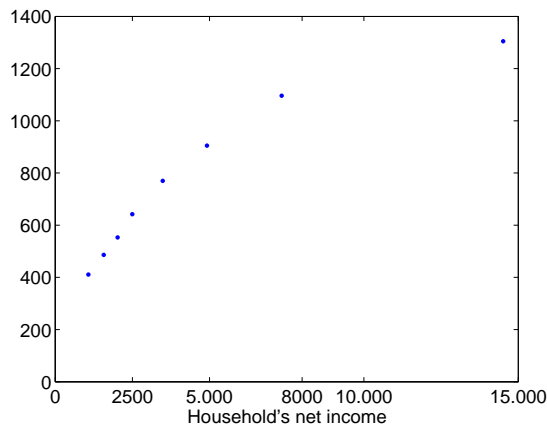
(a) Fixed costs
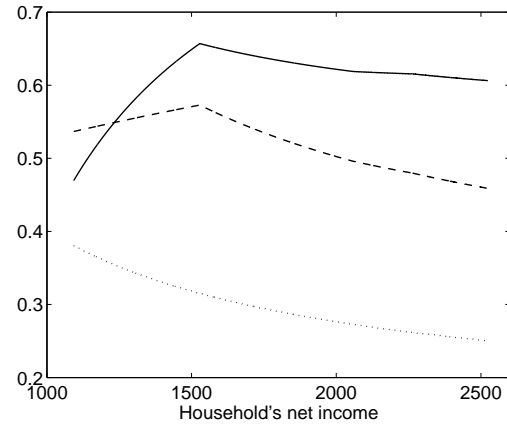
(b) Adjusted income loss

before the death of the spouse was beyond € 2022, i.e. the survivor's net benefits b_n exceed about € 1112. Moreover, the adjusted net income loss (ANL) is above 50 % except for very low income where the subsistance level applies. This is startling, since it means that the amount available to the survivor for consumption other than housing is less than 50 % of the equivalent amount available in the two-person-household. What this means in absolute terms is seen in the table below.

Adjusted net income loss and cost on housing for various houshold net incomes.

d_n	b_n	C	$\frac{C}{d_n}$	$\frac{C}{b_n}$	ANL
910,5000	747,4000	388,4000	0,4266	0,5197	0.3124
1138,1250	781,7293	422,7293	0,3714	0,5408	0.4982
1365,7500	816,0551	457,0551	0,3347	0,5601	0.6049
1593,3750	876,3563	491,3810	0,3084	0,5607	0,6507
1821.0000	1001,5500	525,7068	0,2887	0,5249	0,6326
2048,6250	1126,7438	560,0327	0,2734	0,4970	0,6193
2275,0833	1241,2708	594,1826	0,2617	0,4787	0,6105

Consider a single-earner couple in Austria with a net income of € 1365,75 (third row in the table above. The cost for housing is estimated at € 457,0551. The household spends 33.47 % of net income on housing. The amount available for disposal after deduction of housing costs is € 908,70, or € 454.35 for each spouse. After the single-earner has died, the survivor receives net benefits of € 816,06. After deduction of housing cost, the survivor receives € 359. This is less than half the amount previously available for two persons. It represents 60.49 % loss in adjusted net income. In other words: After deduction of housing cost, the survivor has less than 40 % of what was available in the two-person household after similar deductions. A fair regulation would yield at least 50 % as is the case for small income due to the subsistance level for elderly, i.e. when appropriate cost for shelter and heating exceeds income minus € 359, the difference is provided as additional social benefit. Thus, below a household's net income of about € 1150, more than 50 % of what was available in the

two-person household after similar deductions remain.

A large ANL brings about the risk of poverty. In particular, unfavourable situations may occure when fixed costs rise but net income is adjusted after a time lag. Let k be the amount by which C increases, i.e. $C_1 = (1 + k) C_0$ where C_0 stands for the fixed costs in the two-person household and C_1 are the fixed costs the survivor has to face. Thus, ANL is

$$ANL = \frac{d_n - b_n + k\,C_0}{d_n - C_0}.$$

To analyse the effect of increasing fixed costs on ANL we calculate the derivative in regard to k:

$$\frac{\partial ANL}{\partial k} = \frac{C_0}{d_n - C_0} = \frac{1}{g(d_n) - 1}, \quad \text{where } g(d_n) = \frac{d_n}{C_0}.$$

We assume that $g(x_n)$ is a monotonically increasing, concave function, which can be seen from Figure 1(b). Thus, the electricity of ANL in regard to k is

$$\varepsilon = \frac{\partial ANL}{\partial k} \cdot \frac{k}{ANL} = \frac{k\,C_0}{d_n - b_n + k\,C_0} = \frac{1}{h(d_n) + 1},$$

where $h(d_n) = \dfrac{d_n - b_n}{kC_0}$ is a monotonically increasing function in d_n. This can easily be seen when calculating the derivative in regard to d_n and using $b_n = p(d_n)\,d_n$ and $C_0 = ad_n + b$ for appropriate positive parameters a and b. We assume p to be monotonically decreasing, which holds for the German situation. Thus, the elasticity ε is monotonically decreasing in d_n. This means that survivors with small income loose most when fixed costs increase.

To analyse the effect of increasing survivor's benefits on ANL we calculate the elasticity μ in regard to b_n

$$\mu = \frac{\partial ANL}{\partial b_n} \cdot \frac{b_n}{ANL} = -\frac{1}{\frac{1}{p(d_n)} - 1},$$

where $p(d_n) = \frac{b_n}{d_n}$. As before we assume p to be monotonically decreasing. Thus, μ is monotonically increasing with regard to d_n. In other words: Adjusted income loss decreases most in the low income segment when survivor's benefits are raised.

Summary

The present analysis investigates survivor financial vulnerability after the death of a spouse. In contrast to existing studies on the financial consequences of the death of a spouse, the present research deals with hypothetical retiree households. The economic risk associated with the death of a spouse mainly affects survivors with no own income. For the single-earner household net income loss after deduction of fixed costs is analyzed as a function of the household net income before the death of the earner.

For small income households fixed costs such as those for housing, heating and electricity form the major part of expenses. Adjusted net income loss, i.e. net income loss after deduction of fixed cost is above 50 % except in the low income segment. Thus, the amount net of fixed cost available to the survivor is smaller than half the amount net of fixed costs previously available to two persons. In Germany the situation would be much worse with no subsistance level for elderly.

The low income segment is most affected by an increase of fixed costs and by an increase of survivor's benefits, which can be seen from the corresponding elasticities of the adjusted net income loss. These are important findings for legislation to avoid poverty especially amoung women who decide to leave gainful activity in order to take up child care.

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ABSTRACT (RÉSUMÉ)

The death of a spouse constitutes a serious economic risk not only but most notably for single-earner households since normally it causes a decline of the household net income. Whether and under which conditions the survivor suffers poverty depends on how social security protects the survivor against such an income loss. Having single-earner households in mind, social security generally provides survivor benefits that are derived as a particular share of the deceased spouses gross retirement benefits before death. Such a benefit formula does not provide an appropriate protection because it ignores that fixed costs such as cost of shelter, electricity and heating make up a large part of expenditure, in particular for people in the low income segment.

In contrast to existing studies on the financial consequences of the death of a spouse, the present research deals with hypothetical retiree households in Germany. Adjusted net income loss, i.e. net income loss after deduction of fixed cost is more than 50 % except in the low income segment, where the situation would be much worse with no subsistance level for elderly. An increase of of fixed costs mainly affect the low income segment. Moreover, an increase of benefits is most advantageous for survivors with low income.