Labor Supply in the Terminal Stages of Parents’ Lives

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Abstract

Based on Norwegian register data we show that having a lone parent in the terminal stage of life affects the offspring’s labor market activity. The employment propensity declines by around 1 percentage point among sons and 2 percentage points among daughters during the years just prior to the parent’s death, ceteris paribus. Reliance on sickness insurance and other social security transfers increases with up to 4 percentage points for sons and 2 percentage points for daughters. After the parent’s demise, earnings tend to rise for those still in employment while the employment propensity continues to decline. The higher rate of social security dependency persists for several years.

Keywords: Elderly care, labor supply, ageing, inheritance.

JEL Classification: J14, J22.

* This research is part of the project “The public long term care and its effect on labour market participation for elderly workers”, financed by the Norwegian Research Council through the Welfare Research Program. Administrative register data have been provided by Statistics Norway. Thanks to Simen Gaure for programming assistance and to Heidi Gautun, Tor Iversen, Jos van Ommeren, and participants at the EALE 2008 meeting in Amsterdam for useful comments. Correspondence to: Knut Røed, the Ragnar Frisch Centre for Economic Research, Gaustadalléen 21, 0349 Oslo, Norway. E-mail: knut.roed@frisch.uio.no.
1. Introduction

Given current demographic trends, most industrialized countries are heading towards a future with shrinking working-age populations relative to the number of (ever older) pensioners. This development is likely to impose large fiscal strains on future workers in order to finance an increasingly overstretched public sector. But future workers may also come under stronger domestic pressures, e.g., in the form of care-needing parents. While increased longevity tends to reduce the demand for health services during the terminal stages of life, it raises the demand for long-term care even more; see Spillman and Lubitz (2000). Given the prevailing level of informal care provision in Norway, labor demand in the long-term care sector is projected to double during the next four decades (Langset, 2006). Mobilizing the within-family caring potential may apparently alleviate this problem. However, if informal care substitutes for labor supply and/or human capital accumulation in the formal sector of the economy, a larger role for relatives may add to, rather than alleviate the fiscal burden.

Although it is a firmly established empirical fact that informal care is negatively correlated with labor supply (Charmichael and Charles, 1998; 2003; Spiess and Schneider, 2003; Heitmueller, 2007), the causal relationship running from informal care provision to market labor supply is not easily disentangled from other sources of correlation. The problem of reverse causation is acute in this case, since the decision to provide informal care is likely to be influenced by individuals’ labor market outcomes. For example, children with little or no participation in the labor market - for reasons other than the need for family care provision - may face lower time costs and, hence, provide more informal care than children who participate fully in the labor market. Moreover, there may exist individual characteristics that affect both the propensity to supply labor in the market and the propensity to provide informal care within the family. Individuals with poor
health, for example, may be particularly likely both to stay outside the labor market and to have parents with poor health. Many empirical studies have either not addressed these endogeneity problems at all or relied on potentially invalid or weak instruments; see, e.g., Bolin et al. (2008) or Heitmueller and Michaud (2006) for discussions of the recent literature. A variable commonly used in the literature to instrument parental care is the parent’s health status (or, in the absence of health data, their age or education as proxies for health); see Wolf and Soldo (1994), Ettner (1995; 1996), Heitmueller (2007), and Bolin et al. (2008). We will argue that the validity of such instruments is questionable, given the strong intergenerational correlation in health and labor market performance (see, e.g., Marmot, 2004).

In the present paper, we take advantage of the established empirical regularity that the need for care among the elderly is heavily concentrated during the final years of life; see, e.g., Emanuel et al. (1999), Romøren (2003), Seshamani and Gray (2004), Polder et al. (2004) and Wolff et al. (2007). Hence, rather than evaluating the impact on labor market outcomes of actually observed care provision, we examine the time path of labor market outcomes during the final years of parents’ lives as well as the years after the decease of the parents. The demise of a parent may also affect labor market activity through the changes in budget constraints caused by inheritance; see Holtz-Eakin et al. (1993) and Joulfaian and Wilhelm (1994). To the extent that individuals optimize freely with respect to an intertemporal budget constraint, expected inheritance does not alter labor market behavior around the time of the parents’ demise; see MaCurdy (1981). However, with credit constraints, and with uncertainties in longevity as well as in the size of the bequest, we would expect labor supply to shift downwards in response to inheritance. It is conceivable that this effect builds up gradually as the moment of parents’ death approaches, both because the time and the size of a forthcoming inheritance can be assessed with
greater precision and because bequests/gifts are sometimes paid out in advance. A key concern in our analysis is therefore to disentangle the effects on labor supply arising from the demand for informal care from the potential income effects associated with a realized or forthcoming bequest. It is also conceivable that the loss of – or the process of losing – a parent causes grief reactions, which in turn reduce the offspring’s ability to work. These reactions may sometimes be strongest in the period prior to the parent’s death. Schultz et al (2003) show that caring for persons with dementia result in higher levels of depressive symptoms, but after death the caregivers tend to recover from depressive symptoms.

Our empirical basis is complete administrative register data from Norway, which during 1993-2005 keep track of employment status, yearly earnings, and social security claims for all Norwegian citizens. The data contain family identifiers, which make it possible to date important family events, such as the demise of parents, and to identify siblings. The data also contain information about geographic proximity between parents and offspring and about the parents’ economic wealth (the expected size of the inheritance).

The extent to which the existence of a care-needing elderly family member affects the offspring’s labor market behavior obviously depends on both the level of the required care and on the access to care provided by the market or by the public sector. Like other Scandinavian countries, Norway is characterized by a comprehensive system of publicly provided care for elderly and disabled individuals, in the form of nursing homes and community nursing. The user payment for these services is means-tested against own income (but not against the income of the offspring), and the level of support is supposed to be determined on the basis of individual needs rather than by ability to pay. In 2000, publicly funded long-term care took hold of around 1.8 per cent of the Norwegian GDP, compared to 0.7 per cent in the United States and 0.8 per cent in the United Kingdom.
The quality of publicly provided care is of course subject to substantial variation. It is supposed to be sufficient for covering basic needs; hence the extent to which relatives need to adjust their own labor market behavior in order to care for elderly parents is likely to be limited. However, many relatives view the level of publicly provided care as insufficient, particularly with respect to coverage of “social needs”.

According to Norwegian time-use surveys (Vaage, 2002), approximately eight per cent of the Norwegian adult population provided informal care to a person outside his/hers own household on a randomly selected day in 2000. The average time use (among those who provided care) was 1.3 hours. Not all of this can be attributed to the elderly, however.

Based on some supplementary questions that were used in the Statistics Norway’s labor force sample survey in the second quarter of 2005, it is estimated that around 5.3 per cent of the adult population regularly provide care for elderly relatives or other adults. In a recent survey, Gautun (2008) found that 70 per cent of the informants in the age group 45 to 65 who still had at least one parent alive, to some extent combined the roles of paid work and parental care/assistance. Further, in a detailed longitudinal study of all elderly above 80 years in the Norwegian municipality of Larvik (434 individuals), Romøren (2003) showed that the average duration of the period with serious functional disabilities prior to death is 3.2 years for women and 1.8 years for men (only 9 percent experienced no functional disabilities prior to death). However, informal care is typically provided for much longer periods than that; in cases where an offspring is the primary care provider, roughly 40 percent of the care-periods stretch beyond five years. And since many of the elderly

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1 Long term care can also to some extent be provided by hospitals and thus recorded in national statistics as health care. Since the organization of services varies between countries, this implies that statistics from different countries may not always bee directly comparable; see also Herolfson and Daatland (2001).

2 Informal and formal care alternatives are not necessary complete substitutes. Motel-Klingebiel et al. (2005) find in an international comparison that the welfare state does not crowd out family care, while Bonsang (2008) finds informal care to be a weak complement to nursing care.
end their lives in care-institutions, the demand for family care is not always at its largest in the period just prior to death, but rather in the period just prior to admittance into the care-institution. There are no social programs in Norway particularly targeted at offspring who provide care/assistance to a parent, except that workers are entitled to up to 20 days unpaid leave in the terminal phase of each parent’s life.

The main findings of our paper are that having a lone parent in the terminal phase of life holds back overall earnings for both men and women and also causes labor market participation to decline and social security dependency (particularly related to long-term sickness absence) to rise. While the employment effect is strongest for daughters, the social security effect is strongest for sons. Employment rates continue to decline after the demise of the lone parent, while social security dependency rates persist at the high level experienced during the year of the parent’s death.

2. Theoretical considerations

The theoretical literature emphasizes several motives for a child to provide care to its elderly parents, such as altruism, duty, social norms, reciprocity, direct payments, strategic bequest motives, and the provision of a demonstration for own children regarding the desired behavior towards elderly parents. Regardless of the motive, it is clearly the case that the more time devoted to informal care provision, the less time available for leisure and market work. In order to organize our thinking about the various tradeoffs involved, we take the altruistic motive as a point of departure; see, e.g., Chang and White-Means (1995), Nocera and Zweifel (1996), and Kuhn and Nuscheler (2007). In the altruistic model, the child takes the utility of the parents into account when determining own behavior. The basic idea can be illustrated within a simple three-period model, where period 0 is the period with healthy parents, period 1 is the terminal phase of parents’ life, where
informal care is demanded, and period 2 is the period after the parent’s death. Disregarding the issue of discounting, the offspring’s overall utility can be expressed as

$$\Omega = U(X_0, L_0, E) + U(X_1, L_1, E) + \beta V(Z + \bar{Z}) + U(X_2, L_2, E),$$

(1)

where $X$ is consumption, $L$ is leisure, $E$ is human capital (education), and $Z$ is the amount of care provided by the offspring to the parent in period 1, and $\bar{Z}$ is the amount of care provided by others. $V$ can be interpreted as the utility function of the parent, and $\beta$ is the weight it obtains in the offspring’s utility. Both $U$ and $V$ are strictly concave functions and we assume that all the cross-derivatives of $U$ are positive. A key idea is that human capital potentially enhances the transformation of goods and leisure into utility (Michael, 1973) while leaving the productivity of informal care-provision unchanged (Romøren, 2003; Gautun, 2003). This implies that low-skilled individuals have a comparative advantage in care-provision.

The child’s intertemporal budget constraint is determined by the total availability of healthy time in the three periods $\{T_0, T_1, T_2\}$, by the wage and price levels $\{w, p\}$, by the size of the inheritance $M$, and by the time needed to provide each time-unit of effective care $(1+a)$, i.e.,

$$pX_0 + pX_1 + pX_2 = w(T_0 - L_0) + w(T_1 - L_1 - (1+a)Z) + w(T_2 - L_2) + M.$$  

(2)

If the offspring is credit constrained we may alternatively think of the budget constraints as being periodic, with no transfers from one period to another. We assume here that the
size of the inheritance is unaffected by child’s choice of care effort; i.e., we rule out stra-
tegic bequest behavior.3

Equipped with this basic modeling framework, we now discuss the impacts on la-
bor supply of having a care-needing parent in the terminal phase of life. A more general
and formal analysis is provided in a separate companion paper (Fevang et al., 2008).

Optimally determined levels of leisure, consumption, and care provision in period
1 requires that the marginal rate of substitution between consumption and care-giving
equals the ratio of the consumption price and the time cost of care-giving \( \frac{p}{w(1+a)} \),
unless a corner solution is obtained with either \( Z=0 \) or \( L_i=0 \). In addition, the marginal rate
of substitution between leisure and care-giving equals \( \frac{1}{1+a} \), since the time cost is the
same for these two alternatives. With equal time budgets across periods \( T_0 = T_1 = T_2 \) and
in the absence of credit constraints and uncertainty, this model predicts labor supply to be
lower in period 1 than in periods 0 and 2 (provided an interior solution to the optimization
problem), with labor supply being equal across the pre- and post-care periods. Even with
credit constraints, we normally expect labor supply to decline from period 0 to period 1,
as the reduction in available time for leisure and consumption is distributed between the
two goods in order keep the marginal rate of substitution constant. With credit constraints,
the labor supply in period 2 is unequivocally lower than in period 0, since the inheritance
entails an income effect raising both consumption and leisure in period 2. Compared to

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3 According to Norwegian legislation at least two thirds of the inheritance – up to a limit of 1 mil-
ion NOK per child – must be shared equally between siblings. In addition, the progressivity of the inheri-
tance tax system strongly favors equal sharing. To the extent that parents deviate from the equal-sharing
norm, the motivation is typically to compensate for differences in needs, rather than to pay for help and
services. Survey-based evidence reported by Halvorsen and Thoresen (2005) shows that only 1 percent of
Norwegian parents with adult children think that intergenerational transfers should be disproportionally
allocated to “the most helpful child”; 73 percent prefer equal sharing, while 23 percent prefer a division
based on needs. These views also turn out to be reflected in actual gift behavior, i.e., there are no indica-
tions that children who help their parents a lot receive more gifts, compared to their siblings (Halvorsen and
Thoresen, 2005).
period 1, labor supply may rise or fall, depending on whether the removal of the care requirements or the income effects arising from inheritance dominates.

In reality, neither the perfect-market-perfect-foresight model nor the credit-constraint model provides a realistic description of the environment in which labor supply decisions are made. With imperfect credit markets and/or uncertainty regarding the timing and the size of a forthcoming inheritance, we may expect observed behavior to lie somewhere between the predictions from the two “extreme” versions of the model. In particular, we may expect the income effect of the forthcoming inheritance to arise gradually as period 2 approaches, reflecting that the uncertainty regarding the timing and size of the inheritance becomes smaller and/or that parts of the inheritance are paid out in advance. From an empirical point of view, this makes it difficult to disentangle the labor supply impacts of care requirements from the impacts of inheritance. However, by looking at the interactions between labor supply behavior over the three periods and the other key parameters in our model – and comparing them with observed interactions in the data – we may nevertheless shed some light on the empirical relevance of the different explanations.

Consider first the level of care provided by others $\bar{Z}$. An increase in $\bar{Z}$ unequivocally reduces informal care-giving and increases labor supply in period 1. If $\bar{Z}$ is sufficiently high (low), a corner solution may be chosen, with $Z=0$ ($L_1=0$). In the empirical analysis, we obtain proxies for $\bar{Z}$ by exploiting data on siblings and on variation in public care-provision across municipalities.$^4$ A rise in the time-cost of care-giving $a$ implies that more time is required to provide a given level of care, yielding a reduction in labor supply. On the other hand, it also reduces the optimal level of care provision. Hence, the

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$^4$ Note that we treat the care provided by others as exogenous. Several papers have studied the interactions or strategic behavior of siblings when the parent’s health is considered a common good, see, e.g., Konrad et al. (2002), Engers and Stern (2002), Rainer and Siedler (2005) and Callegaro and Pasini (2007). There are also papers treating the publicly provided care as endogenous; see Van Houtven and Norton (2004).
overall impact of the time-cost on labor supply is theoretically indeterminate. In the empirical analysis we use the geographical distance between the child and the parent as a proxy for the time-cost of care.

The level of the inheritance $M$ affects the intensity of care-giving positively – and the level of labor supply negatively – in the perfect-credit-market model, while having no impact on care-giving and period 1 labor supply in the credit-constraint model. The pure care-motivated labor supply responses in period 1 may in any case be identified on the basis of individuals with no (or very low) expected inheritance.

Our simple model can also be used to examine the disparities in labor supply responses towards care-needing parents between individuals with different levels of human capital $E$. For a given wage rate $w$, we find that the level of care-giving declines with the level of human capital, since human capital is assumed to increase the utility of consumption and leisure, while leaving the productivity of care-provision unchanged. Under reasonable conditions, the extra time from less care-provision is distributed between the two goods of leisure and consumption; hence labor supply is likely to exhibit a particularly strong positive relationship with human capital in the period with demand for parental care (period 1). The wage rate also increases with human capital. A higher wage rate, $w$, entails the usual income and substitution effects for both leisure and care-giving with indeterminate net effects. In the empirical analysis, we are not able to separate the impacts of education (human capital) and wages, since wage rates are generally unobserved. According to the existing empirical literature, labor supply tends to be less elastic the higher is human capital; see, e.g., Røed and Strøm (2002) for an overview of the relevant literature. We may therefore guess that the impact of care-requirements on own labor supply is also smaller the higher is the level of human capital.
Finally, we turn to the sizes of the overall time budgets \(\{T_0, T_1, T_2\}\). Different phases of life may be characterized by different types of time-constraints. In particular, we may interpret a period with own dependant children as a period with reduced time available for purposes of work, leisure and care for parents. A reduction in \(T_1\) generally reduces labor supply in period 1. However, it may also raise the likelihood of ending up in a corner solution with \(L_1=0\), in which case care-giving may actually increase. Limited time budgets may place individuals with care-need parents in a time-squeeze. For some workers, it may be difficult to reduce the number of hours worked in the market even when this is the optimal choice, e.g., because the employer demands full-time work or because the employee foresees that reduced work-hours adversely affects the future labor market career. In such cases, we may expect the level of long-term sickness absence and other forms of social security dependency to rise. This effectively reduces the time budget (the total availability of healthy time) and thus potentially the level of employment.

3. Data, Institutions, and Descriptive statistics

Our empirical analysis is based on administrative register data describing the life histories of all Norwegians from 1993 to 2005, with earnings and employment records dating back to 1980 (including paid employment as well as self-employment). The data we use contain information about age, gender, municipality, employment status, yearly earnings, and all kinds of social security transfers (the latter on a monthly basis). They also include information on family-ties, making it possible to date the (exact) time of parents’ deaths, to compute the expected level of inheritance, and to identify siblings. Our analysis focuses on Norwegian (native-born) individuals born between 1933 and 1967 who lost a lone parent between 1993 and 2005 while they themselves were between 38 and 66 years. We
limit the analysis to the loss of lone parents, since married parents may have had the spouse, rather than the offspring, as the primary informal care provider. This leaves us with 308,706 individuals for whom labor market behavior can be traced prior to, during, and after the terminal stage of their lone parent’s life. Table 1 gives an overview of some key descriptive statistics. On average, the offspring are around 50 years old when they lose a lone parent. This implies that informal care demands tend to be highest during the late 40’s, i.e., at the height of a typical labor market career.

- Table 1 around here -

Our main empirical strategy is to examine the time-path of various labor market outcome measures before and after the death of a lone parent. We focus on employment propensity, annual earnings, and social security dependency. The latter includes long-term sickness benefits (absence spells exceeding two weeks), rehabilitation benefits, disability benefits, early retirement, unemployment benefits, and social assistance; see Table 2. Social security claims are of interest for two reasons. First, they may contain a sort of “hidden” labor supply response, since employees can be absent due to sickness for up to one year, while still being recorded as employed and without a reduction in observed earnings. Although the sickness insurance system is meant to cover own sickness only and despite that absence has to be certified by a physician, there is ample empirical evidence indicating that physicians sometimes certify sickness absence to help employees cope with difficult life situations; see Carlsen (2008). Second, the development of social

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5 Note that family identifiers are incomplete for individuals born before 1953, since the family tie is often missing for offspring who moved out of their parents’ home before the 1970 census. Since daughters of the relevant generations tended to move out significantly earlier than sons, this implies that we lose more daughters than sons in these birth cohorts. For individuals born before 1953, we can establish the identity of parents for around 57 per cent of the men and for 40 per cent of the women. Failure to identify parents also results from the fact that the parents are already dead in 1993, when we first can observe family linkages.

6 Employment is for each year defined as having earnings or self-employment income sufficiently high to earn pension points in the Public Pension System. Currently (2008/2009) the required income level is 70,256 NOK. Social security dependency is defined on a monthly basis, and implies that social security claims are made during the month in question.
security claims during the terminal stages of parents’ lives conveys information regarding
the indirect fiscal costs associated with informal care.

- Table 2 around here -

Before we set up the statistical models used to identify the effects of interest, we
take a look at how the various outcomes actually developed before and after the death of
lone parent; see Figure 1. Employment and earnings are recorded annually, with period 0
denoting the year of the lone parent’s death, period -1 the year before that, and so forth.
Panel a) indicates that employment propensity declines substantially during the years
prior to a lone parent’s death. The decline continues at a slightly lower rate after the lone
parent’s death. Panel b) shows that the earnings profiles for those who continue to work
display exactly the opposite pattern; earnings tend to rise significantly during the years
prior to the parent’s death, and the rise continues afterwards at a somewhat lower pace.
Social security claims are recorded monthly, with period 0 denoting the month of the par-
ent’s death. Panels c)-e) show the development of claim-propensities for up to three years
before and two years after the lone parent’s death. Sickness absence and reliance on
longer term welfare benefits clearly trend upwards in this period, with long-term absen-
teeism displaying a large spike at the time of the parent’s demise. Unemployment and so-
cial assistance dependency seem to trend downwards, for men particularly in the period
after the parent’s demise.

- Figure 1 around here -

Now, most of the developments shown in Figure 1 can hardly be causally associ-
ated with the parents’ demises. As offspring approach the time of their parents’ deaths,
they also become older, and the general economic conditions change. Hence, in order to
identify the causal impacts of having a parent in the terminal phase of life, we clearly
have to control for time and age, or equivalently, cohort and age. Figure 2 illustrates this
point, by showing the employment-age profiles for selected offspring cohorts represented in our dataset. It is evident that the employment propensity depends strongly on age and that the employment-age profile also varies significantly across different cohorts. To isolate the impacts of having a lone parent in the terminal stage of life, we clearly have to control for age/time in a way that allow the age/time effects to vary by cohort and gender.

- Figure 2 around here -

4. Empirical analysis

In this section, we set up statistical models aimed at recovering the causal impacts on labor market outcomes of having - or recently having had – a lone parent in the terminal stage of life. To simplify the analysis, we define all outcomes on an annual basis, including social security claims. We define a person as dependent on social security in a given year if social security of some sort (conf. Table 2) was claimed for at least three months during that year. We can follow individuals for up to 15 years before and 12 years after the parent’s demise. However, we are going to assume that there cannot be any causal impacts more than 10 years before the parent’s death, and that any after-death effects are constant from year five after the death of the parent and onwards. We have data on earnings and employment from 1980 to 2005 and for social security claims from 1992 to 2005.

The outcomes are modeled separately for men and women within a regression framework where we control for cohort and age/time. Given the large variation in employment-age profiles across cohorts shown in Figure 2, we set up models of the following form:

\[ y_{rt} = f(\sigma_{rc} s_{ct} + \delta_{rk} d_{it} + u_{rt}), \]  

(3)
where $y_{rit}$ is an outcome measure $r$ (r=earnings, employment, social security dependency) for individual $i$ at time $t$, $s_{cti}$ is a vector of dummy variables representing birth cohort $c$ ($c=1933,...,1967$) interacted with year of outcome measurement $t$ ($t=1980,...,2005$), $d_k$ is the number of years away from the death of a lone parent ($k=-9,-8,...,0,...,4,5$), $u_{rit}$ is an error term, and $(\sigma_{rci}, \delta_{rk})$ are the parameters to be estimated. The dichotomous outcome measures (employment, social security dependency) are modeled in terms of clustered Logit equations, with $f(a) = \exp(a)/(1+\exp(a))^{-1}$.

Our estimation procedure takes into account that the error terms may be correlated over time for each individual, and only robust confidence intervals are reported. The continuous outcome measure (annual earnings) is modeled conditional on employment in the relevant year, and we use the log of annual earnings as the left hand side variable, with $f(a) = a$ in Equation (3). The employment condition clearly creates a sorting problem, since if the loss of a lone parent affects employment propensity, it also effects the composition of individuals for whom earnings are included in the analysis. We therefore model the earnings effect by means of a fixed effects (within) estimator; i.e., including an individual-specific intercept in Equation (3).

To estimate a separate effect of each cohort-age/year combination may appear overly ambitious, since it involves the usage of almost 700 dummy variables (35 cohorts, each observed for on average around 20 years). However, since we attempt to identify a presumably moderately sized effect from data with large outcome variations due to other factors (age and time), it turns out that it is critical to avoid invalid restrictions on the control variables.\(^7\) Our focus is of course on the impact of the lone parent’s demise ($\delta_{rk}$). In

\(^7\) In the fixed effects model, a separate dummy for each possible cohort-year combination implies that one multicollinear vector is introduced for each cohort. Hence, one normalization is required for each cohort in this model.
order to trace out average effects, we start out by estimating the model on the full male and female datasets; see Table 1.\textsuperscript{8} We then estimate the model separately for various subgroups to examine the extent to which the effects vary according to indicators for i) care provided by others, ii) the size of the expected inheritance, iii) the level of human capital, and iv) the time-cost of care provision. Some of the indicators required for these purposes are available for later years only; hence significant numbers of observations (up to a third) are lost in these exercises. Ideally, we would have formulated multivariate models designed to pick up the partial impacts of the various explanatory variables. However, then we would obviously have to compromise on our nonparametric modeling strategy and impose some functional form restrictions on the $\delta_{rk}$-vectors and on the way they interact with the various explanatory variables. Unfortunately, we have not been able to find any model specification that allows us to identify partial impacts \textit{robustly}. The results tend to be highly sensitive to the exact way in which functional form restrictions are imposed, suggesting that nonparametric modeling is essential in this particular application.

Section 4.1 presents the main results of our regression analysis. The estimated impacts are presented graphically (for a representative offspring) with 95 percent confidence intervals. Sections 4.2-4.5 compare the estimated labor supply responses for various subgroups. For ease of exposition, we draw confidence intervals for one group at a time, and represent the comparison group solely by point estimates (the two confidence intervals are typically of similar size). A complete list of estimates with standard errors can be downloaded from our web-page www.frisch.uio.no/docs/informal_care.html. This page also contains a description of the sizes of the datasets (and groups) used for the various regressions, and the reasons why some observations are lost.

\textsuperscript{8} We disregard individuals who lost a lone parent more than once during the relevant time-period (this is possible if the parents are divorced). We also disregard individuals who did not reside in Norway in the year of their parent’s death.
4.1. Overall impacts of a lone parent’s death

Figure 3 presents our key regressions results. The impacts on employment and social security dependency are evaluated in terms of percentage point deviation from a reference level 9-15 years prior to the lone parent’s death. The reference levels are chosen separately for men and women to match the observed employment and social security rates in the data nine years before the loss of the lone parent. The impacts on earnings (conditional on employment) are similarly evaluated in terms of percent earnings deviation relative to the level 9-15 years before the parent’s demise. These numbers follow directly from the estimated log-earnings equation.

Our results indicate that the offspring’s employment propensity drops in the years just prior to a lone parent’s death, ceteris paribus. The drop is around 1 percentage point for sons and 2 percentage points for daughters. The decline in employment propensity continues during the first years after the parent’s demise. Conditional on remaining in the workforce, offspring earnings are relatively stable in the 10 year period prior to the lone parent’s death, although a very small decline seems to occur during the year of the parent’s death. Some time after the demise of the lone parent, earnings tend to increase by around 1 percent for sons and 2 percent for daughters, indicating that the earnings level may have been slightly restrained for a relatively long period prior to the loss of the lone parent. The most conspicuous result in Figure 3, however, is that social security dependency increases sharply during the years prior to the loss of a lone parent. The probability of becoming a long-term (at least three months) social security claimant rises by almost 4 percentage points for men and by 2 percentage points for females. And the higher risk of

9 The reference levels are chosen simply by computing averages for all observations available 9-15 years before lone parents’ deaths. For employment, these reference levels are 96 percent for men and 79 percent for women. For social security dependency, the reference levels are 19 percent for men and 23 percent for women.
social security dependency seems to persist for several years after the parent’s demise. It is of interest to note that the labor market responses towards having a lone parent in the terminal stage of life are quite similar for sons and daughters. But, while daughters to a somewhat larger extent than men respond by pulling out of the labor force, they are to a lesser extent than men inclined to claim longer-term social security benefits.

Taken together, these results are clearly consistent with the hypothesis that informal care requirements reduce labor supply at the extensive as well as the intensive margin, although some of the effects may be viewed as quantitatively insignificant. The negative employment effects identified after the lone parent’s death also suggest that the improved liquidity arising from inheritance does play a role for labor market participation choices. However, inheritance cannot explain the small rise in earnings occurring after the parent’s demise (conditional on employment). The significant rise in social security dependency also indicates that many offspring are subject to a difficult time-squeeze in the terminal phase of their own parents’ lives. This interpretation is confirmed by a recent interview survey encompassing middle aged Norwegians, in which 57 percent of the respondents in the relevant group report a burdensome “twin pressure” from work and care obligations (Gautun, 2008). The social security effect is stronger for men than for women, probably reflecting that fewer men decide to pull voluntarily out of the labor force. The failure of the social security propensity to return to its “reference” level after the parent’s demise may indicate, however, that the improved liquidity associated with an inheritance implies that social security becomes an affordable option for a larger share of the population.

4.2. Care provided by others

To the extent that offspring’s labor supply behavior is affected by parents’ informal care demands, the magnitudes of the responses are likely to be sensitive towards the level of
care provided by others. The main alternative providers of care to a lone parent are the offspring’s siblings and the municipality. We have estimated the impacts of parental death separately for lone children and for offspring with at least one sibling; see Figure 4. From the theoretical discussion provided in Section 2, we expect lone children to be more strongly affected by their lone parent’s death, both because they have nobody to share the informal care responsibility with \( Z \) is low) and because they can expect a larger inheritance \( M \) is large). This prediction is confirmed by the data. In particular, we note that employed lone children – in contrast to offspring with siblings – reduce their earnings quite significantly (by almost 2 percent) during the years prior to the parent’s demise. For lone daughters, there is also a much stronger negative employment response than for daughters with siblings.

There is not much observed variation in the municipalities’ overall supply of elderly care, and the national system for allocation of funding is indeed designed to ensure equal standards across the whole country. There has, however, been some variation in the weights that different municipalities attach to institutionalized versus home-based care provision. One may hypothesize that home-based care to a larger extent than institutionalized care relies on contributions from family members. Based on accounting data from the so-called KOSTRA database (administered by Statistics Norway) we have divided the population into two equally sized groups, depending on their municipalities’ “institution-share” in overall care expenditures. We use information about the municipality the same year as the parent dies.\(^{10}\) Municipalities with an institution-share above the median are

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\(^{10}\) In our data we do not have information about the parent’s place of residence before 1998, which means that we lose a lot of observations. Since we know the fraction of overall care expenditures used in care institutions only in the years after 2000, we use the fraction lying closest to the parent’s death.
denoted institution-oriented, while the rest are denoted homecare-oriented.\textsuperscript{11} Figure 5 displays the estimated labor supply responses by municipality type. Although the statistical confidence intervals are too wide to draw any firm conclusions, the results indicate that both the negative employment effect and the positive social security dependency effect of having a lone parent in the terminal phase of life are somewhat larger in a homecare-oriented municipality than in an institution-oriented municipality, particularly for daughters.

- Figure 5 around here -

4.3. The role of inheritance

To which extent do the behavioral impacts of a lone parent’s death arise from the income effects of inheritance ($M$)? We examine this issue by exploiting data on the parent’s wealth in the year prior to his/her death. The key idea is to identify a group of individuals with little or no inheritance, and to estimate the causal impacts of the lone parent’s death separately for them. The required information on parent’s wealth can be collected from the tax registers (since Norwegian citizens pay a wealth tax). We calculate expected inheritance by dividing the parent’s wealth on the number of siblings in the family. We then split the population according to positions in the expected inheritance distribution, such that the low-inheritance group consists of the third with the lowest expected inheritance. In order to ensure that the presumed low-inheritance-group does not comprise individuals for whom the low expected inheritance upon the parent’s death results from large transfers in advance, we also require that their parents’ joint income during their 50’s belongs to the lowest third in the distribution of all parents joint incomes during this age-period.

\textsuperscript{11} Note that variation in institution shares may not solely reflect different priorities, but also differences in the composition of the care-need population.
Data on the parents’ incomes during their 50’s are collected from pension point accrual register covering all citizens of Norway.

The estimation results shown in Figure 6 indicate that the income (liquidity) effects arising from inheritance are important for labor supply behavior around the time of a lone parent’s demise. First, the employment responses are strongest for offspring who expect a significant inheritance. Second, the rise in earnings after the parent’s death (conditional on employment) are clearly largest for offspring with little or no inheritance, suggesting that the income effect arising from inheritance does moderate these responses among other workers. And finally, the rise in social security propensity is much larger among high-inheritance than among low-inheritance offspring, indicating that the increased wealth arising from inheritance actually makes a life on social security more affordable.

- Figure 6 around here-

4.4. Human capital

Based on the model outlined in Section 2, we expect the magnitude of the labor supply response with respect to informal care requirements to decline in the offspring’s human capital \( E \). In Figure 7, we compare the estimated responses for two education groups – those with only compulsory education and those with college or university education. The theoretical prediction is clearly confirmed for sons, while the pattern for daughters is more mixed. Conditional on employment, it seems that the labor supply responses declines with human capital even for daughters. However, at the extensive margin, the daughters’ labor supply responses seem to increase with human capital. One possible explanation for this phenomenon is that since a large fraction of college educated females work in the relatively low-paid education and healthcare sectors, the skill premium in fe-
male wages tends to be much lower than the skill premium in male wages (Hægeland and Kirkebøen, 2007, pp. 14-15).

- Figure 7 around here -

4.5. The time-cost of care provision

While human capital affects the opportunity cost of care provision, there are also direct costs. Offspring who reside in another region than their parent face particularly high time and travel costs. From the discussion in Section 2, we know that a rise in the time-cost of care-giving \( (a) \) has an ambiguous effect on labor supply; on the one hand it implies that more time is required to provide a given level of care (which partially displaces labor supply); on the other hand it implies that the optimal level of care declines. Figure 8 present the results from models that are estimated separately for offspring who do and do not reside in the same “travel-to-work area” as the parent. While employed offspring who live in the same region as their lone parent experience a significant increase in earnings after the parent’s demise, no such impacts can be seen among offspring living in another region. However, for daughters it also seems to be the case that those who reside in another travel-to-work area than their parent experience the strongest negative employment impacts. One reason for this may be that daughters to a larger extent than sons feel obliged to help their parent, even if this means a long travel.

- Figure 8 around here -

The labor supply impact of informal care requirements may vary across age groups because different age groups have different time or budget constraints. As it turns out, however, separate estimations for different age groups do not reveal any significant differences (not shown).
5. Conclusion

Based on administrative register data from Norway, we have shown that offspring’s labor supply is negatively affected by having a lone parent in the terminal phase of life, both at the extensive and the intensive margin. The pattern of responses across different groups of offspring is consistent with economic theories emphasizing that market labor supply is responsive towards informal care demands as well as towards unearned income (inheritance). While the impacts on employment and earnings are quantitatively small, the impacts on social security dependency are quantitatively large, particularly for sons. The probability of being a long-term social security claimant – defined as claiming benefits or social assistance for at least three months during a year, due to, e.g., sickness absence, early retirement, or disability – rises on average by 2-4 percentage points during the final years of a lone parent’s life. Also, the higher level of social security dependency persists for many years after the parent’s demise. The rise in social security dependency is particularly large for offspring who receive a significant inheritance from their demised parent, suggesting that the rise in wealth makes a life on social security more affordable for some individuals.

There are no social programs in Norway targeted particularly at workers with care-needing parents, although employees are entitled to 20 days of unpaid leave during the final stage of parents’ lives. Our results indicate that offspring avoid this rather costly option in favor of claiming sick themselves. Hence, our results confirm interview-based evidence reported by Carlsen (2008) indicating that physicians sometimes certify sickness to help employees cope with a difficult life situation, even when the employee is not really sick. We can of course not rule out, however, that the stress associated with having a dying parent actually causes own sickness or make it more difficult to work with an already existing health problem.
Norway combines a comprehensive system of publicly provided elderly care with a relatively generous welfare support system for workers who cannot work for reasons of sickness, disability, or unemployment. Taken together, these institutional features may have contributed to de-privatize the responsibility for elderly care. The results presented in this paper suggest, however, that offspring still have a significant role to play in taking care of their own parents. Informal care substitutes for the supply of labor in the market. But to some extent the offspring – and in particular the sons – pass their costs on to the public purse through the social security system.

References


Statistics Norway, Research Department.


Table 1
The Data – Key Descriptive Statistics

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of working age individuals who lost a lone parent 1993-2005</td>
<td>170,669</td>
<td>138,037</td>
</tr>
<tr>
<td>Mean age at the time of the lone parent’s death (years)</td>
<td>50.9</td>
<td>50.2</td>
</tr>
<tr>
<td>Per cent of offspring being lone children</td>
<td>20.6</td>
<td>18.8</td>
</tr>
<tr>
<td>Per cent of offspring living in the same region as lone parent</td>
<td>71.0</td>
<td>65.1</td>
</tr>
<tr>
<td>Per cent of offspring employed in the year of the lone parent’s death</td>
<td>83.4</td>
<td>74.8</td>
</tr>
<tr>
<td>Per cent of offspring claiming social security benefits for at least three months in the year of the lone parent’s death</td>
<td>26.5</td>
<td>34.6</td>
</tr>
<tr>
<td>Mean annual earnings employed offspring (1000 NOK, measured in 2000 value)</td>
<td>301</td>
<td>202</td>
</tr>
</tbody>
</table>

Table 2
Social security transfers in Norway

<table>
<thead>
<tr>
<th>Type</th>
<th>Main eligibility requirements</th>
<th>Replacement ratio and time limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sickness absence insurance</td>
<td>Work capacity reduced due to own sickness/disability. Must be certified (with diagnose) by an authorized physician.</td>
<td>100 per cent of regular earnings for a maximum period of one year.</td>
</tr>
<tr>
<td>Rehabilitation benefits</td>
<td>Same as sickness absence insurance. Work capacity must be reduced by at least 50 per cent.</td>
<td>Typically around 66 per cent of previous earnings. Substitutes for sickness absence benefits when these are exhausted. No absolute time limit.</td>
</tr>
<tr>
<td>Disability benefits</td>
<td>Same as rehabilitation benefits. In addition, the reduced work capacity must be considered permanent.</td>
<td>Typically around 66 per cent of previous earnings. Lasts until the ordinary retirement age of 67 years.</td>
</tr>
<tr>
<td>Early retirement</td>
<td>Having reach age 62 and working in a firm affiliated to the early retirement scheme (around 80 percent of workers in the relevant age group).</td>
<td>Equal to the pension a person would have received had he/she worked until the ordinary retirement age of 67; i.e., no actuarial adjustment caused by earlier takeout.</td>
</tr>
<tr>
<td>Unemployment benefits</td>
<td>Involuntary loss of paid work.</td>
<td>62.4 per cent of previous earnings. Maximum period of 2-3 years (depending on time and on past earnings).</td>
</tr>
<tr>
<td>Social assistance</td>
<td>Means tested income support of last resort. No other benefits available or additional support deemed necessary.</td>
<td>Minimum subsistence income levels, depending on family situation. No time limit.</td>
</tr>
</tbody>
</table>

Note: The early retirement scheme is not formally a part of the social security system, since it is partly financed by the participating firms and partly by the state.
Figure 1. Labor market outcome before and after the death of a lone parent for men (solid lines) and women (dotted lines).

Note: The lone parent dies at time 0. Income/employment is recorded on an annual basis. Social security claims are recorded on a monthly basis.
Figure 2. Employment-age profiles by birth cohort.
Figure 3. Estimated impacts of time (years) to loss of a lone parent (with 95 percent confidence intervals).

Note: Upper panels (earnings effects) based on fixed effects log-linear model. Middle and lower panels based on logit models (with robust standard errors). All regressions include around 700 cohort-year(age) dummy variables.
Figure 4. Estimated impacts of time to loss of a lone parent for children with siblings (thin line, with 95 percent confidence intervals) and for lone children (bold line).

Note: Upper panels (earnings effects) based on fixed effects log-linear model. Middle and lower panels based on logit models. All regressions include around 700 cohort-year(age) dummy variables, and cohort – time effects are assumed to be the same for children with and without siblings.
Figure 5. Estimated impacts of time to loss of a lone parent when the parent lives in an institution oriented municipality (thin line, with 95 percent confidence intervals) and when the parent lives in a home care oriented municipality (bold line).

Note: Upper panels (earnings effects) based on fixed effects log-linear model. Middle and lower panels based on logit models. All regressions include around 700 cohort-year(age) dummy variables, and cohort-time effects are assumed to be the same for both types of municipalities.
Figure 6. Estimated impacts of time to loss of a lone parent for offspring who expect a significant inheritance (thin line, with 95 percent confidence intervals) and for offspring who expect little or no inheritance (bold line).

Note: Upper panels (earnings effects) based on fixed effects log-linear model. Middle and lower panels based on logit models. All regressions include around 700 cohort-year(age) dummy variables, and cohort-time effects are estimated separately for each group.
Figure 7. Estimated impacts of time to loss of a lone parent for offspring with low education (thin line, with 95 percent confidence intervals) and for offspring with high education (bold line).

Note: Upper panels (earnings effects) based on fixed effects log-linear model. Middle and lower panels based on logit models. All regressions include around 700 cohort-year(age) dummy variables, and cohort-time effects are estimated separately for each group.
Figure 8. Estimated impacts of time to loss of a lone parent for offspring who live in another travel-to-work area than the parent (thin line, with 95 percent confidence intervals) and for offspring who live in the same travel-to-work area (bold line).

Note: Upper panels (earnings effects) based on fixed effects log-linear model. Middle and lower panels based on logit models. All regressions include around 700 cohort-year(age) dummy variables, and cohort-time effects are estimated separately for each group.