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Indirect Fiscal Effects of Long-term Care Insurance

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Johannes Geyer, Peter Haan, and Thorben Korfhage[1]

Indirect Fiscal Effects of Long-term Care Insurance

Abstract

Informal care by close family members is the main pillar of most long-term care systems. However, due to demographic ageing the need for long-term care is expected to increase while the informal care potential is expected to decline. From a budgetary perspective, informal care is often viewed as a cost-saving alternative to subsidized formal care. This view, however neglects that many family carers are of working age and face the difficulty to reconcile care and paid work which might entail sizable indirect fiscal effects related to forgone tax revenues, lower social security contributions and higher transfer payments. In this paper we use a structural model of labor supply and the choice of care arrangement to quantify these indirect fiscal effects of informal care. Moreover, based on the model we discuss the fiscal effects related to non-take-up of formal care.

JEL Classification: J22, H31, I13

Keywords: Labor supply; fiscal effects; long-term care insurance; structural model

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1 Johannes Geyer and Peter Haan, DIW; Thorben Korfhage, RWI. *– Korfhage gratefully acknowledges the support of a special grant (Sondertatbestand) from the German Federal Ministry for Economic Affairs and Energy and the Ministry of Innovation, Science, and Research of the State of North Rhine-Westphalia. The usual disclaimer applies.* *– All correspondence to: Thorben Korfhage, RWI - Büro Berlin, Invalidenstr. 112, 10115 Berlin, Germany, e-mail: thorben.korfhage@rwi-essen.de*

1 Introduction

In most countries long-term care is largely provided informally by close family members. For OECD countries Fujisawa and Colombo (2009) estimate that informal carers account for 70% to 90% of the total care workforce. The demographic change and the aging of the society is a challenge for long-term care systems in general and in particular for the informal care supply. First, the number and population share of the oldest-old (80+) will increase significantly and this will lead to more demand for long-term care. Second, the number of informal caregivers is expected to decline. Not only because of the ageing of the society but also because of rising female labor force participation, an increase of single households, and, in general, a decline in family size. Consequently, public spending on long-term care is expected to increase in OECD countries over the coming decades (De la Maisonneuve and Martins, 2013; Fujisawa and Colombo, 2009). Most important, spending on the formal long-term care sector needs to increase to compensate for reduced family care.

From a policy perspective, informal family care is often viewed as an attractive alternative to more expensive forms of formal care. Therefore, several countries, e.g. Germany in 1995, have introduced allowances for informal care in order to increase the attractiveness of the informal sector. This strategy however neglects that family carers are often of working age and face the difficulty to reconcile care and paid work (Colombo et al., 2011). In particular co-residential caregivers and intensive caregivers work fewer hours and are more often not working than people who do not provide care on a regular basis (Lilly et al., 2007). Therefore, a strong informal pillar may hide sizable indirect fiscal effects of care related to forgone tax revenues and social security contributions and transfer payments. In more detail, increased public spending for formal care enables more caregivers to work or to increase working hours which then leads to indirect fiscal effects. In addition, it is important to consider take up rates for formal care. In particular, families often choose to provide informal care instead of asking for formal services independent of

financial incentives. In other words, people would provide care even in the absence of informal care allowances and may even choose not to take up formal care alternatives. Survey data shows that most people in Germany prefer family care. Asked for the preferred main caregiver in case of long-term care about 50% name their partner, 30% their daughter or son (Geyer et al., 2013).[1]. For an evaluation of the fiscal costs of extending the formal sector it is therefore crucial to understand and quantify the indirect fiscal consequences and to consider the fiscal consequences of low take up rates of formal care.

It is the aim of this paper to provide evidence on these indirect economic effects. In more detail in this analysis we use a structural model similar to Geyer and Korfhage (2015) and estimate the choice of care arrangement as well as the labor supply responses of the carer. In the model we estimate the degree of substitution between informal and formal care which allows us to analyze changes in take-up rates. The structural model is then used to evaluate a counterfactual reform in which subsidies for informal care are replaced by increased subsidized formal care. The aim is to estimate the indirect fiscal effects of this reform. For this specific reform we impose revenue neutrality in the long-term care system, i.e. the additional subsidized formal care will be completely financed by the abolished allowance for informal care. Thus, the resulting fiscal effects of this reform measure the indirect (hidden) effects of changes in income taxation, social security contributions and transfer receipt related to positive labor supply effects. Moreover we discuss take up rates related to the reform and quantify potential fiscal consequences of non-take up of formal care. In particular, as a benchmark we estimate the fiscal costs assuming full-take up of formal care.

Germany is an interesting case for our analysis; first, as mentioned above, Germany introduced allowances for informal care and reflecting this care is mainly pro-

[1] Schupp and Künemund (2004) report similar figures for earlier years. Geyer et al. (2013) also show that asked for the second important person in case of long-term care only about 15% report that they would prefer a formal carer

vided by family members. Second, Germany is a rapidly aging country (Kahlenberg and Spermann, 2012). Therefore, the challenges of the demographic change on the public care system will be particularly pronounced in Germany.

Similar to Van Soest (1995), Aaberge et al. (1995) or Blundell et al. (2000) we model the labor supply decision in a discrete choice setting and following Geyer and Korfhage (2015) we include the choice of the care arrangement. In more detail, the household can choose between informal and formal care and between part-time, full-time or no employment of the carer. We specify a random utility model and account for observed and unobserved heterogeneity following McFadden and Train (2000). Our study is based on panel data from the German Socio-Economic Panel Study (SOEP) for the years 2001 through 2010. The structural model focuses on working age carers who live together with the person in need of care, most often their partner or parent, and who are most likely the main caregiver. This population is of particular interest since informal care provided by co-residents is in general more intense and time consuming than extra-residential informal care. In addition, in Germany informal care by co-residents is by far the most common care arrangement (Schneekloth and Wahl, 2005). In the conclusion we discuss how the empirical results estimated for co-residential carers can be generalized to the full population.

The effect of informal care on labor supply has been studied extensively and most of the empirical literature focuses on the general relationship between labor supply and caregiving (Lilly et al., 2007, provide an overview). Long-term care is similar to childcare in that it affects the trade-off between leisure and consumption (Carmichael and Charles, 1998). Studies find negative labor supply effects in particular for intensive informal care and co-residential care (Lilly et al., 2007; Colombo et al., 2011). Heitmueller (2007) notes that the labor supply response is also related to other factors such as the preference for leisure or the availability of alternative sources of care. He uses British data and focuses on individual heterogeneity related to the provision of informal care and paid labor. He finds the link between care

provision and employment decision to depend on the care setting. He does not find an effect for extra-residential carers but a negative effect for co-residential carers. Some studies show that the long-term care insurance or similar institutions matter for labor supply of carers. For example Sugawara and Nakamura (2014) use data for Japan and show that the negative relationship between care and female labor supply became weaker after the introduction of the LTCI in 2000. This is in line with theoretical considerations because the Japanese LTCI provides only formal services and no cash allowances. A positive labor supply effect of benefits in kind was also found in Geyer and Korfhage (2015). They show that benefits in kind have a positive labor supply effect and a negative effect of cash benefits. Skira (2015) estimates a dynamic structural model for the US and finds, in addition to a negative labor supply effect of care allowances, that care leave can strengthen carer's labor market attachment. Heger (2014) compares the labor supply of caregivers across different institutional settings using data from the Survey for Health, Aging and Retirement in Europe (SHARE). She finds negative effects on labor participation in countries with few formal care options, the effect is insignificant in countries with more generous care systems. So far we are not aware of studies that take into account the fiscal consequences of the labor supply reactions of caregivers into account. Most often fiscal effects are estimated for demographic scenarios in which behavioral reactions are either ruled out or are based on scenario assumptions (e.g., Hancock et al., 2003) .

Based on the estimated structural model we find relatively large positive labor supply effects. In particular, a shift of subsidies for informal to formal care increases the working hours of the carers on average by 11.6% and employment by 4 percentage points. The labor supply effects for female carers are particularly strong; working hours increase by 19% and participation by more than 6.3 percentage points. These labor supply responses lead to significant indirect fiscal effects in terms of income taxation, social security contributions and transfer payments. Annual revenues in-

crease on average by more than 400 euro per household. The effects are relatively large: in particular the indirect fiscal effects, i.e. the increase in public revenues, amount to about 14% of the redistributed amount of cash benefits (direct cost of the reform).Further, we find that low take up rates have strong fiscal implications. When we impose a full take-up scenario, instead of the estimated take-up rate of 53%, the cost for the long-term care system increases on average by 5,100 euro per year and household which is an increase of 161% compared to the scenario with estimated take-up rates.

Our paper is structured as follows. In the next section we provide a short overview about the long term care system in Germany. Then we describe the structural model, the empirical implementation, the data and provide the estimation results for the structural model. In section 4 we discuss the policy reform, i.e. replacing subsidies for informal care with subsidies formal care and present in detail the simulation results with a focus on labor supply and on the indirect fiscal costs related to tax payments, social security contributions and transfers and to non-take-up of formal care. Section 5 concludes.

2 Long-term care insurance in Germany

About 1.9 million people living in private households receive benefits from the long term care insurance (LTCI) in Germany (Pflegestatistik 2013)[2]. About 1.3 million receive only informal care while 0.6 million beneficiaries receive both informal and formal care at home. 62% of family carers live in the same household as the care recipient and are usually the primary caregivers (Schneekloth and Wahl, 2005). In the empirical analysis we will concentrate on the latter group; in more detail we concentrate on working age carers who live together with the person in need of care, most often their partner or parent. This population is of particular interest

[2]In addition about 0.8 million people live in nursing homes. This paper focuses only on individuals in private households

since informal care provided by co-residents is in general more intense and time consuming than extra-residential informal care. At the same time Geyer and Schulz (2014) estimate that about 6% of the whole adult population provide informal care on a regular basis whereas 60% of all caregivers are of working age. Thus, long-term care affects a nontrivial share of the working population and as mentioned above this share is likely to increase in the future.

In Germany, the LTCI provides benefits to individuals with permanent (at least six months) impairments in at least two activities of daily living (ADL) and one instrumental activity of daily living (IADL).[3] Depending on the level of impairments, three care-levels are distinguished, which are assessed by the Medical Service of the Health Funds and can therefore be interpreted as objective measures of health. LTCI consists of two parts, informal care, in general provided by nonprofessional family members and formal care provided by professional health care services. Informal care benefits are given as cash transfer whereas formal care is organized as an in-kind transfer. In 2015 monthly benefits in cash for informal care ranged from 244 euro (in care-level I) up to 728 euro (in care-level III).[4] Cash benefits can be used to reimburse informal carers, in general family members, they are neither means tested, earmarked nor is their spending monitored. Benefits in kind for formal care are more generous. They range from 468 euro per month up to 1,612 euro and are directly paid to an ambulatory care service.[5]

Beneficiaries in private households can choose between cash benefits and benefits in kind or a combination of both. It is important to note that these benefits do not fully cover the risk of long-term care; they are designed to support and complement family care but not to replace it. The choice between benefits for informal and formal care depends mainly on the caregivers' preferences for family care and the

[3] Schulz (2010) provides a detailed overview about the long term care insurance in Germany.
[4] Until 2008 cash benefits ranged from 205 euro up to 665 euro; to account for inflation they were slightly increased in 2008, 2010, 2012, and 2015.
[5] Benefits in kind were also increased over time. Until 2008 they ranged from 384 euro up to 1,432 euro.

financial attractiveness of the two different benefit schemes. Formal and informal care have opposite effects on labor supply incentives, this fact is key for the following empirical analysis; see Geyer and Korfhage (2015) for a more detailed discussion. In particular increasing non-labor income (benefits in cash) induces negative labor supply incentives. In contrast, benefits in kind for formal care substitute informal care which enables family carers to increase labor supply. Crucially the structural model developed in the next sections accounts for these different labor supply effects.

3 Structural model, data and estimation

In this section we describe the structural model that will be used for the policy evaluation, discuss the econometric implementation and the data and finally we present the estimation results of the structural model.

3.1 Structural model of care arrangement and labor supply

For the analysis of the indirect fiscal effects of formal long term care we propose a structural model similar to Geyer and Korfhage (2015) that explains jointly the decision of the care arrangement and labor supply.[6] As mentioned above the structural model focuses on working age carers who live together with the person in need of care, most often their partner or parent, and who are most likely the main caregiver.

In more detail, we derive a discrete choice model with different alternatives of labor supply (working hours) and benefits from the LTCI (formal or informal). This approach takes into account that working hours are heavily concentrated at particular points of the distribution, such as zero hours, part-time and full-time. It also allows to model nonlinearities in the budget constraint related to the tax-benefit system, see e.g. Van Soest (1995), Aaberge et al. (1995) or Blundell et al.

[6] In this paper we only provide a short description of the model, for more details including further references to other relevant structural models of care arrangement and labor supply, see Geyer and Korfhage (2015)

(2000). The choice set of the carer consists of three working hours categories and two categories of benefits from the LTCI. The working categories include non-working (0 hours), part-time work (19 hours), and full-time work (41 hours). In addition, households can choose between benefits in cash (informal care) or benefits in kind (formal care). Thus, households can choose between six alternative combinations.

Following Becker (1991) we assume that the carer is altruistic. Thus, the carer not only gains utility from leisure and income, but also from the well-being of the household member in need of care. Therefore the following utility function for the household can be derived:

$$U = u[c, l, f(\lambda, h_c, h_o); X, \xi, \varepsilon], \tag{1}$$

where c is net household income and l is the carer's pure leisure time. $f(\cdot)$ describes the wellbeing of the care recipient, this depends on the care-level λ, informal family care hours h_c, and formal care-hours h_o. Furthermore, utility depends on observable characteristics which are captured by vector X. ξ describes unobserved individual characteristics that influence preferences and ε is an alternative specific error term.

3.2 The Budget Constraints

Households maximize the utility function subject to budget constraints describing the available time and income resources which depend on the chosen working categories and the care arrangement. Net income depends on the hourly wage w, working hours h_w, non-labor income A, such as capital income, and on the tax-benefit system $t(\cdot)$.

$$c = t(wh_w + A; X) + b_c(\lambda), \tag{2}$$

where net income generated by $t(\cdot)$ depends in addition to gross household income

on individual and household characteristics captured by the vector X (e.g., children, marital status). Net household income is simulated for each alternative on the basis of the Tax-Transfer-Simulation-Model (STSM). This microsimulation model contains the main properties of the German tax and transfer system.[7] Cash benefits from the LTCI are tax free and are not withdrawn and not credited against other transfers, such as social assistance transfers. Therefore, benefits in cash b_c can be added to the household's net income without further adjustments. As mentioned above, according to the LTCI scheme, benefits increase with a higher care-level (λ).

Further, we assume that a certain care-level is related to a fixed amount of care hours that must always be provided. We rely on a representative survey study by Schneekloth and Wahl (2005) to obtain average weekly care hours of 29.4 hours in the first care-level, 42.2 hours in the second level, and 54.2 hours in the third level.[8] We use these averages as the total care-time (h_T) that must be provided formally by the care service and/or informally by the caring household member.[9]

$$h_T(\lambda) = h_c + h_o \tag{3}$$

If households choose benefits in kind, a part of the care load is provided formally. Depending on the care-level, households are eligible for different amounts of benefits that are directly paid to a care service. In order to calculate informal care hours we follow Büscher et al. (2007) and assume an hourly price of formal care of $p_{h_o} = 28.30$ euro in 2006. We adjust prices by the consumer price index for all other years. Note, b_k equals zero if the household does not use benefits in kind.

[7] For a detailed description of the STSM, see Steiner et al. (2012).

[8] Because the double burden of informal care and market work is especially relevant on weekdays. We only consider the trade-off between choices on weekdays. Thus, in the model the stated average care hours are multiplied by (5/7).

[9] This assumption implies h_c and h_o are substitutes, which is not uncontroversial in the literature. Bonsang (2009) or Bolin et al. (2008) show that the assumption of substitution is reasonable if care does not require specific medical knowledge. Hence, e.g., doctor visits are likely to be a compliment to informal care but fundamental care tasks can be supplied by any carer.

$$h_o = b_k(\lambda)/p_{h_o}, \tag{4}$$

According to Equation (3) the informal care hours can simply be calculated as the difference between the exogenous total care time h_t and formal care time h_o

$$h_c = h_T(\lambda) - h_o. \tag{5}$$

Note again, the insurance only partly covers the risk of long-term care, meaning that home care is primarily provided by the household member, no matter what type of benefits is chosen. h_c is thus always positive and larger than h_o.

Finally, leisure time is calculated as the difference between total time allowance ($T = 80$), time devoted for paid employment h_w, and for informal care services h_c.

$$l = 80 - h_w - h_c \tag{6}$$

Substituting Equations (2), (4), (5) and (6) into the utility function (1) yields the carer's maximization problem

$$U = u\left\{t(wh_w + A) + b_c(\lambda), 80 - h_w - h_c, f[\lambda, h_c, h_t(\lambda) - h_c]; X, \xi, \varepsilon\right\} \rightarrow \max_{h_c, h_w} \tag{7}$$

subject to non-negativity of the choice variables.

3.3 Econometric Specification

For the estimation we use a mixed logit model with random coefficients as for example McFadden and Train (2000). In more detail, we specify U_{ijt}, the utility that carer i gains from choosing alternative j at time t. Assuming a log-linear functional

form, the utility function for the household can be restated as

$$U_{ijt} = \log(l_{ijt})\beta_{li} + \log(c_{ijt})\beta_{ci} + \log(h_{c_{ijt}})\beta_{h_c} + \log(l_{ijt}) \times \log(c_{ijt})\beta_{lc} + X'_{ijt}S_{ijt}\beta_X + \varepsilon_{ijt}. \quad (8)$$

Thereby, the alternative specific error term ε_{ijt} is assumed to be iid extreme value; β_{li} and β_{ci} are random coefficients which are allowed to vary between individuals and are introduced in order to capture the unobserved heterogeneity ξ in Equation (1). We assume that both random coefficients are normally distributed $\beta_{li} \sim \mathrm{N}(\beta_l, W_l)$ and $\beta_{ci} \sim \mathrm{N}(\beta_c, W_c)$, where the means $\beta_{l,c}$ and the variance-covariance matrices $W_{l,c}$ are to be estimated. Furthermore, in order to control for observable heterogeneity, characteristics X_{ijt} are interacted with observable attributes of the alternatives which are collected in vector S_{ijt}. All other β-coefficients are mean coefficients and will be estimated by simulated maximum likelihood. In the main specification we use 100 Halton draws for the simulations; (for more details, see Geyer and Korfhage (2015)).

3.4 Data

For the empirical analysis we use data from SOEP covering the years 2001 through 2010.[10] Our study focuses on households with a working age individual, i.e. the carer, and a person eligible for LTCI. In particular carers are between 35 and 65 years old and are not retired. Overall, we use 367 individuals with 1601 observations over time.

Tables 1 and 2 provide summary statistics. In the first panel of Table 1 we show some characteristics of the carer. In particular, of all carers, 72% are employed, the majority of carers are women, the average age is close to 50 and the majority of carers is in good or very good health. The second panel contains information about

[10]For a description of SOEP, see Wagner et al. (2007) and http://www.diw.de/soep.

the care recipient. In line with the official statistics, the majority chooses informal care (more than 70%). About half of the eligible are entitled to Care level I (44%), 35% receive Care level II and 21% Care level III.

Table 1: Descriptive statistics

	mean	sd
main carer		
employed	0.72	0.45
age	49.01	7.56
female	0.53	0.50
migration background	0.14	0.35
self-rated health status: good–very good	0.43	0.50
self-rated health status: satisfactory	0.40	0.49
self-rated health status: poor–bad	0.17	0.38
care recipient		
benefits in cash	0.73	0.45
age	40.47	30.73
male	0.47	0.50
care-level I	0.44	0.50
care-level II	0.35	0.48
care-level II	0.21	0.41
Observations	1601	

Source: SOEPv30, own calculation.

In Table 2 we present the share of the households in the different labor supply and care alternatives, on average (Column I) and by care level (Columns II - IV). In addition we report the average distribution of female and male carers in the categories. All combinations find support, including formal care and non-employment (about 7%) and full time employment and cash transfers (about 30%). Further, the table shows that employment is more frequent in Care level I. Finally we find the expected differences by gender. Male carers are more likely to work full time whereas for female carers non-employment and part time work is dominating.

Table 2: Frequencies of actual chosen alternatives (in %)

Alternatives	All	Level I	Level II	Level III	Female	Male
no work & in cash	19.9	18.9	19.5	22.6	28.2	10.7
no work & in kind	7.7	6.4	7.7	10.6	10.5	4.7
part time & in cash	20.8	22.1	22.0	16.1	34.6	5.5
part time & in kind	7.6	6.7	8.5	7.9	11.9	2.8
full time & in cash	31.9	33.8	32.8	26.4	9.2	57.0
full time & in kind	12.2	12.2	9.5	16.4	5.7	19.3

Note: All values indicated frequencies of chosen choice in percent. For instance, of all females 30% chose not to work and to get benefits in cash.

Source: SOEPv30, own calculation.

3.5 Results

Table 3 shows the estimation results. In addition we present the model fit in Table 8 in the Appendix. We estimate significant standard deviations of the random coefficients of leisure and household income in the mixed logit model. Moreover we find the expected heterogeneity with respect to the observed characteristics. In particular, we estimate a higher preference for leisure time for women compared to men. In general, however, the single coefficients and the significance are difficult to interpret given the multiple interactions in the model. Therefore, in the Appendix we present labor supply elasticities and elasticities with respect to changes in financial incentives for informal and formal care and we show bootstrapped confidence intervals to test significance of these effects. In more detail, Table 9 in Appendix shows an elasticity with respect to a one percent increase in hourly wages of 0.18 with respect to working hours. Females react stronger with 0.32 compared to men (0.018). Further we show that labor supply is reduced when benefits in cash are increased by 1% (Table 10, Appendix): on average by 0.08 (% in working hours); women again stronger with 0.13 but men react as well: 0.03. Note that this increase is not constant across care levels. Finally, we find positive labor supply reaction with respect to changes in benefits in kind (Table 11, Appendix). Again women react stronger than men and effects are largest for Care level III.

Table 3: Estimation results

	(1)
Mean	
log (leisure) × log (net income)	1.385**
	(0.297)
log (net income) × east	−2.722*
	(1.316)
log (net income) × (household size > 2)	4.019**
	(1.258)
log (net income) × female	3.774**
	(1.335)
log (leisure) × age	−0.784**
	(0.234)
log (leisure) × (age^2/100)	0.940**
	(0.243)
log (leisure) × female	7.016**
	(0.557)
log (leisure) × children in household	0.623**
	(0.222)
log (leisure) × adults in household	−0.279
	(0.200)
log (leisure) × migration background	0.316
	(0.593)
log (leisure) × care-level 2	−0.080**
	(0.012)
log (leisure) × care-level 3	−0.110**
	(0.015)
log (leisure)	5.247
	(6.011)
log (net income)	0.680
	(1.959)
SD	
log (leisure)	4.615**
	(0.360)
log (net income)	−9.790**
	(0.861)
log likelihood	-2,054.42
Akaike's Information Criterion (AIC)	4,140.85
Observations	9,606

Note: Values denote estimated coefficients. Standard errors are reported in parentheses. The random coefficients model is estimated using simulation methods. Simulation was performed using 100 pseudo-random Halton draws for each household.

Significance levels: † p <0.10, ∗ p <0.05, ∗∗ p <0.01

Source: SOEPv30, STSM, own calculation.

4 Policy Simulation

In the final section of the paper we use the estimated structural model to analyze the indirect fiscal effects of subsidized formal care. As discussed above the indirect fiscal effects can be related to changes in tax revenues, social security contributions and transfer receipt which are induced by positive labor supply effects of the long-term care reform. Moreover, non-take up of formal care reduces the potential fiscal costs of the reform. Low take-up rates on the other hand imply that informal care continues to play a dominant role which then has a direct effect on the net income or the leisure time of caring households.

In more detail, in the following we simulate labor supply effects, the choice of care arrangement and the related fiscal effects of a counterfactual policy reform in which subsidies for informal care are replaced with increasing subsidies for formal care. For this specific reform we impose revenue neutrality in the care system, i.e. the additional subsidized formal care will be only financed by the abolished allowance for informal care. To be more precise, in this policy reform we use the cash transfers paid for informal care (according to our model, per year 3,159 euro per household, see Table 6) to finance an increase of in-kind transfers for formal care. When calculating the additional amount of in-kind transfers we account for the choice of care arrangement, i.e. the substitution between informal and formal care which defines take up of the additional provided in-kind transfers. In the calculation we impose the same change for the different care levels and increase the in-kind transfers to match the available resources used to finance formal care in the base-line scenario; this results in an increase of the transfers for formal care by about 15%. Although we impose in the simulation that the extra costs for the informal care are matched by the reduction in the subsidy for informal care this reform might lead to sizable indirect fiscal effect which are the main focus of this study. Simulations based on the structural model allow us to assess these effects. In particular, we use the structural model to estimate the labor supply effects induced

by the policy reform and then to calculate the related changes in tax revenues, social security contributions and transfer receipt. In order to quantify the potential fiscal consequences of non-take-up of formal care we propose the following simulation. We calculate the additional direct fiscal costs, i.e. the costs for formal care, in a scenario with full-take up of formal care, and interpret these additional costs as the hidden fiscal effects of estimated non-take up rates. These effects need to be interpreted carefully: first we do not consider the potential indirect fiscal effect of potential labor supply effects under full take up, and second, full take up is an extreme scenario given the strong preferences for informal care by family members (Geyer et al., 2013). However these fiscal effects document the importance to consider non-take up rates when predicting costs of expanding formal care.

4.1 Labor supply and care arrangement

Table 4: Simulated responses in labor and informal care supply

	Working hours %	Empl. PP	Inform. hours %	Ben. in kind PP
all	11.6	4.0	-6.9	20.0
	(10.4 – 13.0)	(3.6 – 4.3)	(-7.4 – -6.3)	(17.7 – 22.0)
males	3.3	1.5	-3.5	9.7
	(2.8 – 3.8)	(1.3 – 1.7)	(-4.3 – -2.8)	(6.6 – 12.7)
females	19.0	6.3	-10.0	29.2
	(17.1 – 21.3)	(5.7 – 6.8)	(-10.7 – -9.2)	(26.1 – 32.1)
care-level 1	4.0	1.6	-3.8	15.7
	(3.6 – 4.4)	(1.5 – 1.7)	(-4.1 – -3.5)	(13.8 – 17.5)
care-level 2	10.8	4.1	-8.0	21.0
	(9.6 – 11.9)	(3.6 – 4.4)	(-8.6 – -7.2)	(18.4 – 23.2)
care-level 3	28.5	8.8	-11.7	27.2
	(25.6 – 32.9)	(8.1 – 9.6)	(-12.6 – -10.6)	(24.3 – 29.9)

Note: 10% confidence intervals in parenthesis are calculated using parametric bootstrap with 100 draws.
Source: SOEPv30, STSM, own calculation.

Table 4 shows the simulation results with respect to labor supply and care arrangement of the hypothetical policy simulation. The behavioral changes are derived from the estimated structural model. In particular, based on the estimated coefficients we

predict the households' choice of labor supply and care arrangement for the base-line scenario and for the policy reform. The difference between the choice probabilities can then be interpreted as behavioral effects due to the reform. We summarize the labor supply effects by reporting relative changes in working hours (in %) and changes in participation rates (in percentage points). Changes in the care arrangements are measured by the change in hours spent on informal care (in %) and the increase in the take up of formal care (in percentage points).

We find strong and positive labor supply effects of the carer which go along with substitution between informal and formal care. In particular, on average we find that working hours increase by 11.6% and the participation rate by 4 percentage points. The effects strongly differ by gender and increase with the care level. As expected, and consistent with the higher elasticities of female labor supply, women react stronger to the reform than men. Female working hours increase by more than 19% while the working hours of the male carer increase only by about 4%. The effects for carers in Level III which requires most care and where the level of employment is particularly low, is strongest. According to the simulations, working hours increase by more than 30% and participation by nearly 10 percentage points.

In Columns III and IV we report the substitution effects between informal and formal care induced by the reform. On average the number of hours spent on informal care is reduced by about 7% and again this effect is stronger for women and for households in higher care levels. Further, we find that due to the reform the share of households using formal care increases by 20 percentage points. Thus, in the new scenario more than 53% of all households rely on formal care. On the other hand a large fraction of households decide not to take up formal care and to continue with informal care despite the new incentive structure which provides no cash transfers for informal care. This implies that these households accept a significant drop in their net household income together with a reduction in leisure time. To be more precise, under full take up the demand for formal care could have

increased by 67 percentage points instead of 20 as predicted by our model. Thus, we estimate a non-take up rate for formal care of 47 percentage points. Obviously the non-take up of formal care have important fiscal consequences for the long-term care reform which we will quantify and discuss below.

4.2 Indirect fiscal effects related to employment

In this subsection we discuss the indirect fiscal effects induced by the increase in employment. Table 5 presents the absolute (Euro per year per household) and relative (in %) increase in gross earnings, the change in social security contributions, the increase in income taxation and finally the reduction in transfer payments. In order to simulate theses effects we use the micro simulation model described above which includes all relevant components of the German tax and transfer system and the important interactions and dependencies of the different components.

On average the labor supply effects presented above increase gross earnings by 1,366 euro per year. The difference in the increase of gross earnings by gender is slightly smaller than the pure difference of the labor supply effects. This is because, on average, wages of male carers are higher but female labor supply reacts stronger. Further the simulations show sizable changes in social security contributions, income taxation, and transfer receipt. The increase in social security contributions (on average more than 260 euro per year) is larger than the increase in income taxation as the latter schedule is more progressive and has a large disregard. Finally, we find a clear reduction of transfer receipt as the additional earnings are withdrawn from transfers at a rate close to 100%.

In total we estimate that the long-term care reform leads to indirect fiscal effects of 419 euro per year (see Table 6). Relative to the direct fiscal cost of the reform (Column II), more precisely, the resources that are transferred from informal care to formal care, the indirect fiscal effects are of sizable magnitude. According to our simulation the indirect fiscal effects amount to 14.1% of these total costs.

Table 5: Simulation: Indirect fiscal effects

	ΔEarnings	Earnings (%)	ΔSSC	SSC (%)	ΔTax	Tax (%)	ΔTransfers	Transfers (%)
all	1,366	5.2	260	3.3	87	3.2	-73	-8.1
males	690	2.2	142	1.6	92	2.0	-72	-7.4
females	1,963	8.8	366	5.2	82	8.0	-74	-8.8
care-level 1	463	1.7	86	1.1	31	1.1	-27	-2.8
care-level 2	1,474	5.2	283	3.2	124	4.0	-72	-10.0
care-level 3	3,038	13.9	581	8.4	142	7.1	-169	-15.9

Note: The differences are calculated as absolute and relative euro amounts per year and household.
Source: SOEPv30, STSM, own calculation.

Table 6: Simulated indirect fiscal effects relative to increased formal care costs

	I Δ Costs	II Indirect fiscal effect	III %
all	3,159	419	14.1
males	3,361	306	20.7
females	2,976	522	12.1
care-level 1	1,567	144	12.7
care-level 2	3,455	478	14.4
care-level 3	5,966	891	14.3

Note: Costs and fiscal effects are calculated in euro per year and household.
Source: SOEPv30, STSM, own calculation.

4.3 Fiscal effects related to non-take up

In the final part of the analysis we quantify the fiscal effects related to non-take up rates of the reform. As discussed above, according to our simulations the take up of formal care increases only by about 20 percentage points which implies a non-take up rate of 47%. This is related to the high preferences of households for informal care. In order to understand the fiscal consequences of the low take up rates we use the estimated model and simulate the hypothetical fiscal effects of the reform under full take up. We then interpret the differences in the fiscal cost under full take up and the estimated take-up rates as indirect fiscal effects related to non-take up, in other words we interpret this difference as fiscal gain for the government.

In Table 7 we compare the results of both reform scenarios. In Column I we show the average fiscal cost for financing formal care with full take up, in Column II fiscal costs with estimated take-up rates are reported. In Columns III and IV we present the absolute and relative increase in the costs when we assume 100% take-up. Overall we find that the fiscal costs under full take up increase markedly.

Table 7: Simulated average costs with partial and full take up

	I Δ costs for formal care 100% take up	II Δ costs for formal care 53% take up	III diff. absolute	IV diff. relative (in %)
all	8,260	3159	5101	161
males	8,670	3361	5309	158
females	7,889	2976	4913	165
care-level 1	3,684	1567	2116	135
care-level 2	9,601	3455	6146	178
care-level 3	15,536	5966	9571	160

Note: The differences are calculated as absolute and relative amounts in euro per year and household.
Source: SOEPv30, STSM, own calculation.

In particular the average fiscal costs per year and household amount to about 8,200 euro. This is more than 5,000 euro higher than the increase in costs for formal care under the estimated take up rate of 53%. In other words, under full take up the costs for the care system would increase further by more than 160% compared to the other reform scenario. We find small differences by gender of the carer and by the care level which is related to the differences in the estimated take-up rates for these groups.

5 Conclusion

In this paper we analyze the indirect fiscal effects of expanding formal long-term care. In particular based on a structural model of labor supply and care arrangement choices we simulate the indirect fiscal effects of an increase in formal long-term care which is financed by a reduction of subsidies for informal care. This hypothetical reform leads to sizable positive employment effects in particular for women. Related to these positive employment effects we calculate the increase in social security contributions, income taxation and the reduction in transfer payments. Annual public revenues increase on average by more than 400 euro per household. The effects are relatively large: in particular the indirect fiscal effects, i.e. the increase in public revenues, amount to about 14% of the direct increase in the costs for formal

care, i.e. the direct cost of the reform.

Further, we study the fiscal effects of non-take up rates. In more detail, according to our estimation take up rates of formal care in the simulated scenario are only 53%. These low take up rates have important fiscal implications. When we impose full take-up, instead of the estimated take-up rate of 53%, the cost for the care system increases on average by 5,100 euro per year and household which is an increase of 161%. These additional costs do not reflect potential indirect fiscal effects in terms of taxes and transfers. Moreover, according to the literature take-up rates of 100% are an extreme assumption since preferences for informal care irrespective of financial incentives are high.

The empirical analysis is based on households with working age carers who live together with the person in need of care, most often their partner or parent. This population, which covers the majority of households eligible for long-term care, is of particular interest since informal care provided by co-residents is in general more intense and time consuming than extra-residential informal care. *A priori*, it is not clear how our findings are affected when focusing on the full population of households eligible for long term care; yet it is likely that the estimated indirect fiscal effects might represent an upper bound. First we expect extra-residential carers to be less sensitive to labor supply effects, and second, the take-up rates for formal care in households with extra-residential carers should be higher. Still, the conclusion derived from the empirical analysis remains relevant for the whole population; indirect fiscal costs related to expanding formal care are important and should be considered when designing policies to cope the challenges of long term care.

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Table 8: In-sample model-fit

	Data	Predicted
no work & in cash	19.9	18.5
no work & in kind	7.7	13.5
part time & in cash	20.8	14.9
part time & in kind	7.6	7.5
full time & in cash	31.9	33.3
full time & in kind	12.2	12.3

Source: SOEPv30, STSM, own calculation.

Table 9: Estimated elasticities of a 1% increase in wages

	Working hours %	Empl. PP
all	0.1786	0.0715
	(0.1509 – 0.2027)	(0.0611 – 0.0804)
males	0.0144	0.0008
	(-0.0043 – 0.0342)	(-0.0087 – 0.0116)
females	0.3246	0.1343
	(0.2867 – 0.3625)	(0.1216 – 0.1462)
care-level 1	0.2107	0.0793
	(0.1840 – 0.2360)	(0.0687 – 0.0890)
care-level 2	0.1433	0.0611
	(0.1149 – 0.1666)	(0.0516 – 0.0700)
care-level 3	0.1695	0.0721
	(0.1402 – 0.2037)	(0.0614 – 0.0834)

Note: 10% confidence intervals in parenthesis are calculated using parametric bootstrap with 100 draws.

Source: SOEPv30, STSM, own calculation.

Table 10: Estimated elasticities of a 1% increase in benefits in cash

	Working hours %	Empl. PP
all	-0.0830	-0.0323
	(-0.0898 – -0.0751)	(-0.0349 – -0.0296)
males	-0.0297	-0.0137
	(-0.0340 – -0.0244)	(-0.0156 – -0.0115)
females	-0.1311	-0.0491
	(-0.1427 – -0.1187)	(-0.0527 – -0.0451)
care-level 1	-0.0392	-0.0167
	(-0.0424 – -0.0358)	(-0.0181 – -0.0152)
care-level 2	-0.0847	-0.0351
	(-0.0942 – -0.0755)	(-0.0386 – -0.0313)
care-level 3	-0.1706	-0.0600
	(-0.1873 – -0.1558)	(-0.0662 – -0.0549)

Note: 10% confidence intervals in parenthesis are calculated using parametric bootstrap with 100 draws.

Source: SOEPv30, STSM, own calculation.

Table 11: Estimated elasticities of a 1% increase in benefits in kind

	Working hours %	Empl. PP
all	0.0667	0.0236
	(0.0625 – 0.0710)	(0.0224 – 0.0248)
males	0.0221	0.0106
	(0.0201 – 0.0239)	(0.0098 – 0.0114)
females	0.1069	0.0353
	(0.0995 – 0.1148)	(0.0334 – 0.0373)
care-level 1	0.0206	0.0080
	(0.0190 – 0.0222)	(0.0076 – 0.0085)
care-level 2	0.0809	0.0297
	(0.0753 – 0.0853)	(0.0280 – 0.0315)
care-level 3	0.1388	0.0456
	(0.1283 – 0.1498)	(0.0427 – 0.0483)

Note: 10% confidence intervals in parenthesis are calculated using parametric bootstrap with 100 draws.

Source: SOEPv30, STSM, own calculation.