

# GOING FORMAL OR INFORMAL, WHO CARES? THE INFLUENCE OF PUBLIC LONG-TERM CARE INSURANCE

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## ABSTRACT

International differences in long-term care (LTC) use are well documented, but not well understood. Using comparable data from two countries with universal public LTC insurance, the Netherlands and Germany, we examine how institutional differences relate to differences in the choice for informal and formal LTC. Although the overall LTC utilization rate is similar in both countries, use of formal care is more prevalent in the Netherlands and informal care use in Germany. Decomposition of the between-country differences in formal and informal LTC use reveals that these differences are not chiefly the result of differences in population characteristics but mainly derive from differences in the effects of these characteristics that are associated with between-country institutional differences. These findings demonstrate that system features such as eligibility rules and coverage generosity and, indirectly, social preferences can influence the choice between formal and informal care. Less comprehensive coverage also has equity implications: for the poor, access to formal LTC is more difficult in Germany than in the Netherlands. Copyright © 2014 John Wiley & Sons, Ltd.

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## 1. INTRODUCTION

Patterns of utilization of long-term care (LTC) differ across Europe. Two phenomena in LTC utilization have received particular attention in the literature: differences in the relative importance of formal and informal care and differences in rates of institutionalization (OECD, 2005; Huber *et al.*, 2009; Rodrigues and Schmidt, 2010). Although cross-country variation in LTC use is well documented, it is not very well understood. Studies on LTC using the Survey of Health, Ageing and Retirement in Europe<sup>1</sup> (SHARE) do not go beyond including country dummies to account for cross-country differences. We aim to explain international differences in LTC use by investigating the impact of differences in public LTC insurance on household decisions. We focus on Germany and the Netherlands because both countries have a similar system of financing and organizing universal coverage for LTC but with some interesting differences in their degree of comprehensiveness. Despite the similarities in financing and organization, there are large differences in the mix of LTC use. We hypothesize that (part of) these differences in LTC use between the Netherlands and Germany stem from two important differences in the design of the public insurance system: (i) the use of the spouse's ability to provide informal care as a criterion in determining eligibility for publicly funded care and (ii) comprehensiveness of public LTC coverage.

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<sup>1</sup>[www.share-project.org](http://www.share-project.org)

To test our hypotheses, we model LTC use as a function of personal and household characteristics and decompose the difference in formal and in informal LTC use into contributions of differences in population characteristics and of differences in coefficients. These differences in coefficients show that the association between population characteristics and LTC use is different and may result from institutional and cultural differences. Previous studies on which characteristics are important determinants of formal LTC use (e.g., Manton *et al.*, 2006, 2007; Nihtilä and Martikainen, 2008; de Meijer *et al.*, 2009; Weaver *et al.*, 2009; Luppia *et al.*, 2010; de Meijer *et al.*, 2011) have obtained qualitatively similar findings, regardless of the institutional setting. Need-related characteristics, such as measures of health status and disability, are invariably the most important determinants in terms of size and significance and have therefore received most attention. The second most important determinant is typically the availability of informal care, a close substitute to formal LTC. Informal care availability within the household is approximated by the respondent's co-residence status in all of these studies. Bakx and de Meijer (2013) have shown that living alone is indeed a proxy for informal care availability in the Netherlands: the importance of living alone is reduced when variables are included that indicate the spouse's physical ability to provide informal care. Bakx and de Meijer (2013) and Goeree *et al.* (2011) find that spouse age increases use of formal and informal LTC and that spouse disability lowers the probability of spouse caregiving and increases the probability of receiving other types of LTC. Meng (2010) finds that spouse problems with activities of daily living (ADLs) and instrumental activities of daily living (IADL) have a small effect on LTC choices of disabled persons: it increases the probability that the respondent does not use any LTC, possibly because the spouse cannot provide informal care.

A related strand of the literature has addressed the relationship between informal care (from children) and formal LTC (Van Houtven and Norton, 2004; Charles and Sevak, 2005; Bolin *et al.*, 2008; Bonsang, 2009; Kalwij *et al.*, 2009; Knoef and Kooreman, 2011). One of the main findings is that the relationship between informal care and formal care differs between countries and between types of formal care. Informal care is always found to be a substitute for formal LTC, but the magnitude of the substitution effect differs. Bolin *et al.* (2008) attribute the difference that they find between northern, central, and southern Europe to differences in the strength of family ties and norms regarding family responsibility. Our research does not directly assess substitution of formal and informal care but investigates what specific factors may explain some of these between-country differences.

When testing the hypotheses regarding eligibility and comprehensiveness, we also highlight differential equity implications of alternative systems by examining the effect of institutional differences on horizontal equity in LTC use. Horizontal equity is defined as equal use in case of equal need, that is, irrespective of income or wealth. Hence, horizontal equity holds if LTC use is not associated with income after controlling for other characteristics. That is, we assume that vertical equity – appropriately unequal treatment in unequal situations – is not an issue: on average, each system gets it right (van Doorslaer *et al.*, 2000). This assumption is reasonable because within both countries, eligibility criteria are uniform and explicit. To our knowledge, horizontal equity in LTC use has not been studied before. Previous studies have only examined equity consequences of alternative LTC arrangements either by looking at the extent to which needs are assumed to be met (Kemper *et al.*, 2008; Gannon and Davin, 2010) or by assessing perceived financial protection (Keese *et al.*, 2010; Zuschandke *et al.*, 2010).

## 2. LTC FINANCING IN GERMANY AND THE NETHERLANDS

The LTC financing systems in Germany and the Netherlands are similar in a number of ways. First, both countries have a separate mandatory public LTC insurance system with legal entitlements. Public LTC insurance coverage is (nearly) universal: it covers 100% of the population in the Netherlands (although income-related co-payments do exist) and 90% of the German population. In Germany, high-income individuals may opt out but have to buy mandatory private insurance that has the same benefit package as public LTC insurance. Public insurance accounts for the great majority of total LTC expenditures: 68% in Germany and 90% in the Netherlands.

Voluntary LTC insurance only plays a small role in Germany and no role at all in the Netherlands: care that is not covered is paid for out-of-pocket (Rothgang, 2010; Schut and Van den Berg, 2010; CVZ, 2011).

Second, insurance companies jointly negotiate prices (both countries) and volume (the Netherlands only) with each provider (SER, 2008; Rothgang and Igl, 2007). Insurance companies have little incentive to negotiate down prices because they are fully reimbursed for all LTC expenditures.

Third, eligibility for public LTC is assessed by independent officials and is based on objective eligibility criteria that are set centrally, and the outcomes of the eligibility assessment are legally binding. The officials are employed by either the association of health insurers (Germany)<sup>2</sup> or the government (the Netherlands). Eligibility for publicly funded LTC is not affected by the use of private formal LTC. Upon established eligibility, the patient may choose to receive care either in kind or through a cash benefit. Cash benefits can be spent freely in Germany but only on formal and informal care in the Netherlands (Ministry of Health, Welfare and Sport, 2007; CIZ, 2009; Schulz, 2010).

However, there are also two important differences in LTC financing. First, patient cost sharing is much higher in Germany than in the Netherlands. In Germany, the patient pays the difference between the lump-sum insurance benefit and the cost of care, neither of which depends on income. In addition, the patient pays for board and lodging and investment costs (if applicable) (Rothgang, 2010). Private expenditures amount to 31% of total expenditures in Germany and 8% in the Netherlands (Colombo *et al.*, 2011). When in Germany a patient is unable to pay the bill, his or her children or, ultimately, social assistance steps in (Schulz, 2010). In the Netherlands, the level of co-payment depends on the type of LTC used and on income. The co-payment never exceeds the household income (CAK, 2012).

Second, the rules for eligibility differ with respect to the availability of informal care. In Germany, LTC is publicly financed regardless of the presence of a potential informal caregiver if LTC is needed daily for at least 90 min (e.g., Schulz, 2010; MDS, 2011). In the Netherlands, eligibility is contingent not only on medical need but also on the availability of informal care: LTC is not publicly funded if an informal caregiver has already been providing it. Furthermore, unskilled LTC is not financed publicly if there is someone in the household who is able to provide it.<sup>3</sup> Unskilled LTC is domestic help and supportive guidance; skilled LTC is nursing, activating guidance, and treatment of an ailment. Personal care – help with ADLs – is at the border and is only paid for if it is needed for at least 3 months (CIZ, 2005; Schut and van den Berg, 2010). No objective criteria have been defined to assess physical ability to provide informal care. Ability depends on the household member's health but not on employment status and preferences, unless the combination of providing care and having a job causes (mental) health problems for the caregiver or if the caregiver is often away from home for a long period for work (CIZ, 2005).

### 3. EXPECTED IMPLICATIONS OF THE INSTITUTIONAL DIFFERENCES

The differences in the treatment of informal care and the level of out-of-pocket payments may affect a household's decisions on LTC use. When a family member needs LTC, the family essentially makes a make-or-buy decision: buy formal care or provide informal care, which may be provided by someone from either inside or outside the household. The cost of formal care is the sum of (i) the price that is borne by the user and (ii) the cash benefit that the user foregoes and that the user may partly have spent freely otherwise; the cost of informal care is foregone leisure or, if not yet retired, the wage rate. In case of compensation for informal care, for example, through cash benefits, the cost of informal care is lower.

More comprehensive coverage of formal care increases the probability of using formal LTC for everyone (Stabile *et al.*, 2006). But we hypothesize that there may be differences in the magnitude of the increase

<sup>2</sup>Eligibility assessment of the privately insured is carried out by a private company (Schulz, 2010).

<sup>3</sup>Voluntary informal care may, however, substitute for *usual care* provided. Hence, if someone provides personal care to his spouse for more than 3 months, they are eligible for compensating, publicly financed domestic help.

between subgroups for which the increase in probability is higher because differences between the Netherlands and Germany will affect LTC use in two indirect ways. That is, *ceteris paribus*, differences in comprehensiveness and eligibility may affect (i) the effect of spouse characteristics on LTC use and (ii) the effect of income on LTC use. The first hypothesis means that the effect of spouse characteristics on LTC use may be affected by the difference in eligibility rules between the Netherlands and Germany – although in the Netherlands, public coverage is contingent on the availability of informal care within the household, in Germany, it is not. That is, in the Netherlands, the household's cost of (some types of) formal care depends on the spouse's ability to provide informal care. According to the former hypothesis, spouse ability will be more important in explaining formal LTC use in the Netherlands than in Germany.

Differences in comprehensiveness and eligibility may affect the effect of income on LTC use because when public coverage is not comprehensive, the cost of formal care can be substantial. If, in addition, co-payments and cash benefits are not income related, this situation may differentially affect the decisions of the rich and the poor (Newhouse *et al.*, 1981; van Doorslaer *et al.*, 1992; Ellis and McGuire, 1993).

A higher co-payment implies an increase in the out-of-pocket price of formal care. This price increase has two effects. First, it leads to substitution of informal care for formal care. Furthermore, the price increase implies lower real income and may therefore have a negative effect on demand for both goods (in case of positive income elasticities). The net price effect on formal care is therefore negative (*e.g.* Doehner *et al.*, 2007); the price effect on informal care use is unclear. With diminishing marginal utility of income, the impact of a price increase is smaller for households with a higher income because the income effect will be smaller for these households. Furthermore, the difference between income groups is larger for formal care than for informal care if formal care is a more luxury good implying that the income elasticity of formal care is higher than the income elasticity of informal care, which is likely if formal care is more expensive. As a result, income is expected to have a stronger effect on formal LTC use in Germany than in the Netherlands. More specifically, in Germany, low-income households will more often forgo formal LTC than high-income households.

## 4. EMPIRICAL ANALYSIS

### 4.1. Data

We use data from the first and second wave of the SHARE. The SHARE collects microdata on health, socioeconomic status, and other personal and household characteristics of individuals 50 years and older and their spouses irrespective of age.<sup>4</sup> If the individual was not able to answer the questions, a proxy respondent was allowed to answer (part of) the questions.

The final sample consists of both respondents living alone and respondents living together with their spouse. Respondents who reported having a spouse but whose spouse was not interviewed were also excluded from the sample. Table I shows the size of the sample and composition for both countries.

### 4.2. Variables

The dependent variable indicates self-reported use of LTC: no LTC, informal care only, or formal LTC with or without informal care. Informal care includes domestic help or help with paperwork provided by family, friends, or relatives from outside the household only and personal care provided by caregivers living within or outside the household. Because it was unclear from the survey which household member(s) benefited from informal care from outside the household, we attributed this type of informal care to a household member if and only if this household member was the only person in the household with a health problem or disability. Informal care from outside the household was coded missing if the main respondent indicated that someone within the

<sup>4</sup>According to the SHARE team, the sample only includes nursing home residents if they had been interviewed before they moved to an institution.

Table I. Sample selection and attrition: descriptive statistics

	The Netherlands	Germany
Individual response rate 2004 <sup>a</sup>	87.8%	86.2%
2004 sample	2979	3008
Interviewed twice/balanced panel	1778	1544
Refreshment sample	884	1024
2006 sample	2662	2568
Total number of observations	5641	5576
Sample with full information (% of total # of obs)	4349 (77%)	4390 (79%)

<sup>a</sup>www.share-project.org

household received informal care from outside the household and if there were more persons with a health problem in the household. Otherwise, this variable was coded zero. Formal care comprises home care or institutional care, both publicly and privately financed. Formal home care consists of professional or paid help with domestic tasks, nursing, and personal care. Institutional LTC includes (temporary) admissions to residential or nursing homes. We do not model level of use because hours of informal care provided within the household are not measured in SHARE.

Explanatory variables include health status and disability, age, gender, and whether the respondent has a spouse. Other covariates are household net worth (assets), year-specific and country-specific income quartiles, and the presence of an informal caregiver either inside or outside the household. Income and household wealth are imputed if missing. Presence of informal care outside the household is approximated by a variable indicating whether the respondent has children; the presence of an informal caregiver within the household is measured by the spouse's physical ability to perform caregiving tasks conditional upon the presence of a spouse. The spouse's physical ability to provide informal care is approximated by the health and disability status of the spouse while we control for his or her age. These characteristics are related to the ability to provide informal care but not affected by the burden of informal care: this burden has been found to mainly impact the caregiver's mental health and well-being (self-rated health), not disability status (Coe and van Houtven, 2009). Hence, the variables we use to measure spouse's ability are not directly affected by caregiving activities.

#### 4.3. Model specification and decomposition

We use a multinomial probit model to analyze LTC use. Although alternative specifications can allow for correlated error terms and correct for unobserved heterogeneity over time for respondents with multiple observations, we chose not to exploit the panel structure of the data because it would unnecessarily<sup>5</sup> complicate the decomposition (e.g., Van de Poel *et al.*, 2009). Instead, standard errors are adjusted for correlation of choices over time by clustering observations at the individual level.

Institutional differences are expected to contribute to between-country differences in LTC use as described in Section 3. They will do so because they lead to differences in the relationship between LTC use and the covariates rather than to differences in means of covariates themselves. As a first step, we compare coefficients and average partial effects (APEs) resulting from separate regression analyses for both countries. But differences in APEs estimated by nonlinear models may result from both between-country differences in coefficients and differences in the distribution of other independent variables included in the model. Therefore, we use a decomposition method for nonlinear models proposed by Yun (2004) to examine whether differences in LTC use between the Netherlands (*NL*) and Germany (*DE*) result from differences in means of covariates or in the functional relationship. The decomposition is

<sup>5</sup>Regression results of models that do account for unobserved heterogeneity by including random effects were similar to the results from the multinomial probit model presented here.

$$\begin{aligned}\bar{Y}_{NL} - \bar{Y}_{DE} &= \overline{F(X_{NL}\beta_{NL})} - \overline{F(X_{DE}\beta_{DE})} \\ &= \left[ \overline{F(X_{NL}\beta_{NL})} - \overline{F(X_{DE}\beta_{NL})} \right] + \left[ \overline{F(X_{DE}\beta_{NL})} - \overline{F(X_{DE}\beta_{DE})} \right]\end{aligned}\quad (1)$$

where  $Y$  is LTC use and  $X$  and  $\beta$  are the sets of covariates and coefficients, respectively.  $F$  denotes the multinomial probit. The first part represents the contribution of the difference in covariates to the difference in outcomes, and the second part represents the contribution of the difference in coefficients. Subsequently, both terms can be broken down further to identify the contribution of each variable. The detailed decomposition is based on a Taylor expansion at the sample averages  $\bar{X}_{NL}\beta_{NL}$  and  $\bar{X}_{DE}\beta_{DE}$  and results in sets of weights  $W$  that measure the contributions of between-country differences in means and coefficients:

$$\bar{Y}_{NL} - \bar{Y}_{DE} = \sum_{i=1}^{i=K} W_{\Delta X}^i \left[ \overline{F(X_{NL}\beta_{NL})} - \overline{F(X_{DE}\beta_{NL})} \right] + \sum_{i=1}^{i=K} W_{\Delta \beta}^i \left[ \overline{F(X_{DE}\beta_{NL})} - \overline{F(X_{DE}\beta_{DE})} \right] \quad (2)$$

where  $K$  is the number of independent variables in the model, and for variable  $i$   $W_{\Delta X}^i = \frac{(\bar{X}_{NL}^i - \bar{X}_{DE}^i)\beta_{NL}^i}{(\bar{X}_{NL} - \bar{X}_{DE})\beta_{NL}}$ ;  $W_{\Delta \beta}^i = \frac{\bar{X}_{DE}(\beta_{NL}^i - \beta_{DE}^i)}{\bar{X}_{DE}(\beta_{NL} - \beta_{DE})}$  and hence  $\sum_{i=1}^{i=K} W_{\Delta X}^i = \sum_{i=1}^{i=K} W_{\Delta \beta}^i = 1$  (Yun, 2004). It is customary to decompose the conditional expectation into the relative contributions, but in a multinomial outcome model, this approach is not feasible. Because the values of the choice alternatives are arbitrary, the conditional expectation of this model cannot be interpreted (Bauer and Sinning, 2008). Therefore, we focus on decomposing the differences in predicted probabilities for informal care ( $IC$ ) and formal care ( $FC$ ) separately instead. That is, rather than decomposing  $\bar{Y}_{NL} - \bar{Y}_{DE}$ , we decompose  $P(IC)_{NL} - P(IC)_{DE}$  and  $P(FC)_{NL} - P(FC)_{DE}$ , where  $P()$  denotes the probability of use. In other words, we treat each part of the multinomial probit as if it were a binary probit model. The interpretation of the results changes accordingly. Following Yun (2008), the contribution of differences in coefficients of dummy variables is normalized, and standard errors are calculated using the delta method.

## 5. RESULTS

### 5.1. Descriptive statistics

Table II presents summary statistics stratified by country. The probability of not using any LTC is similar in both countries, but the probability of using any formal care is much higher in the Netherlands (10.23%) than in Germany (3.64%), which is in line with macro figures reported by Huber *et al.* (2009). The opposite holds for informal care: the average probability of using informal care is 6.7 percentage points higher in Germany (11.57%) than in the Netherlands (4.85%).

Between-country differences in the levels of covariates are indicative for the extent to which these differences could contribute to variation in LTC use patterns. Between-country differences in sample averages are statistically significant only for age, wealth, income in 2006, presence of a child, disability, and health status. Spouse characteristics show the same pattern, which is not surprising as spouses are also included as respondents. The higher share of respondents with a child in the Netherlands and the similar shares of single-living respondents seem counterintuitive with the fact that informal care is twice as high in Germany than in the Netherlands. Worse health and higher disability in Germany are reflected in the hospitalization rate but not in LTC use. Although a number of between-country differences in means are statistically significant, they are fairly small in economic terms, except for the differences in income and assets.

### 5.2. Analysis

Table III presents the results for the regression analyses, run separately for each country. Because nonlinearity complicates the interpretation of the coefficients, the table also includes estimates of APEs. Comparing APEs



Table II. Descriptive statistics

	The Netherlands mean	Germany mean	Difference
Number of observations	4349	4390	
2004	2357	2361	
<i>Dependent variable</i>			
% No care use	84.92	84.61	0.31
% Only informal care	4.85	11.57	−6.72***
% Formal care (+ informal care)	10.23	3.64	6.59***
<i>Explanatory variables</i>			
Age	63.76	64.24	−0.47**
% Female	45.94	44.87	1.07
% Living alone	23.27	24.19	−0.92
Assets	316530.30	232611.40	83918.90***
Income in 2004 <sup>+</sup>	46614.30	47152.48	−538.18
Income in 2006 <sup>+</sup>	40595.97	31922.67	8673.30***
% having at least one child	89.38	86.79	2.59***
Disability <sup>#</sup>	0.55	0.68	−0.14***
% having a mental health problem	18.65	18.54	0.11
% having 1–2 chronic conditions	50.40	50.48	−0.08
% having ≥3 chronic conditions	15.93	20.77	−4.84***
% self-assessed health: fair	43.14	41.16	1.97*
% self-assessed health: bad	27.36	37.02	−9.65***
% hospitalization	9.73	16.15	−6.42***
Cognitive ability <sup>#</sup>	6.94	6.99	−0.05*
Spouse age <sup>^</sup>	62.33	62.94	−0.61***
Spouse disability <sup>^</sup>	0.42	0.54	−0.11***
% spouse has 1–2 chronic conditions <sup>^</sup>	50.31	50.69	−0.38
% spouse has ≥3 chronic conditions <sup>^</sup>	13.87	18.69	−4.82***
% spouse hospitalization <sup>^</sup>	8.96	14.90	−5.94***
% spouse cognitive ability <sup>^</sup>	7.06	7.13	−0.07**

<sup>#</sup>Rescaled on a 0–10 scale; a score of 0 indicates no disability/no cognitive ability.

<sup>^</sup>Conditional on having a spouse, coded zero if the respondent has no spouse.

<sup>+</sup>Income in 2004 is gross income, and income in 2006 is net income.

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

between the Netherlands and Germany in Table III reveals that differences in the coefficients primarily reflect differences in eligibility rules. Spouse disability, for instance, is taken into account in the Netherlands but not in Germany when assessing eligibility and positively affects the probability of formal care use in the Netherlands but not in Germany: in the Netherlands, a one-point increase in the spouse's disability score leads to a 1.6-percentage point increase in the probability of using formal care. In Germany, higher cognitive ability of the spouse is associated with a slightly lower probability of using formal LTC. Having a child decreases the probability of using formal LTC. The role of living alone in explaining LTC use is reduced but still significant once spouse ability is included (Bakx and de Meijer, 2013).

A disabled spouse positively affects the probability of informal care use in the Netherlands; in Germany, the coefficient is positive but insignificant. Informal care includes informal care from within the household and informal care given by someone from outside the household. As expected, the influence of spouse disability on informal care within the household is negative (but not significant in the Netherlands) but are offset by the positive (insignificant) influence of spouse disability on informal care from outside the household (regression with separate categories not shown). Having an income below the median decreases the probability of using formal LTC in Germany but not in the Netherlands. Access to formal LTC is therefore less constrained by income in the Netherlands than in Germany. Furthermore, *ceteris paribus*, wealthier respondents use more informal care in the Netherlands.

The signs of the other coefficients are as expected and are similar for both countries: worse health and disability scores increase the probability of receiving care. Yet, the size of the APEs does differ in some

Table III. Results for multinomial probit regression <sup>a</sup>

	Informal care only				Formal care (+ informal care)			
	Netherlands		Germany		Netherlands		Germany	
	Coefficient	APE	Coefficient	APE	Coefficient	APE	Coefficient	APE
Age	0.012*	0.000	0.033***	0.003***	0.069***	0.005***	0.052***	0.002***
Gender	0.035	0.014*	-0.049	-0.001	-0.616***	-0.045***	-0.284*	-0.010*
Alone	0.974***	0.050***	0.611***	0.057***	1.344***	0.097***	1.116***	0.041***
Assets	0.000*	0.000**	0.000	0.000**	0.000	0.000	0.000	0.000
Income quartile 1	-0.231	-0.014	-0.037	0.014	-0.023	0.003	-1.029***	-0.042***
Income quartile 2	-0.132	-0.007	0.007	0.009	-0.062	-0.002	-0.556**	-0.020***
Income quartile 3	-0.205	-0.013	-0.043	-0.004	0.007	0.004	-0.055	-0.001
Child	-0.063	0.002	-0.012	0.004	-0.310*	-0.023**	-0.281**	-0.012
Disability	0.479***	0.019***	0.358***	0.033***	0.666***	0.040***	0.483***	0.013***
Hospitalization	0.495***	0.018	0.460***	0.047***	0.892***	0.068***	0.678***	0.022***
Health status: fair	0.120	0.007	0.575***	0.049**	0.060	0.002	0.907**	0.028
Health status: bad	0.360**	0.016	0.773***	0.081***	0.496***	0.031**	0.817**	0.022
1-2 chronic diseases	0.253*	0.012	0.313**	0.039***	0.254*	0.014	-0.222	-0.014**
≥3 chronic diseases	0.535***	0.031**	0.342**	0.046**	0.467***	0.026*	-0.255	-0.015**
Depression	0.356***	0.022***	0.459***	0.050***	0.175	0.006	0.456***	0.011*
Cognitive ability	-0.028	-0.002	0.021	0.003	-0.003	0.000	-0.025	-0.001
Spouse age	0.003	0.000	-0.002	0.000	-0.010	-0.001	-0.020	-0.001
Spouse disability	0.146**	0.005	0.048	0.005	0.252***	0.016***	0.031	0.000
Spouse hospitalization	0.170	0.008	-0.028	-0.001	0.210	0.013	-0.151	-0.005
Spouse 1-2 chronic diseases	0.098	0.004	0.075	0.010	0.124	0.007	-0.102	-0.005
Spouse ≥3 chronic diseases	-0.209	-0.015	-0.069	-0.009	0.185	0.018	0.093	0.005
Spouse cognitive ability	0.012	0.001	-0.003	0.002	-0.026	-0.002	-0.136**	-0.005**
Intercept	-4.071***		-5.383***		-6.979***		-4.475***	

<sup>a</sup>Observations were clustered by respondent.\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .



cases. The APE of disability on formal care use is three times higher in the Netherlands, which may be caused by higher co-payments or stricter eligibility rules in Germany. This finding may indicate that vertical treatment norms differ between the Netherlands and Germany. Reporting a hospitalization or bad health increases the probability of using informal care in Germany, whereas in the Netherlands, it mainly affects formal care use. Although eligibility rules matter, other factors matter too. In Germany, only the number of ADL and IADL limitations was used to assess need for public LTC (Rothgang, 2010). Yet, other measures of health and disability, such as a hospitalization, chronic diseases and depression, or having children, which measures informal care availability outside the household, are associated with (formal) LTC use as well.

### 5.3. Decomposition

We know from the descriptive statistics (Table II) that the average probability of using informal care was 6.7 percentage points lower in the Netherlands (4.9%) than in Germany (11.6%). Of this difference, only 0.6 percentage points could be explained by differences in means of covariates (Table IV, first column). This contribution of covariates is reinforced by the much larger contribution of the difference in coefficients (Table IV, second column). That is, if the Dutch sample had the characteristics of the German sample, the average probability of using informal care would still be 6.1 percentage points lower in the Netherlands than in Germany.

The use of formal care is 6.6 percentage points higher in the Netherlands (10.2% vs 3.6%) than in Germany. The decomposition results in Table IV show that the contribution of differences in means of covariates to variation in formal LTC use is negative: given the observed distribution of population characteristics, the German sample is expected to have a 3.1-percentage point higher use of formal care (third column) than the Dutch sample. However, the contribution of differences in means of covariates is more than offset by the contribution of differences in coefficients (fourth column). This means most of the between-country gaps in use of formal and informal LTC are explained by differences in coefficients (91% for informal care and 146% for formal care) as opposed to differences in means of covariates (9% for informal care and -46% for formal care).

Table IV furthermore shows the contribution of (groups of) variables to the aggregate contribution of both differences in coefficients and differences in means of covariates.<sup>6</sup> The differential impact of age is by far the largest contributor to the gaps between the two countries. Differences in the age coefficients for informal and formal LTC account for a difference of 30.2 percentage points (452.1%) in informal care use and 13.3 percentage points (200.2%) in formal care use (not significant). Differential income effects – especially at the low end of the income scale – also explain a large part of the differences: the variation in formal LTC use would be 2.7 percentage points (41%) lower if having a low income had the same effect in Germany as in the Netherlands. The differential low-income effect is partially offset by the differential high-income effects: high-income respondents in Germany are more likely to use formal LTC and less likely to use informal care than high-income respondents in the Netherlands. As a result, the aggregate contribution of differences in the relationship between income and LTC use is 1.2 percentage points for formal care (19%) and -0.2 percentage points (3%) for informal care.

Differences in eligibility rules also matter. The differential effect of disability contributes 1.5 percentage points (22%) to the discrepancy in the probability of formal care use. The differential association of spouse disability – which is taken into account in determining eligibility for formal LTC in the Netherlands but not in Germany – and formal LTC use also contributes to the gap in formal LTC use: it explains 1.4 percentage points (22%) of the aggregate difference.

<sup>6</sup>A number of robustness checks – reversing the decomposition and using another model specification, that is, two jointly estimated probits – showed that the results were very similar: none of the important signs changed, and the estimated magnitudes remained very comparable.

Table IV. Decomposition results (Use Netherlands – Use Germany) share of total difference explained by covariates and coefficients

	Informal care		Formal care	
	Covariates	Coefficients	Covariates	Coefficients
Age	0.3*	466.5**	–4.7***	190.4
<b>Gender</b>	0.0	1.5	–0.9***	3.0
Male	0.0	–6.6	–0.5***	–13.3
Female	0.0	8.0	–0.5***	16.3
<b>Marital status</b>	0.4***	32.4*	–1.8***	–10.5
Alone	0.2***	–15.2*	–0.9***	4.9
Together	0.2***	47.6*	–0.9***	–15.4
Assets	0.8**	24.3**	–0.7	3.5
<b>Income</b>	0.0	3.3	0.0	18.3***
Income quartile 1	–0.1	8.7	0.0	39.5***
Income quartile 2	0.0	1.3	–0.1	4.4
Income quartile 3	0.1	2.4	0.1	–10.8*
Income quartile 4	0.1	–9.2	0.0	–14.9**
<b>Children</b>	0.1	6.4	–1.2*	–1.9
Child	0.0	7.6	–0.6*	–2.2
No child	0.0	–1.2	–0.6*	0.3
Disability	2.9***	–28.7*	–13.3***	22.4**
<b>Hospital</b>	1.4***	3.0	–8.2***	–12.9
Hospitalization	0.7***	–0.7	–4.1***	3.1
No hospitalization	0.7***	3.7	–4.1***	–16.0
<b>Health status</b>	1.4**	17.6*	–6.7***	–13.9**
Health status: fair	0.0	23.7	–0.4*	–33.6***
Health status: bad	0.8**	15.8	–4.3***	4.5
Health status: good	0.5	–21.9*	–2.0*	15.1*
<b>Chronic diseases</b>	1.1***	12.0	–3.3***	–1.6
1–2 chronic diseases	0.0	18.3	0.0	6.9
≥3 chronic diseases	0.6***	–10.7	–1.6***	11.9**
No chronic diseases	0.6***	4.4	–1.7**	–20.5**
<b>Depression</b>	0.0***	–11.2	0.0	15.8
Depression	0.0***	3.3	0.0	–4.6
No depression	0.0***	–14.5	0.0	20.4
Cognitive ability	–0.1	119.7	0.0	27.6
Spouse disability	0.8**	–18.8	–4.4***	21.7**
<b>Other spouse characteristics</b>	0.1	–133.9	–1.0	225.7
Spouse age	0.1	–114.5	1.0	112.5
Spouse hospitalization	0.2	–3.9	–0.7	3.6
Spouse no hospitalization	0.2	30.4	–0.7	–28.5
Spouse 1–2 chronic diseases	0.0	–8.4	0.0	8.2
Spouse ≥3 chronic diseases	–0.3	5.0	–0.4	–0.4
Spouse no chronic diseases	–0.1	–6.4	–0.5	–9.0
Spouse cognitive ability	0.0	–36.2	0.3	139.2
Intercept		–403.3		–341.3
Sum over column (without intercept)	9.2	90.8	–46.2	146.2
Sum of all contributions		100.0		100.0
Difference in <i>P</i> (use)		–6.7		6.7

Variables in bold represent the aggregate contributions for categorical variables and groups of variables.

\* $p < 0.10$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

## 6. CONCLUSION AND DISCUSSION

We have exploited the availability of comparable data to perform a detailed comparison of formal and informal LTC use in the Netherlands and Germany and a decomposition analysis of the differences. Our starting point is the observation that in the Netherlands, there is more use of formal care and a less use of informal care than in Germany. We then set out to unravel the sources of these differences. Do we observe these differences because the observable characteristics differ between Dutch and German users? Or because institutions differ between these countries?

Our findings are as follows. First, next to demand-related characteristics such as needs and supply factors such as informal care availability, LTC use is also strongly affected by country-specific eligibility criteria for public LTC coverage and comprehensiveness of the public LTC system. These institutional differences translate into very different relationships between LTC use – formal and informal – and personal characteristics. For instance, the spouse's ability to provide informal care, which is an eligibility criterion in the Netherlands but not in Germany, affects the use of public formal LTC in the Netherlands. In Germany, it does not. Furthermore, the role of income is very different in both countries, with low income deterring use of formal care in Germany much more because of higher co-payments for public LTC. As a result, access to formal care for low-income users in Germany without an able spouse is much lower than that in the Netherlands, and this group is much less likely to use formal care. Future research on the timing of the onset of LTC might indicate whether lower access means that low-income users more often postpone formal LTC use or that they do not use it at all.

Second, the decomposition results show that the difference in formal LTC use between the Netherlands and Germany is largely (for 90%) explained by differences in coefficients of covariates, that is, reflecting mostly differences in eligibility rules, while differences in means of covariates play a minor role. This finding confirms that institutional differences as embodied in these coefficients account for much more of the between-country difference than patient characteristics. This is most clearly brought out by the greater importance of spouse characteristics in the Netherlands in determining eligibility for public care services that was described previously. The decomposition results demonstrate that the choice between formal and informal care can substantially be influenced through system features such as eligibility and coverage generosity and, indirectly, by social preferences. Our findings suggest that use of formal care in the Netherlands would be 9.7 percentage points lower and informal care use 6.2 percentage points higher if the German system were in place and unobserved differences in preferences do not play a role.

Third, there is no difference in LTC use between rich and poor in the Netherlands. By contrast, being in the bottom income quartiles in Germany is negatively related to formal LTC use, indicating that conditional on health, disability, and other covariates, the rich use more formal LTC than the poor. Horizontal equity is achieved in the Netherlands but not in Germany. Our results for the German sample show that even with universal public LTC insurance, horizontal equity is not achieved if total expenditures are relatively low and co-payments are large and unrelated to income. However, horizontal equity in the Netherlands appears to come at a price. Total expenditures on LTC for the elderly are much higher in the Netherlands (2.4% of GDP in 2009) than in Germany (1.3% in 2008) (Colombo *et al.*, 2011; CVZ, 2011). Whereas Germany has recently expanded LTC insurance coverage, recent government proposals in the Netherlands involve a substantial reduction of coverage and entitlement to ensure the sustainability of the LTC system (e.g., Rothgang, 2010; Rijksoverheid, 2012). The results of this paper suggest that if the ability to pay and the ability to care are not taken into account when deciding on cost sharing for formal care, undesirable disparities in use may emerge as system features have a strong influence on who ends up taking the burden of caregiving.

## 7. CONFLICT OF INTEREST

None of the authors has a conflict of interest.

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