

## Chapter 3

# The Impact of Caring on Family Carers

*Supporting the role of informal carers (family and friends providing mostly unpaid care to frail seniors) is important to provide an adequate continuum of care between informal and formal care. While caregiving can be beneficial for carers in terms of their self-esteem, it can be difficult for working-age carers to combine paid work with caring duties and carers may choose to quit paid works or reduce the work hours. This may compromise their future employability and lead to permanent drop-out from the labour market. Caring may also cause burnout and stress, potentially leading to worsening physical and mental health. This chapter offers an overview of the characteristics of family carers and the impact of caring for frail seniors on labour market and health outcomes of carers. This will provide insights in how to shape policy reforms with the objectives of 1) helping carers to combine caring responsibilities with paid work; and 2) improving carers' physical and mental wellbeing by reducing mental health problems. Countries which want to maintain or increase reliance on family carers will need to alleviate the burden of family carers and reduce the economic costs associated with caring responsibilities.*

### 3.1. Addressing caring responsibilities: The impact on informal carers

Using household surveys from Australia and United Kingdom, a household survey for individuals aged over 45 years in South Korea (KLoSA) and two surveys for individuals aged over 50, the *European Survey on Health and Ageing* (SHARE) and the United States Health and Retirement Survey, this chapter provides a snapshot of who are the carers, and analyses the impact of caring on people providing personal care within and outside the household.

The analysis shows that caregiving is associated with a significant reduction in employment and hours of work. Wages of carers do not appear to be lower than those of non-carers, however, once other characteristics are taken into account. On the other hand, there is an increased risk of poverty for carers. Finally, caregiving leads to worsening mental health, even after controlling for pre-existing mental health problems.

### 3.2. Most carers are women, care for close relatives and provide limited hours of care

Across the OECD, more than one in ten adults (family and friends) is involved in informal,<sup>1</sup> typically unpaid, caregiving, defined as providing help with personal care or basic activities of daily living (ADL) to people with functional limitations. There are significant variations in the percentage of the population involved in this type of caregiving across OECD countries. As can be seen in Panel A of Figure 3.1, the percentage of the population reporting to be informal carers across OECD countries for which data are available ranges from 8% to just over 16%. There is no clear geographic distribution in the rate of caregiving: certain southern European countries have among the highest percentages (Italy, Spain) but Greece ranks among the lowest rates together with Denmark and Sweden. Some of the country differences are due to slightly different definitions and interpretations of caring for dependents across countries (Box 3.1).

A larger number of carers provide help with instrumental activities of daily living (IADL, that is help with shopping or paperwork for instance), even in countries with comprehensive public long-term care coverage. When informal caring is defined with such a broader focus, close to one in three adults aged over 50 provide unpaid care (Figure 3.1, Panel B). Except in southern European countries, a greater proportion of adults provide help with IADL compared to help with ADL. Northern European countries, despite having a comprehensive public coverage for formal care, have the highest share of individuals providing help with IADL.

Carers are more likely to be female but more males become carers at older ages (Figure 3.2). Across the 16 OECD countries reviewed in this study, close to two-thirds of informal carers aged over 50 years are women. Caregiving tends to decrease at older ages with a smaller percentage of carers being present at age 75 and above, probably being related to health limitations. At the same time, the gender distribution of carers changes with age.

**Box 3.1. Defining carers: Complexity and focus of this study**

There is a lack of comprehensive or comparable international evidence on carers. The definition and measurement of unpaid care presents significant challenges, especially in a study which attempts to make international comparisons. Many carers do not see themselves as such and, even if questioned, would not declare that they were carers. Society's attitudes towards family responsibilities and the availability of services to support both carers and people with health limitations vary widely across countries, influencing the pattern and declaration of informal caring. Studies use different definitions of carers which differ depending on the caring activities included and who is the care recipient, leading to the inclusion or exclusion of so-called instrumental activities of daily living, and the inclusion or exclusion of young care recipients and people with ill health. Glendinning *et al.* (2009) draw attention to how differences in definitions and complex causal relationships make generalisations about international experience difficult.

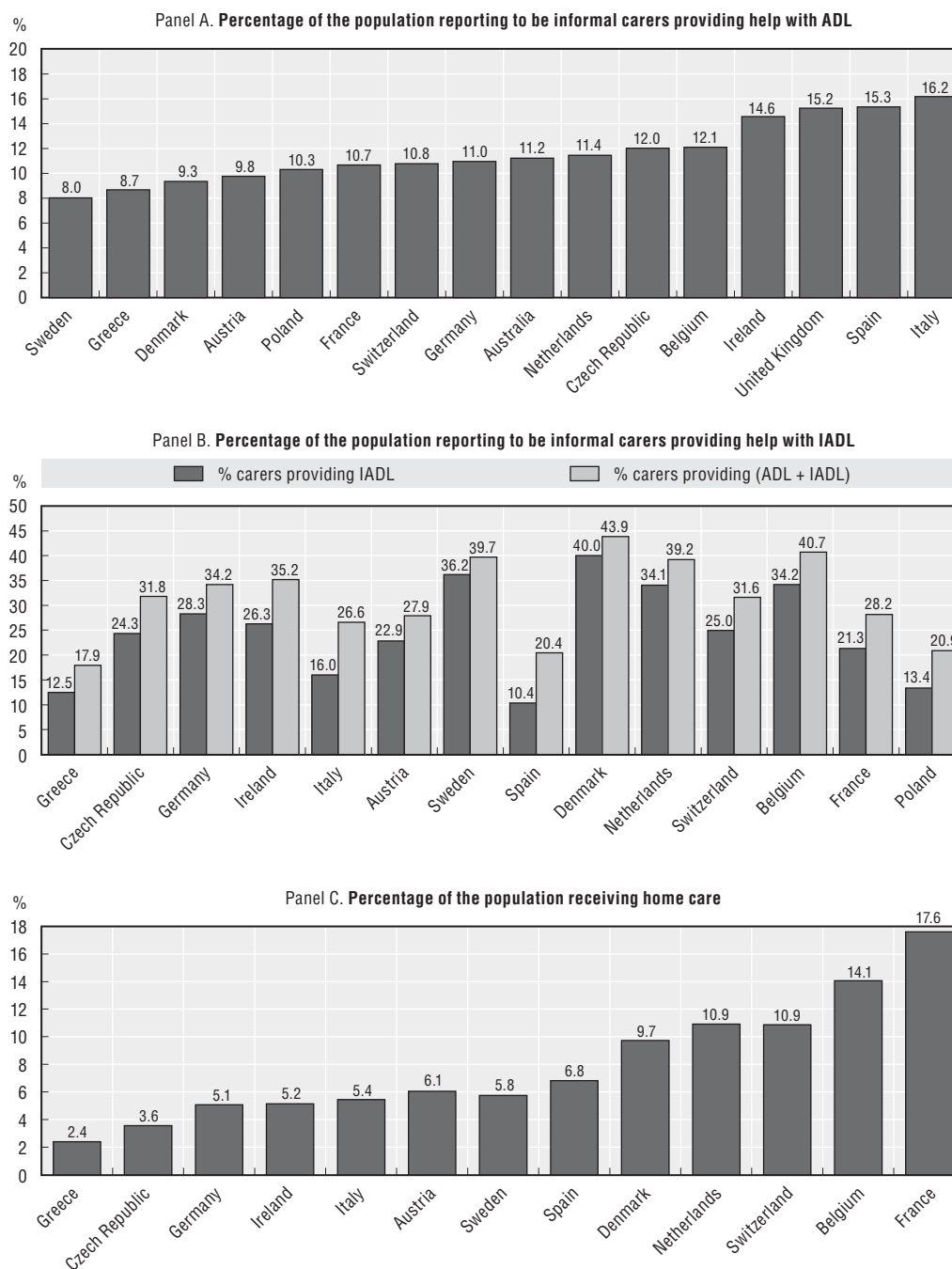
To assess the characteristics of carers and the impact of informal caring, different national and cross-country surveys are used in this chapter. No threshold is used in the general definition of carers and all individuals with caring responsibilities of at least one hour per week are included. All definitions focus on personal care (ADL) inside or outside the household but there are differences in the scope of the definition. In particular, the question in Australia specifies that the type of activities included in care and that they are performed towards someone who has a long-term health condition, who is elderly or who has a disability. In contrast, the definition in the United Kingdom is broader and includes looking after or providing special help to someone who is sick, disabled or elderly. The results might be sensitive to variable definitions and measurement error.

The descriptive analysis on the characteristics of carers is limited to the sample of individuals aged 50 years and above. The choice is partly driven by data limitations and partly by the fact that this group is more likely to be involved in caring responsibilities and more at risk of labour market exit. Data from Australia and the United Kingdom reveal that 75 to 80% of carers are aged 45 and above. Older workers aged between 50 to 64 years and also more prone to early retirement, particularly in the case of family responsibilities.

Relatively more males are carers among the 75-years-old and above: in two-thirds of the countries a similar or higher percentage of male carers than female carers is observed.


On average, unpaid carers are more likely to devote time to close relatives, such as their parents or their spouse. Yet, there is a non-negligible proportion of carers who also report helping a friend or neighbour (18%) or taking care of other relatives such as brothers/sisters or aunts/uncles (18%). Male carers are more likely to be taking care of their spouse rather than other relatives (Table 3.1).

Most informal carers provide limited hours of care but there is wide variation in hours provided across countries (Figure 3.3). Generally, just over 50% of carers are involved in caring activities of less than ten hours per week on average. This low intensity of caring is particularly prevalent in northern countries and Switzerland. In such countries, less than 20% of carers provide an intensive level of caring of more than 20 hours per week. This may reflect the fact that, in these countries, a relatively greater proportion of elderly receives formal care either at home or in institutions. In contrast, in southern Europe, the Czech Republic and Poland more than 30% of carers are providing intensive caring, reaching even slightly over 50% in Spain. The case of Korea is also striking: over 60% of informal carers

Figure 3.1. **Caregiving varies by country and type of help provided**

Note: Samples include persons aged 50 and above. The United States includes care provided to parents only. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. ADL: Activities of daily living; IADL: Instrumental activities of daily living.

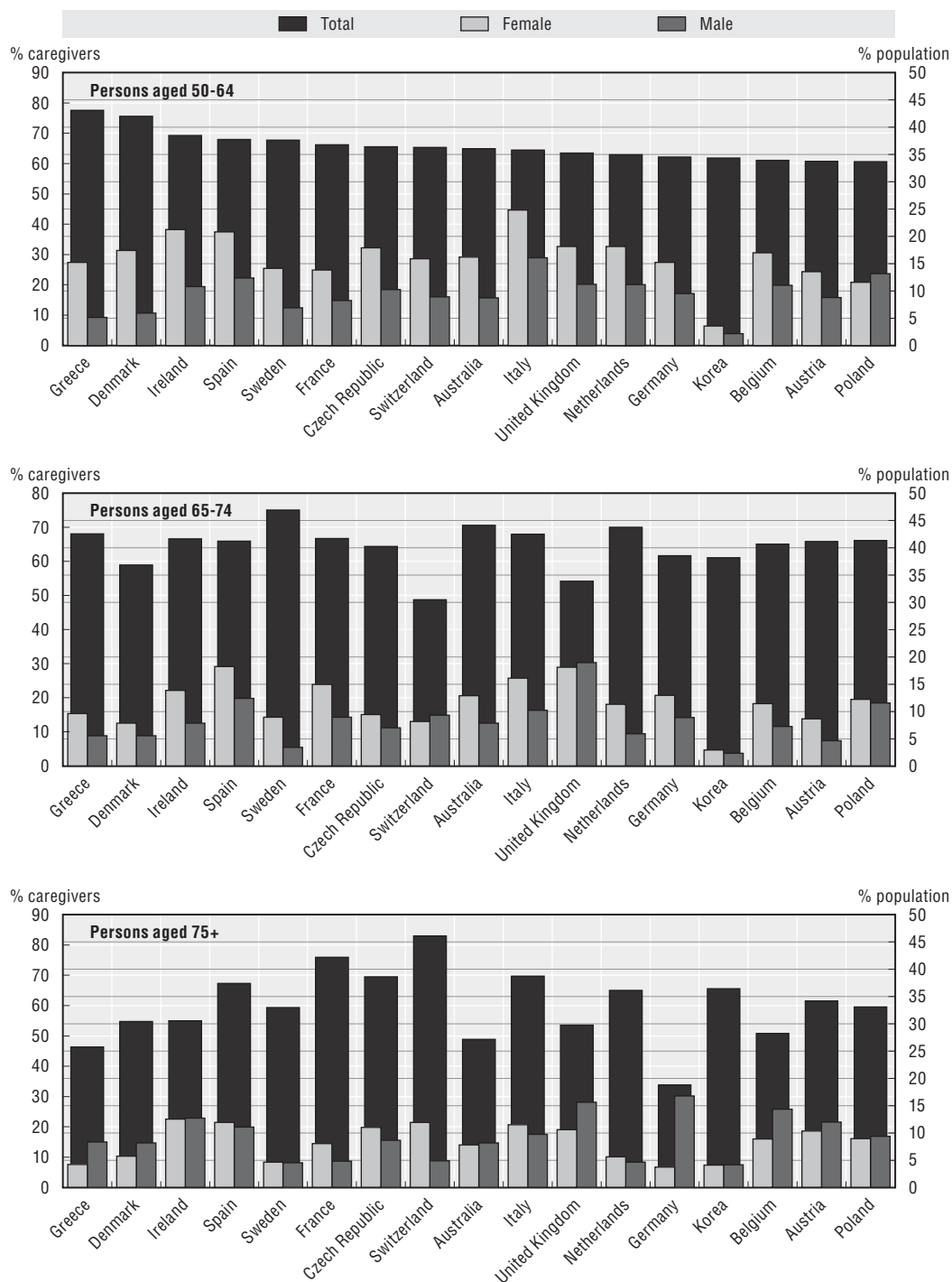
Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

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are providing more than 20 hours a week. The distribution of hours across countries may however be influenced by the definitions of caring, by recall and reporting problems.<sup>2</sup>


**Figure 3.2. Informal carers are predominantly women**

Percentage of informal carers who are female by age group (left axis)  
 Percentage of the population reporting to be carers by gender and age group (right axis)



Note: Samples include persons aged 50 years and above. The United States includes care provided to parents only. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; 2006 for Korea and 1996-2006 for the United States.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, KLoSA for Korea and HRS for the United States.


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**Table 3.1. Unpaid care is mostly directed towards parents and spouses**  
Percentage of carers by relation to the care recipient by country

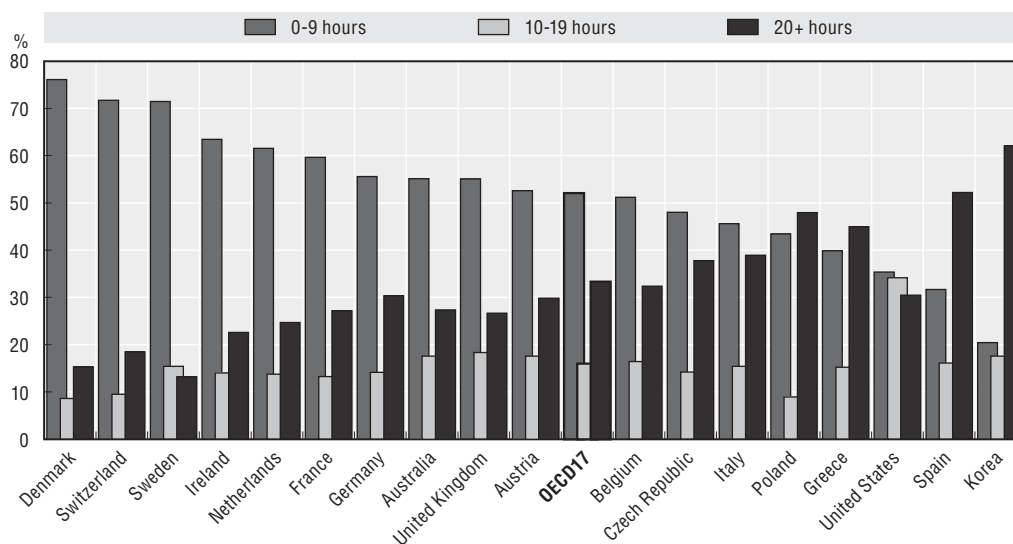
	Spouse	Parent	Relative	Friend
Australia	26.3	41.0	9.7	8.8
Austria	36.3	34.7	14.7	16.8
Belgium	33.7	40.4	16.6	23.4
Czech Republic	27.5	11.2	33.0	16.2
Denmark	39.7	41.3	15.9	20.9
France	31.8	40.5	19.6	13.7
Germany	34.9	44.2	13.0	21.5
Greece	33.2	35.2	14.9	14.7
Ireland	28.5	35.2	22.4	18.8
Italy	23.1	36.2	22.6	24.1
Korea	43.2	33.5	9.6	—
Netherlands	27.4	46.9	17.2	24.7
Poland	33.8	10.6	27.9	8.0
Spain	28.0	39.9	20.6	10.9
Sweden	26.5	48.5	19.0	18.1
Switzerland	30.1	42.8	17.2	24.1
United Kingdom	34.1	32.2	5.4	27.4
<b>OECD (16)</b>	<b>31.6</b>	<b>36.1</b>	<b>17.6</b>	<b>18.2</b>

Note: Samples include persons aged 50 years and above (with the exception of Korea including 45 and above). The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; 2005 for Korea and 1996-2006 for the United States. Percentage sum is different from 100% as people may care for more than one person and care for children is excluded to avoid confusion between child care and care for dependent children.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, KLoSA for Korea and HRS for the United States.


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**Figure 3.3. Carers tend to provide limited hours of care**  
Percentage of carers by category of weekly hours of care



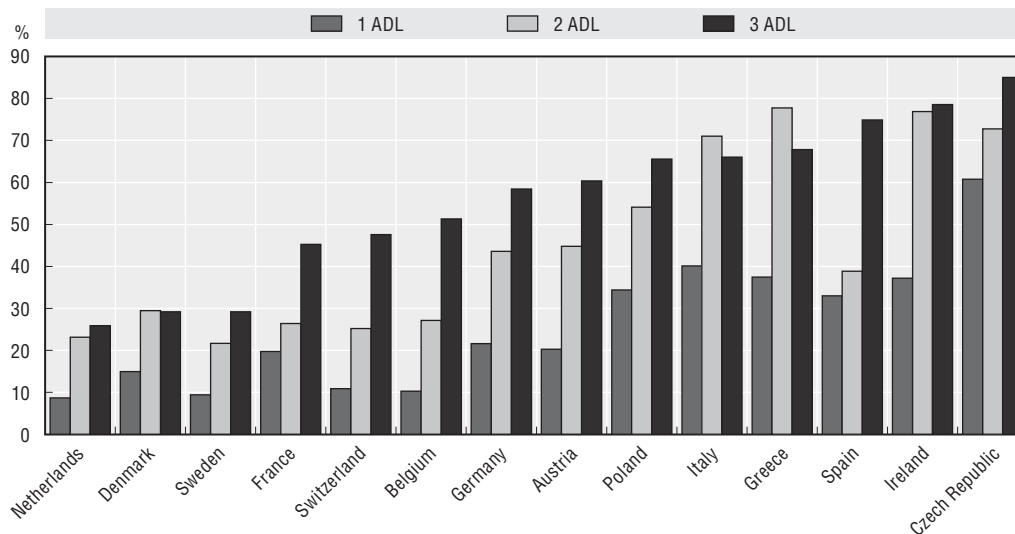
Note: Samples include persons aged 50 years and above (with the exception of Korea including 45 and above). The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; 2005 for Korea and 1996-2006 for the United States.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, KLoSA for Korea and HRS for the United States.

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Caring responsibilities are largely influenced by the health status of care recipients (Figure 3.4). While 25% of adults aged 50 and above suffering from one limitation of daily activities receive care from family and friends, this proportion doubles in the case of two or more limitations. In half of the countries, the proportion of those receiving informal care does not vary greatly with two or more activity limitations, while in the other half it increases progressively. Individuals with ADL limitations are more likely to receive unpaid care in the Czech Republic, Ireland and southern Europe, irrespective of the number of limitations. This result is consistent with other studies on geographic patterns of caring in Europe (Lamura *et al.*, 2008).

**Figure 3.4. Persons with more ADL limitations require more care**  
Percentage of the population receiving informal care by number of ADL limitations



Note: ADL: Activities of daily living. Samples include persons aged 50 and above. The following years are considered for each country: 2004-06.

Source: OECD estimates based on the Survey of Health, Ageing and Retirement in Europe (SHARE).

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### 3.3. High-intensity caring can lead to reduced rates of employment and hours of work

One of the economic costs of caring is related to formal labour force participation. Carers are less likely to be employed and are 50% more likely than non-carers to be home makers (Table 3.2). Country differences in employment rates between carers and non-carers could be linked to overall labour force participation rates and opportunities for part-time work. For instance, the employment gap is small in Nordic countries and tends to be higher in Greece, Spain and Poland. At the same time, in both Greece and Spain, large shares of informal carers are home makers (more than 40%). In other countries, such as Austria and Italy, a large proportion of carers is found among retirees. On the other hand, no clear pattern is found between the number of informal carers and the type of occupation.


Limited labour force participation does not only translate into lower employment rates but also into less time in full-time employment. Indeed, when they are at work, carers work on average two hours less per week than non-carers and they tend to be over-represented in part-time work (Figure 3.5). Furthermore, caring activities could have an impact on career continuity and job choices. This could explain why carers are more likely to hold a

**Table 3.2. Carers are more likely to be home makers, less likely to be employed**  
Percentage of carers and non-carers by labour force status

	Retired		Employed		Unemployed		Homemaker	
	Carer	Non-carer	Carer	Non-carer	Carer	Non-carer	Carer	Non-carer
Australia	16.8	16.2	53.1	66.2	1.6	1.8	21.7	6.9
Austria	48.9	44.0	31.8	38.9	3.3	4.0	11.6	9.8
Belgium	22.3	25.6	39.0	42.7	10.5	6.0	16.5	13.0
Czech Republic	34.7	43.4	44.7	48.1	11.2	5.6	0.3	0.0
Denmark	19.1	22.2	59.0	60.6	7.0	5.9	1.3	1.7
France	24.0	25.5	51.6	52.7	4.3	6.1	13.8	9.3
Germany	23.5	20.5	48.2	53.8	9.7	11.2	11.9	8.9
Greece	18.7	23.3	31.4	47.2	2.4	2.8	46.0	25.1
Ireland	11.1	17.0	55.6	51.9	1.7	4.0	24.7	17.8
Italy	36.2	35.5	33.5	35.8	3.2	4.0	24.5	22.3
Korea	7.0	10.6	45.0	48.9	3.8	3.0	36.9	33.2
Netherlands	6.5	11.0	52.4	5.1	2.9	3.0	27.0	17.6
Poland	37.6	36.2	33.6	60.3	3.4	7.9	9.8	5.3
Spain	10.0	13.8	33.0	45.1	5.9	7.5	43.9	25.7
Sweden	12.9	16.3	75.4	73.9	1.4	3.5	0.8	1.1
Switzerland	7.3	10.2	67.0	69.5	3.5	2.8	15.7	10.0
United Kingdom	10.6	7.3	77.9	80.9	1.4	0.9	5.3	5.0
United States	17.7	15.5	58.5	62.0	2.3	1.8	10.7	9.1
<b>OECD (17)</b>	<b>20.3</b>	<b>21.9</b>	<b>49.5</b>	<b>52.4</b>	<b>4.4</b>	<b>4.5</b>	<b>17.9</b>	<b>12.3</b>

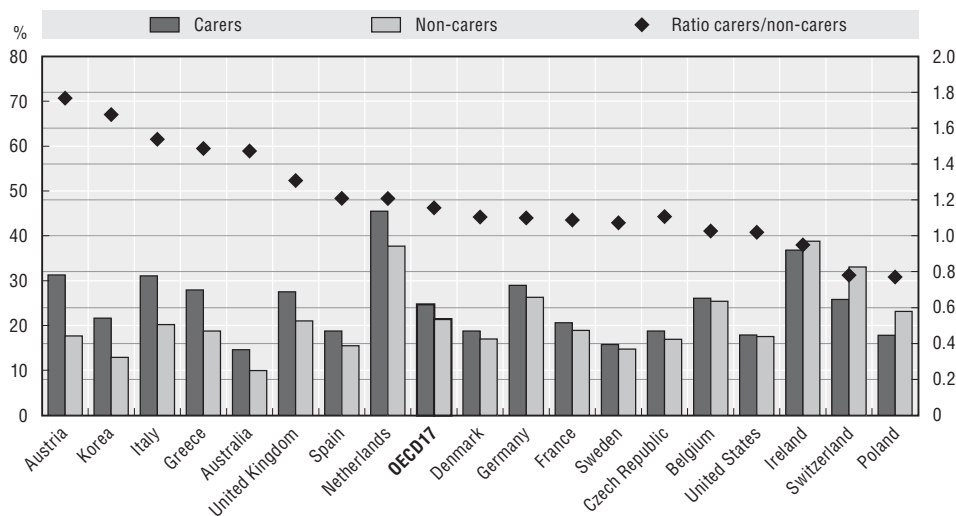
Note: Samples include persons aged 50 to 65 years (except for Korea where 45-65 years-old are considered). The United States includes care provided to parents only. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; 2005 for Korea and 1996-2006 for the United States.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, KLoSA for Korea and HRS for the United States.

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**Figure 3.5. Carers work fewer hours**

Percentage of carers and non-carers working part-time and relative prevalence



Note: Samples include persons aged 50 to 65 years (except for Korea where 45-65 years-old are considered). The United States includes care provided to parents only. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; 2006 for Korea and 1996-2006 for the United States. Part-time refers to less than 30 hours/week.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, KLoSA for Korea and HRS for the United States.

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temporary work contract. Indeed, in Australia and the United Kingdom where data on the type of contract are available, carers are 30% more likely to hold a temporary job. Data from Australia also indicate that carers have on average nearly three years shorter working career than non-carers.

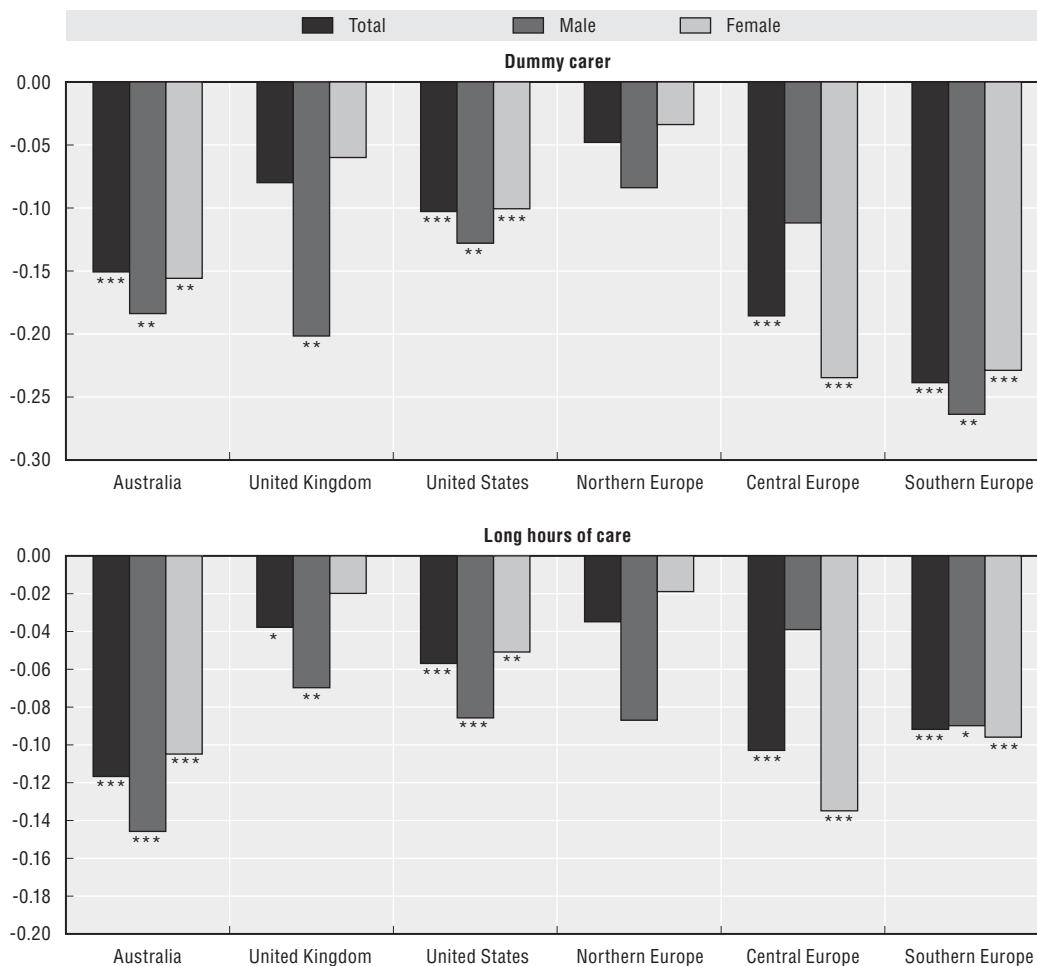
Providing personal care can be a demanding task that is incompatible with a full-time job or with any type of paid employment, explaining the previous findings. Available jobs might not be flexible enough in terms of working hours or leave options to accommodate caring responsibilities. Caring duties might be unpredictable in terms of their intensity, leading to absences from work.

At the same time, carers have different socio-demographic characteristics and human capital levels which might influence participation choices. Decisions within families as to who will be a carer or whether to use formal care instead might be related to different labour market opportunities and earnings potential, as carers tend to be older and have lower education levels. Labour force participation choices might be influenced by other observed and unobserved characteristics of carers and it is important to control for such factors when researching the impact of caring responsibilities on the labour force status of carers. Surveys following individuals over time provide the opportunity to distinguish whether the correlation between labour force participation (or hours of work) and caring is caused by the negative effect of caring on availability for work, or whether individuals with poor job prospects are more likely to engage in caring activities. This section will consider the effects of caregiving on employment, controlling for other characteristics of carers, followed by the impact on working hours for those working. It will then look at the decision whether to work or reduce working hours simultaneously (see Annex 3.A3 for a description of the methods).

Carers are less likely to be in paid employment, even after controlling for employment status in the previous year and other individual observed and unobserved characteristics (Figure 3.6).<sup>3</sup> The estimation controls for other socio-demographic factors that might affect employment status such as education, house ownership (as a proxy for non-labour income) and marital status. Socio-economic status, for instance, affects both caregiving and labour market outcomes because socially disadvantaged families may be more likely to engage in caregiving and have fewer labour market opportunities. A negative coefficient reflects a lower probability to be in employment. The results show a differential impact depending on intensity of care: the greater the hours of care provided, carers are proportionally more likely to give up paid employment. Increasing hours of care by 1% results in carers being more likely to stop working by 10%. The impact of caring on employment is less important than other factors: low education or the presence of a disability have a much larger effect on reducing employment rates.

The impact of care on labour force participation appears only when individuals provide a high intensity of care: at least 20 hours per week (Figure 3.A2.1). Similarly, the impact is significant only in the case of care towards co-residents. Co-residential living arrangements might reflect the high needs of the person being cared for and/or low availability of formal care services. Conversely, caring does not lead to reduced formal labour force participation when caring responsibilities occupy just a few hours. When only a few hours per week are spent caring, it is easier to combine work and care. Such carers may also be providing care to more autonomous individuals or as a complement to a primary caregiver, giving them more flexibility. Staying at work can also help carers to cope with increase expenditures and a reduction in their disposable income.


Figure 3.6. **Informal caring results in a lower probability of employment**  
Coefficients from a dynamic probit



\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: Samples include persons below age 65 in Australia and the United Kingdom, aged 50 to 65 in other European countries and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the following controls: Age, number of children, marital status, education, house ownership and other non-labour income if available, health status and regions (in Australia and the United Kingdom). The United States includes care provided to parents only. Lagged employment and initial employment status are included in all except for European countries (except the United Kingdom).

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

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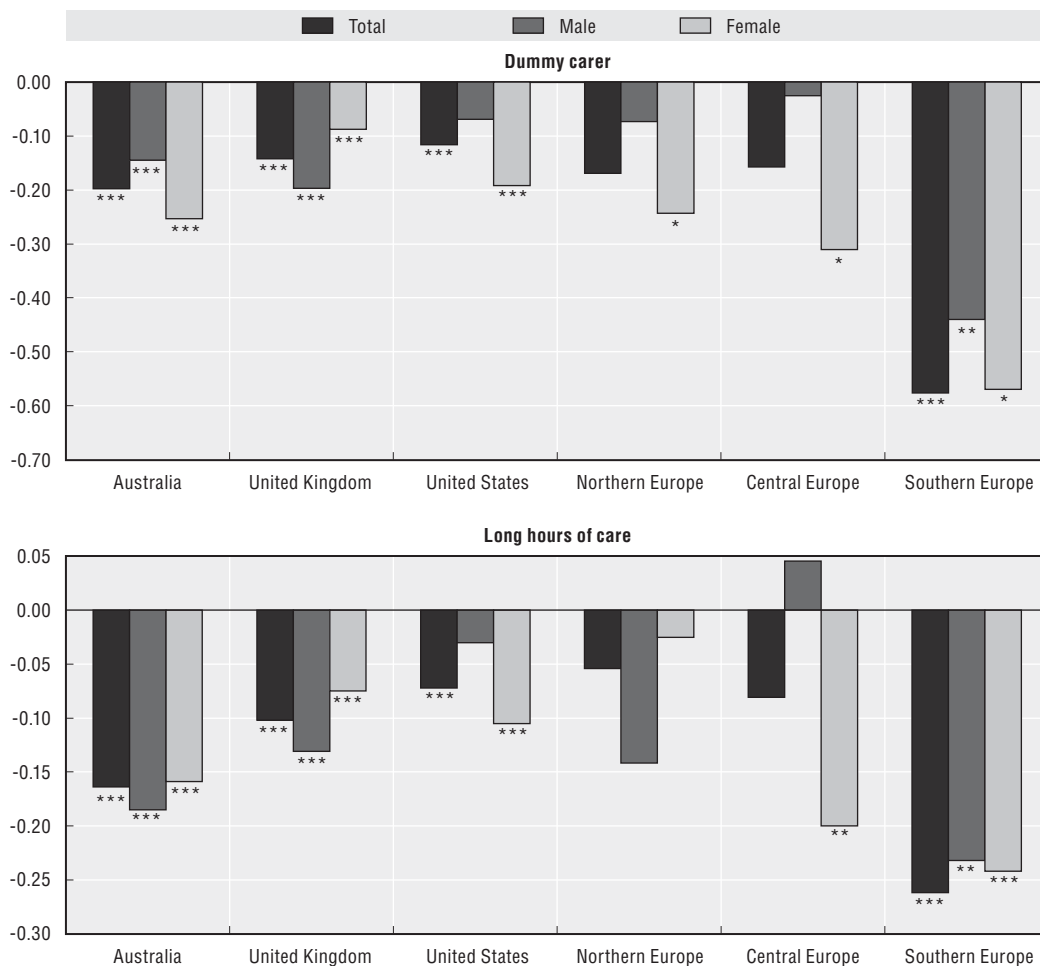
While different definitions of informal carers (see Box 3.1) limit the significance of cross-country comparisons on the impact of caring across countries, certain rough patterns emerge. In particular, being an informal carer is not associated with a significant reduction in employment in northern European countries. At the other extreme, southern European countries exhibit a greater decrease in employment for informal carers. This geographic variation could be explained by the higher labour force attachment in northern countries and different policies which might encourage a better combination of work and family responsibilities. Another explanation of the association between caring and labour force participation can be found in the already observed differences in the intensity and location of care across countries.

Caregiving also leads to reduced working hours across all countries except in northern Europe (Figure 3.7). It leads to a greater reduction in working hours in southern Europe than in central Europe. Hours of work are sensitive to a change in hours of care: a 1% increase in hours of care translates, on average, into slightly more than 1% decrease in hours of work. Other socio-demographic factors, such as education and marital status, are important predictors of working hours.

The impact of caring does not lead to reduced work hours in case of low caring responsibilities and can be attenuated by flexibility of working hours. In Australia and the United Kingdom, all types of care intensity (below 10 hours, 10-19 and 20 or more hours/week) are associated with a reduction in working hours but the reduction associated with low care intensity (below 10 hours) is rarely significant (Figure 3.A2.2). The effect in

Figure 3.7. **Informal carers reduce their working hours when at work**

Coefficients from a random effect tobit



\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: Samples include persons below age 65 in Australia and the United Kingdom, aged 50 to 65 in other European countries and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the same controls as in Figure 3.6. The United States includes care provided to parents only.

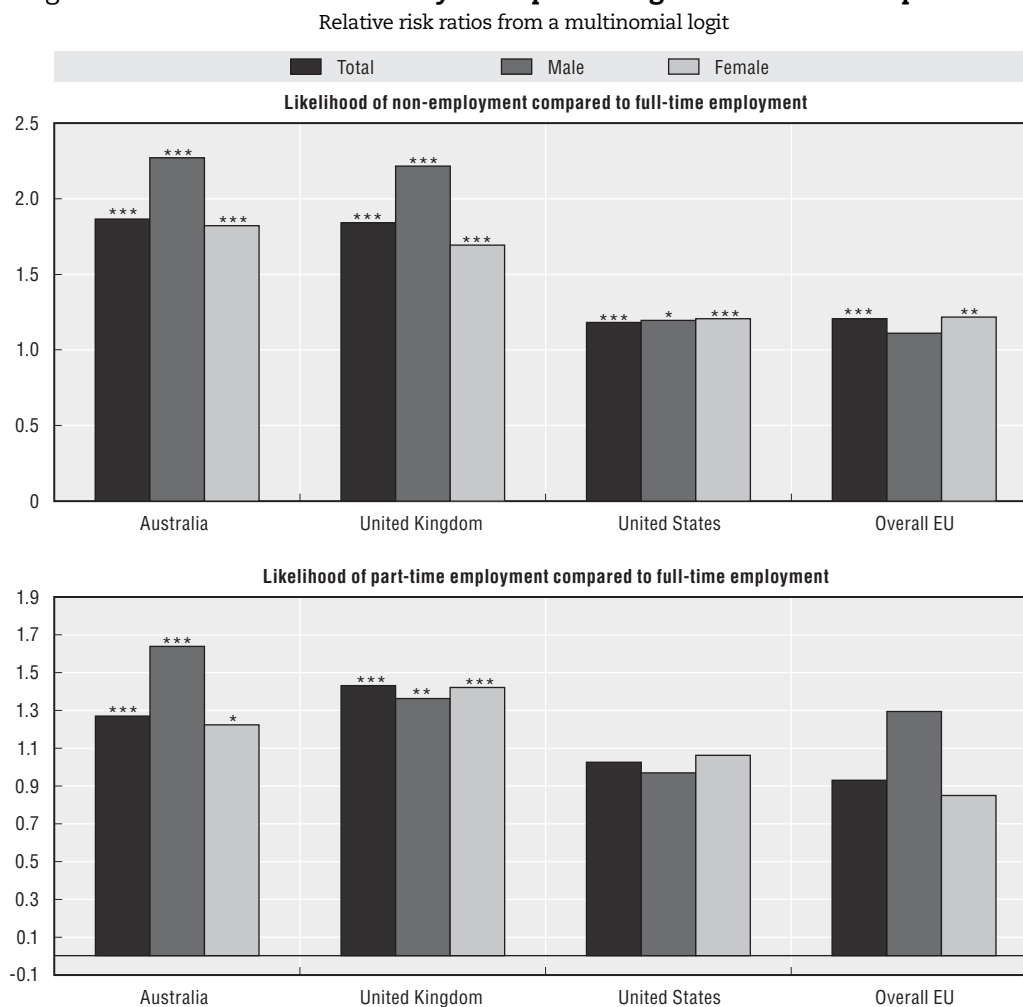
Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

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working hours is twice as high for high intensity of caring in comparison with a medium intensity (10-19 hours/week). In the United States and other European countries, a significant impact is observed only when caregiving obligations represent 20 or more hours per week. In Korea, at high levels of caregiving, women tend to decrease their worked hours (Do, 2008). When carers benefit from flexible working hours or the possibility of a leave of absence from work, this tends to increase their working hours.

Previous analysis has shown how unpaid caring is associated with a lower probability of employment and reduced working hours for workers (Carmichael and Charles, 2003; Heitmueller, 2007; Johnson and Lo Sasso, 2000; Viitanen, 2005). At the same time, most workers will face a decision-making process where both options are considered simultaneously, i.e. whether to stop working or whether to work shorter hours. Such decision

Figure 3.8. **Carers are more likely to stop working rather than work part-time**



\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: Samples include persons below age 65 in Australia and the United Kingdom, aged 50 to 65 in other European countries and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the same controls as in Figure 3.6. The United States includes care provided to parents only.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

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depends on multiple factors, in particular the socio-economic situation of the carer as well as on the possibilities to reduce working time. A simplified estimation procedure is presented here where a full-time worker chooses between non-employment and part-time work. The coefficients represent the probability for a carer to move into non-employment or part-time work, as opposed to the option of staying in full-time employment.

Carers are much more likely to stop working than to reduce work hours (Figure 3.8). In Australia and the United Kingdom, informal caring is associated with a higher probability of both stopping working and switching to part-time work. The relative risk ratios on the probability of non-employment are however much higher than for part-time work. In the United States, being a carer leads to a transition to non-employment but has no significant impact on moving into part-time work. This result is also found for women in other European countries while males tend to work part-time.

### **3.4. For those of working age, caring is associated with a higher risk of poverty**

Another possible economic cost associated with unpaid care is lower wages. For instance, informal carers might experience a wage penalty as a result of career interruptions, which lead to a deterioration of human capital or skills depreciation, or the loss of opportunities for career advancement. The wage penalty might also be the result of signalling low career commitment towards employment. However, lower wages for carers might not necessarily reflect a wage penalty as they could also be the result of self-selection into lower-paid jobs or occupations which provide a better balance between work and family obligations. As in the case of employment, it is therefore important to control for different characteristics and preferences of carers to assess the impact on wages (see Annex 3.A4).

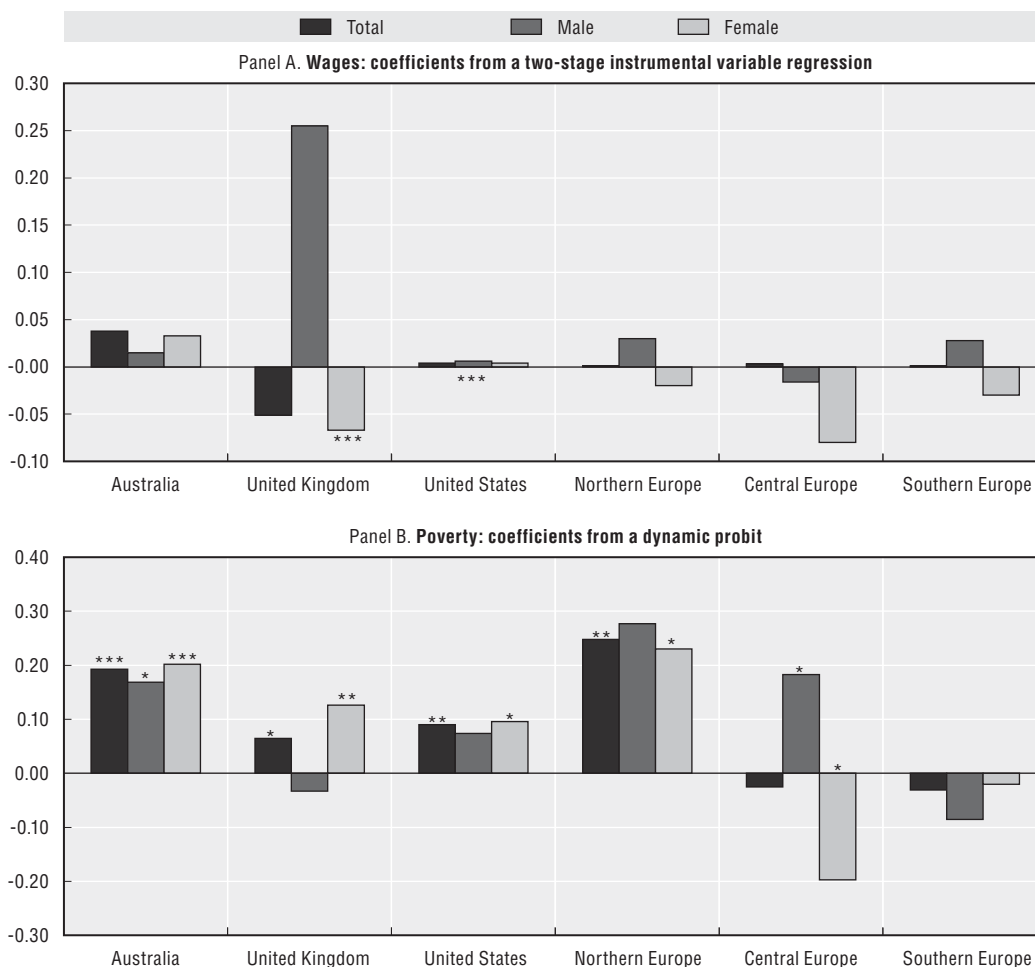
After controlling for individual characteristics and the decision to participate in the labour market, there is little evidence that caregiving leads to lower wages (Figure 3.9, Panel A). Wages of carers are 5 to 7% lower than non-carers in the United Kingdom only and the difference is not significant for men. If job characteristics are taken into account, the difference in wages between carers and non-carers is even more limited (amounting to 3-4%)

That said, working-age carers are at a higher risk of poverty (Figure 3.9, Panel B). For this group, caregiving is associated with a higher probability of experiencing poverty across all countries, except in southern Europe. Women carer appear to be especially vulnerable to poverty risks. Since poverty is measured at the household level and includes income from different sources (equivalised by household size and composition), several reasons could explain such findings. Higher poverty may be linked to lower employment rates and lower working hours for carers, which lead to reduced total annual income. Another possible explanation is that the household composition of carers is different, with fewer household members having earnings from work. The results could also partly reflect the higher risk of dependency and health problems associated with lower socio-economic status.

### **3.5. Intensive caring has a negative impact on mental health**

While unpaid carers provide a valuable service to society and looking after family members or friends brings great rewards, there is growing concern about increased psychological distress, strain and overall health deterioration endured by family carers. Isolation and lack of support might prove a high burden and result in distress or mental health problems. Using the same data sources as in previous sections, this section

Figure 3.9. Unpaid caring leads to lower income but not necessarily lower wages



\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: Samples include persons below age 65 in Australia and the United Kingdom, aged 50 to 65 in other European countries and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions in Panel A include the following controls: Duration in employment since full-time education and its square (or age as a proxy if unavailable), number of children, education and regions (in Australia and the United Kingdom). The United States includes care provided to parents only. All regressions in Panel B include the following controls: Age, number of children, marital status, education, health status and regions (in Australia and the United Kingdom). The United States includes care provided to parents only.

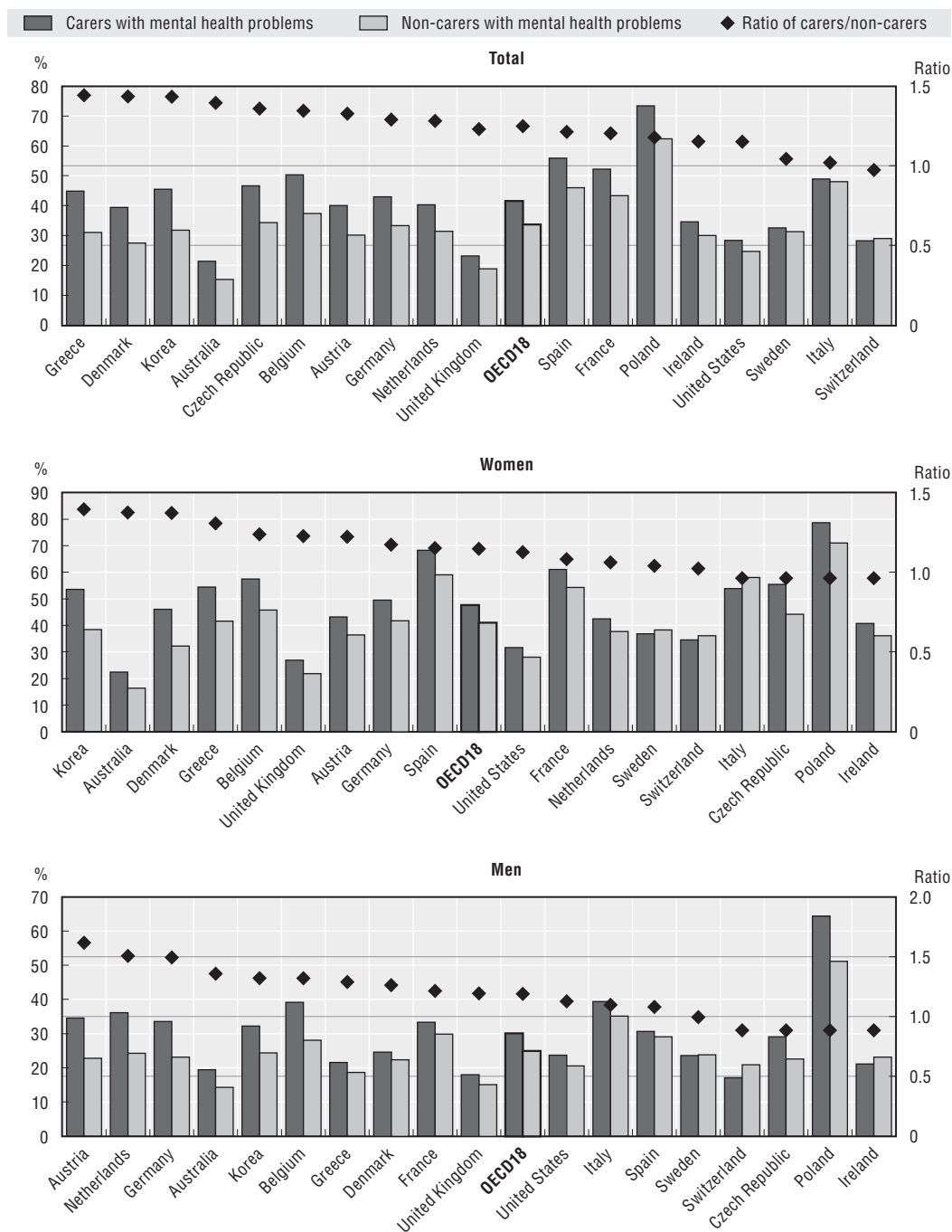
Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

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considers the mental health of carers and non-carers. Prevalence of mental health problems is calculated using indicators of psychological distress based on a series of checklists. Since each dataset uses a different indicator (see Annex 3.A1), emphasis should be on the comparability within datasets between carers and non-carers rather than on the comparability of prevalence across data sources.

Carers exhibit a higher prevalence of mental health problems across OECD countries for which data are available. Overall, the prevalence of mental health problems among carers is 20% higher than among non-carers. There is no clear geographic pattern in prevalence with the difference in prevalence being highest in Greece and lowest in Switzerland (Figure 3.10). Women tend to have more mental health problems than men but

Figure 3.10. **More mental health problems among carers**  
Percentage of mental health problems among carers and non-carers and ratios



Note: Ratios correspond to the relative prevalence of mental health problems among carers and non-carers. Samples include persons aged 50 years and above (with the exception of Korea where 45 and older are considered). The United States includes care provide to parents only. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; 2005 for Korea and 1996-2006 for the United States.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, KLoSA for Korea and HRS for the United States.

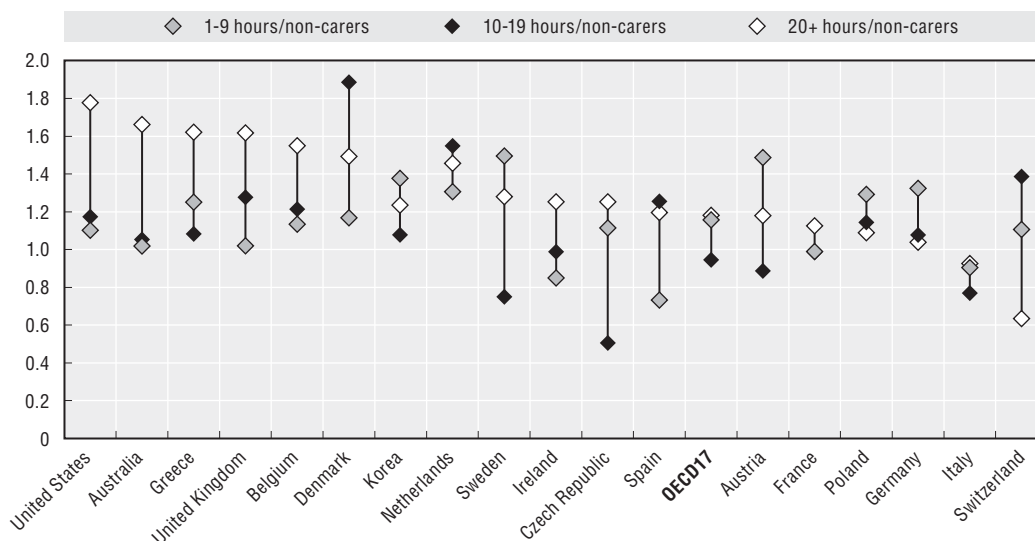
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the ratio in prevalence between carers and non-carers is higher for males. The gap also differs by countries among males and females.

Mental health problems might be influenced by the intensity of caring. Figure 3.11 shows that in most countries there is a clear difference in mental health prevalence for very intensive care (more than 20 hours/week). On average, high intensive caring is associated with prevalence 20% higher than for non-carers, reaching even 70% or 80% higher in Australia, the United States and Korea. At the same time, caring with lower intensity (either less than 10 hours/week or between 10 and 20 hours/week) does not always lead to a higher prevalence of mental health problems than among non-carers.

Figure 3.11. **Mental health problems depend on the intensity of caring**

Relative prevalence (1 corresponds to non-carers)



Note: Numbers presented correspond to the relative prevalence of mental health problems among carers by intensity of caring with respect to non-carers. Samples include persons aged 50 years and above (with the exception of Korea where 45 and older are considered). The United States includes care provided to parents only. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; 2005 for Korea and 1996-2006 for the United States.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, KLoSA for Korea and HRS for the United States.

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Other differences between carers and non-carers might influence their mental health. For instance, carers might be older or have other socio-demographic characteristics which make them more prone to worse mental health. Current mental health problems also depend to a high extent on previous mental health status. There are however relatively few studies which explore this topic, and those that do rarely rely on nationally representative or longitudinal data sources. The few studies available point to a small or non-existent relationship between caregiving and depression (Amirkhanyan and Wolf, 2006; Cameron et al., 2008; Coe and Van Houtven, 2009; Leigh, 2010). Using the same data sources as were used for the econometric analysis of labour force participation, it is also possible to analyse the impact of caring on mental health. A regression analysis which controls for other observed and unobserved characteristics, as well as for mental health status in the previous year, helps to disentangle the effect of unpaid care from other characteristics. The estimation method is the same as for the probability of employment.

**Box 3.2. Intensive carers are older and experience greater social disadvantage than non-intensive carers**

“Intensive carers” (defined as those who provide more than 20 hours of care per week) are more likely to stop working and to have worse mental health outcomes as a result of the caregiving responsibilities. For the government to target support policies at this vulnerable group, it is important to understand who these carers are and how they differ from the rest of the population of carers. Descriptive analysis shows that intensive carers are generally older, less educated and poorer than non-intensive carers.

Most of the intensive carers are found in the 50-64 years old age group, but tend to be much older, compared to non-intensive carers (except in the United States). Across the sample of countries, there are on average twice as many intensive carers aged 75 years and above than non-intensive carers (Figure 3.A2.4).

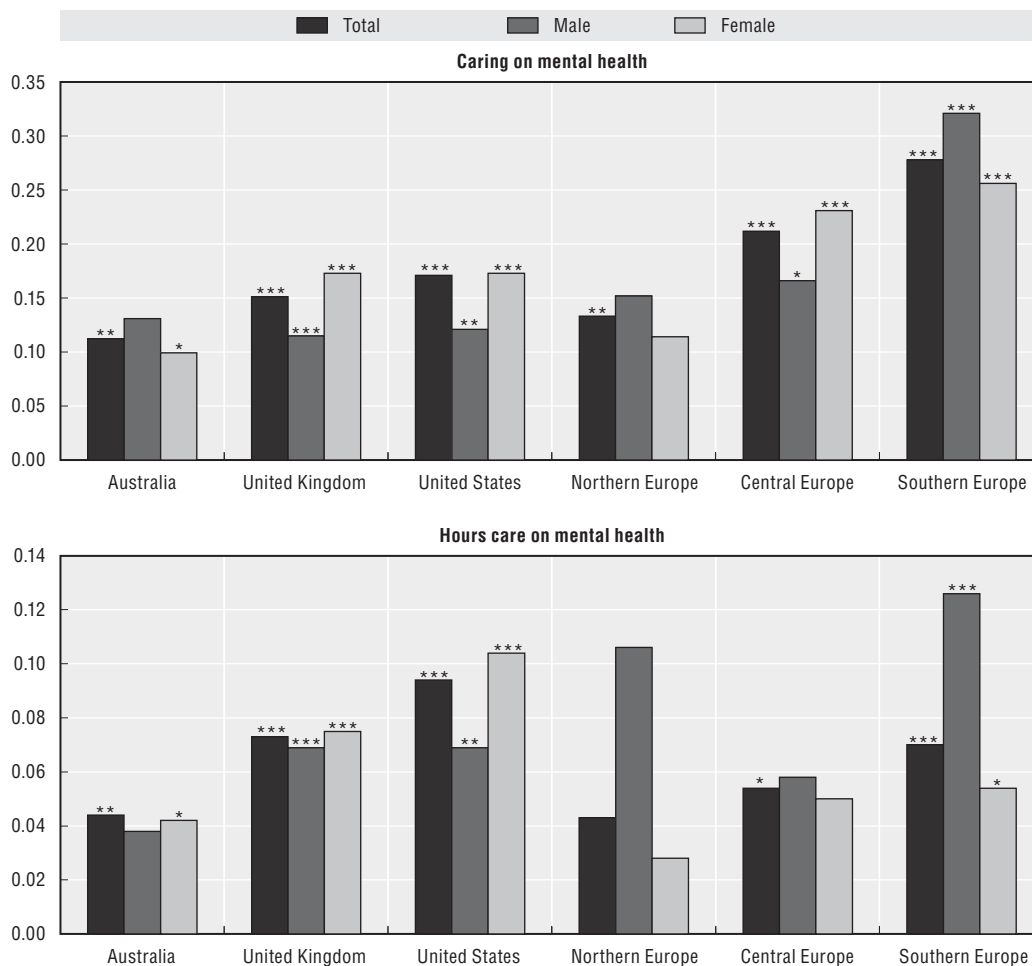
Intensive care is predominately directed to the spouse of the carer. In the case of the United Kingdom, more than 70% of intensive carers provide help to the spouse, with only 17% to parents. In central Europe, 42.3% of intensive care is targeted to the spouse, against only 3.4% of non-intensive care. Note that in southern Europe, intensive care provided to the spouse is not as high as in the rest of the OECD countries (33% in southern Europe, against 50% on average in the rest of the European sample). There, much of intensive care is directed to parents and other relatives (respectively 14 and 25.5%).

Intensive carers seem to also experience greater social disadvantage compared to non-intensive carers. They tend to have lower income compared to non-intensive carers: 60% of them belong to the first and second income quintile compared to 40% for non-intensive carers. They are also more often below the poverty line: the poverty rate of intensive carers is twice as high as for non-intensive carers. This pattern is particularly clear in Anglo-Saxon countries and in southern Europe, where close to 40% of intensive carers fall below the poverty line. In contrast, in northern Europe less than 10% are classified as poor and poverty rates are comparable for both groups. This situation could be partly explained by lower educational attainment among intensive carers in many of the countries considered. The difference of education level between intensive carers and non-intensive carers is large: The proportion of low-educated intensive carers is almost 30% higher compared to non-intensive carers.

Results from regression analysis confirm that being an informal carer leads to a higher probability of mental health problems. Caring has a large effect and has a higher impact on mental troubles than other socio-demographic variables, with the exception of other indicators of health status, such as the presence of a longstanding illness. A higher probability is observed in all countries for both males and females except for men in Australia<sup>4</sup> (Figure 3.12). The impact of caring is more detrimental for women, with the exception of those living in southern European countries. An important result is that being the recipient of a carers’ allowance does not significantly alter the negative impact on mental health in Australia and the United Kingdom (where information on allowances exists).

The detrimental impact of caring on mental health is stronger in the case of intensive and co-residential care. In Australia and in most European countries, significantly worse mental health is only found when care activity is at least 20 hours per week (Figure 3.A2.3 in Annex 3.A2). Intensive carers appear to accumulate disadvantages since they tend to be older, less educated and poorer than non-intensive carers (see Box 3.2). In the United Kingdom, poor mental health is already happening at a medium level of caring intensity (10-19 hours/week)

Figure 3.12. **Caregiving leads to higher chances of mental health problems**  
Coefficients from a dynamic probit



\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: A positive coefficient indicates a higher probability of mental health problems. Samples include persons aged 50 years and above European countries other than the United Kingdom and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the same controls as in Figure 3.6. Lagged mental health is also included. The United States includes care provided to parents only.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

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but the impact is smaller. The United States shows a clear gradient on worsening mental health by care intensity for women. Similarly, co-residential care increases the probability of occurrence of mental health problems across all countries.

### 3.6. Conclusions

Caring can have a major impact on work effort and health, especially for individuals providing a high intensity of care. Since caring does not seem to affect work decisions at low care intensity (below ten hours/week) and for extra-residential caring, intensive caregiving and co-residential carers should be the primary targets of policy interventions. Extra-residential care and less intensive caregiving show some modest effects in terms of mental health

outcomes, too. Caregiving is also associated with a higher probability of experiencing poverty across all countries except in southern Europe, and especially for women.

The analysis has shown that many individuals provide low levels of care, although some might underreport hours. This suggests that there may be some scope for an increase in the availability of informal care, as low intensity caregivers could increase their hours of care with only a limited impact on work effort and mental health status. However, with population ageing, it is likely that a greater share of carers will be involved in high intensity care. Without adequate support, informal caregiving might exacerbate employment and health inequalities for these groups of carers. It may also reduce the chances of working-age carers to re-enter the labour market during or at the end of the caring spell.

Policies for carers should be designed bearing in mind these negative outcomes of caregiving. For those combining work and care, the analysis suggests that flexible working arrangements could mitigate reductions in working hours for carers, and should be promoted. For those who opt for temporarily leaving the workforce for caring purposes, training and employment support programmes might facilitate their transition back into the workforce. Payments to caregivers and care recipients (such as cash allowances) should also take into account the possible economic incentives for certain groups to leave the labour market. As to the impact of caring on mental health, this could be alleviated by policies or programmes, ranging from respite care to physiological support and practical help for carers (see Chapter 4 for a discussion of policies to support family carers). Existing studies suggest that combinations of such interventions, and targeting support to specific categories of carers, might work best in supporting carers (Glendenning *et al.*, 2009). Chapter 4 will take a closer look at policies put in place by countries to support carers of frail elderly and, where it exists, evidence of their effectiveness in reconciling caring with work and in reducing the burden on carers.

Finally, while promoting options to combine care and work and provide support to carers are crucial, the availability of formal care is also important. Differences in access to formal care services are likely to influence the possibility of carers to choose the amount and intensity of caregiving provided. As examined in the next chapters, most OECD countries have formal LTC coverage arrangements complementing informal care, although approaches vary across countries.

## Notes

1. Most of the statistical analyses that have examined the role of family caring use the terminology of “informal caregiving”. This is also used in the rest of the chapter. However, in policy discussion, carers are often referred to as “family and friends”, rather than “informal” carers.
2. Chapter 1 (“Cooking and Caring, Building and Repairing: Unpaid Work around the World”) in OECD (2011), *Society At a Glance*, use time-use surveys to analyse unpaid work devoted by families, including activities such as cooking, cleaning and caring. Figures from time use surveys report an average of up to 6 minutes per day on adult care (OECD, 2011), however these data do not distinguish personal care from domestic care. Most time-use surveys also do not have separate categories for caring for parents, spouse and other family members and other tasks. Women devote on average more time to adult caring than men irrespective of the classification used.
3. Measurement errors of caregiving, which are not controlled for in the analysis, may bias the estimations. First, the variable fails to measure the quality of care. Second, reporting of caring commitment or hours of care may be influenced by employment status *i.e.* to justify not working or fewer hours. Finally, informal caring might be correlated with unobserved factors which influence ability to work. All of these factors may lead to an overstatement of the impact of caring

on employment. At the same time, other studies controlling for endogeneity of care have found that treating care as exogenous leads to an understatement of the effects (Watts, 2008).

4. The coefficients for the impact of informal caring on the probability of mental health problems are significant for the overall sample in northern European countries but not for the regressions disaggregated by gender. The absence of significant results by gender might be related to the small sample size.

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## ANNEX 3.A1

### *Data Sources*

The following longitudinal household surveys are used for the analysis in the first section of the chapter. All longitudinal datasets cover a wide range of subjects including personality traits, occupational and family biographies, employment, participation and professional, mobility, earnings and health.

#### **British Household Panel Survey (BHPS) – United Kingdom**

The British Household Panel Survey\* (BHPS) is a nationally representative household-based yearly survey which began in 1991, interviewing every adult member of sampled households. The wave 1 of the Panel consists of some 5 500 households and 10 300 individuals. Additional samples of 1 500 households in both Scotland and Wales were added to the main sample in 1999, and in 2001 a sample of 2 000 households was added in Northern Ireland. These same individuals are re-interviewed each successive year and, if they split-off from original households to form new households, they are followed and all adult members of these households are also interviewed.

#### **Korean Longitudinal Study of Ageing (KLoSA) – Korea**

The Korean Longitudinal Study of Ageing was led by the Korean Labor Institute. The first wave available dates back to 2005 but another wave has been performed since then. The 2005 version (published in 2006) is representative of the 45+ population (excluding those in institutions and residents of Jeju Island) and contains information on more than 10 000 individuals. The questionnaire covers a wide range of topics related to ageing, including take up of formal and informal care, along with other personal and socio-demographic characteristics. KLoSA is also the only large study available in Korea on financial situation of elderly. A follow-up is to be set every other year, organised on the model of the *Household Retirement Survey* in the United States.

#### **Health and Retirement Study (HRS) – United States**

The University of Michigan Health and Retirement Study (HRS) surveys more than 22 000 Americans over the age of 50 every two years since its launch in 1992. Supported by the National Institute on Aging and the Social Security Administration, the study collects information on physical and mental health, insurance coverage, financial status, family

\* The British Household Panel Survey (BHPS) was obtained through the UK data archive ([www.data-archive.ac.uk](http://www.data-archive.ac.uk)).

support systems, labor market status, and retirement planning. The target population for the HRS cohort includes all adults in the contiguous United States born during the years 1931-41 who reside in households. New cohorts are added every six years; therefore, in 1998 the target population was defined as those born in 1947 or before. In 2004, a supplementary sample was added to make the total sample representative of those born in 1953 or before.

### **Household, Income, Labour Dynamics in Australia (HILDA) – Australia**

Household, Income, Labour Dynamics in Australia (HILDA) is an ongoing household-based Panel survey funded by the Department of Families, Community Services and Indigenous Affairs. The survey started in 2001 and contains at the moment seven waves. The wave 1 of the Panel consisted of 7 682 households and 19 914 individuals.

### **Survey of Health, Ageing and Retirement in Europe (SHARE) – Europe**

The *Survey of Health, Ageing and Retirement in Europe* (SHARE) is a multidisciplinary and cross-national Panel database of micro data on health, socio-economic status and social and family networks of more than 45 000 individuals aged 50 or over. Eleven countries contributed data to the 2004 SHARE baseline study ranging from Scandinavia (Denmark and Sweden) through central Europe (Austria, France, Germany, Switzerland, Belgium, and the Netherlands) to the Mediterranean (Spain, Italy and Greece). Information is collected on a bi-annual basis. The sample represents the non-institutionalised population aged 50 and older and the selection is based on probability samples in all participating countries.

### **Mental health variables**

#### **CES-D Scale**

The CES-D is a symptom scale measuring depression. It is a composite index of 20 items covering the following domains: Depressed mood, fatigue, pessimism, sleep, enjoyment, interest. The index is constructed by summing binary items. A binary indicator is constructed which takes the value of one if the CES-D scale is three or above and zero otherwise, which has been demonstrated to indicate a clinically significant level of depression.

#### **EURO-D Depression Scale**

The EURO-D is a symptom scale measuring depression. It is a composite index of 12 items covering the following domains: Depressed mood, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment and tearfulness. The index is constructed by summing binary items. A binary indicator is constructed which takes the value of one if the EURO-D scale is three or above and zero otherwise, which has been demonstrated to indicate a clinically significant level of depression.

#### **General Health Questionnaire (GHQ)**

The GHQ is a multidimensional, self-reported screening instrument to detect current, diagnosable psychiatric disorder. It focuses on the inability to carry out normal activities and measures the appearance of psychological distress through four elements: Depression, anxiety, social impairment, and hypochondriasis. It has 60-, 30-, 28-, 20- and 12-item versions. All items of the shorter versions are included in the longer versions. Items ask whether a particular symptom or behaviour has been recently experienced. Responses are

indicated using one of the two 4-point scales depending on the nature of the question: Either “Better than usual; Same as usual; Worse than usual; Much worse than usual”, or “Not at all; Not more than usual; Rather more than usual; Much more than usual”.

***The Short-Form Health Survey (SF-36, Sf-20, SF-12)***

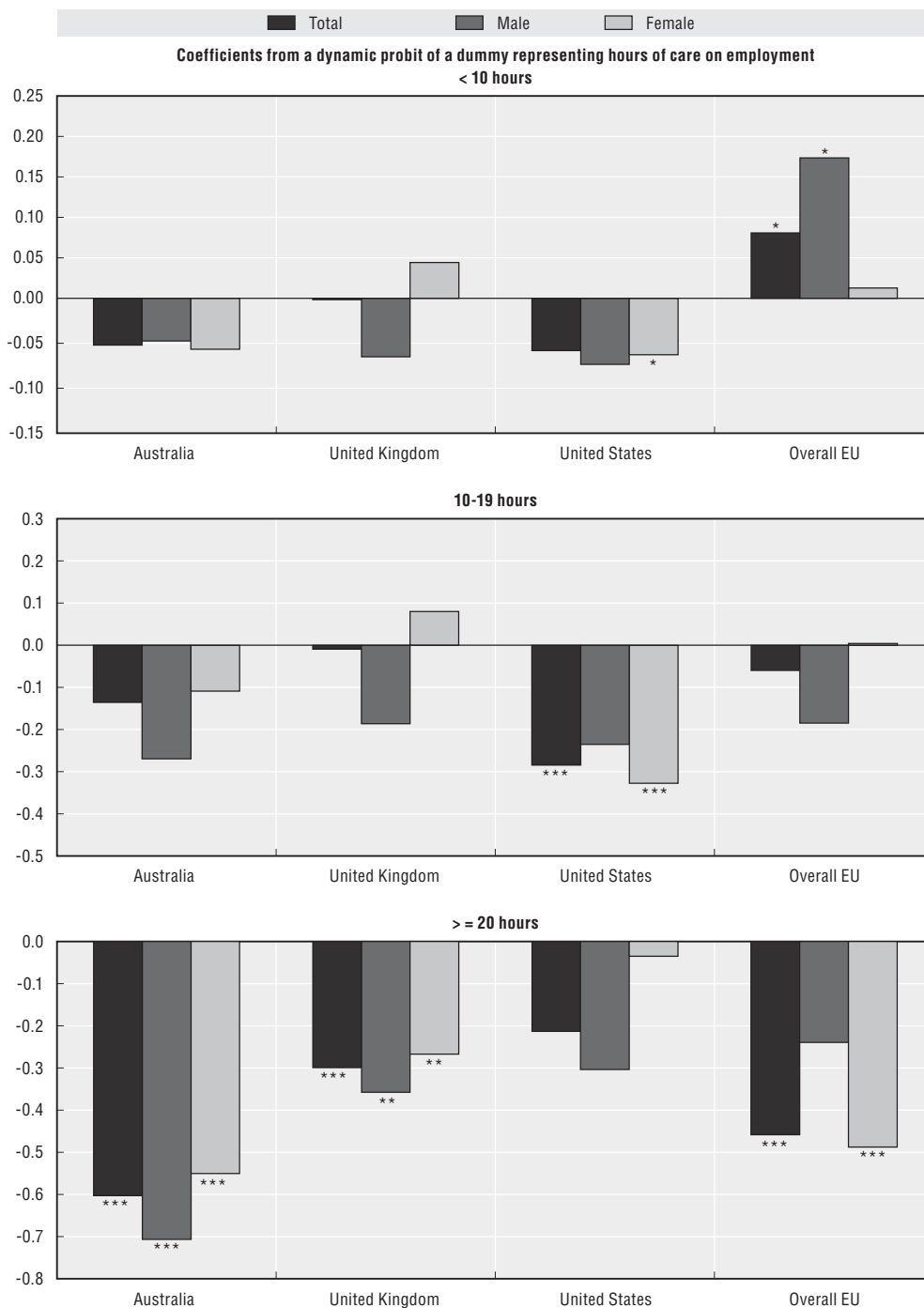
The Short-Form Health Survey index is a multi-purpose health survey that can be self-administered or used in interviews and covers both physical and mental health. The most frequently used version consists of 36 questions and is the SF-36. SF-36 covers eight main health domains as well as the summary measures of physical and mental health. The eight domains are divided into four physical health scales (physical functioning, role-physical, bodily pain, and general health) and four mental health scales (vitality, social functioning, role-emotional, and mental health). The range of scores possible on each of the eight scales is from 0 to 100, with 100 representing optimal functioning as measured by the SF-36. Norm-based scoring algorithms were introduced for all eight scales in 1998, making it possible to compare meaningfully scores for the eight-scale profile and the physical and mental summary measures in the same graph. SF-12 is a part of the SF-36 that reproduces the physical and mental health summary measures with fewer items.



## ANNEX 3.A2

### *Additional Figures*

**Figure 3.A2.1. Higher care intensity and co-residential care have a stronger negative impact on employment**



\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: Samples include persons below age 65 in Australia and the United Kingdom, aged 50 to 65 in other European countries and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the same controls as in Figure 3.6. The United States includes care provided to parents only. Lagged employment and initial employment status are included in all except for European countries (except the United Kingdom).

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.


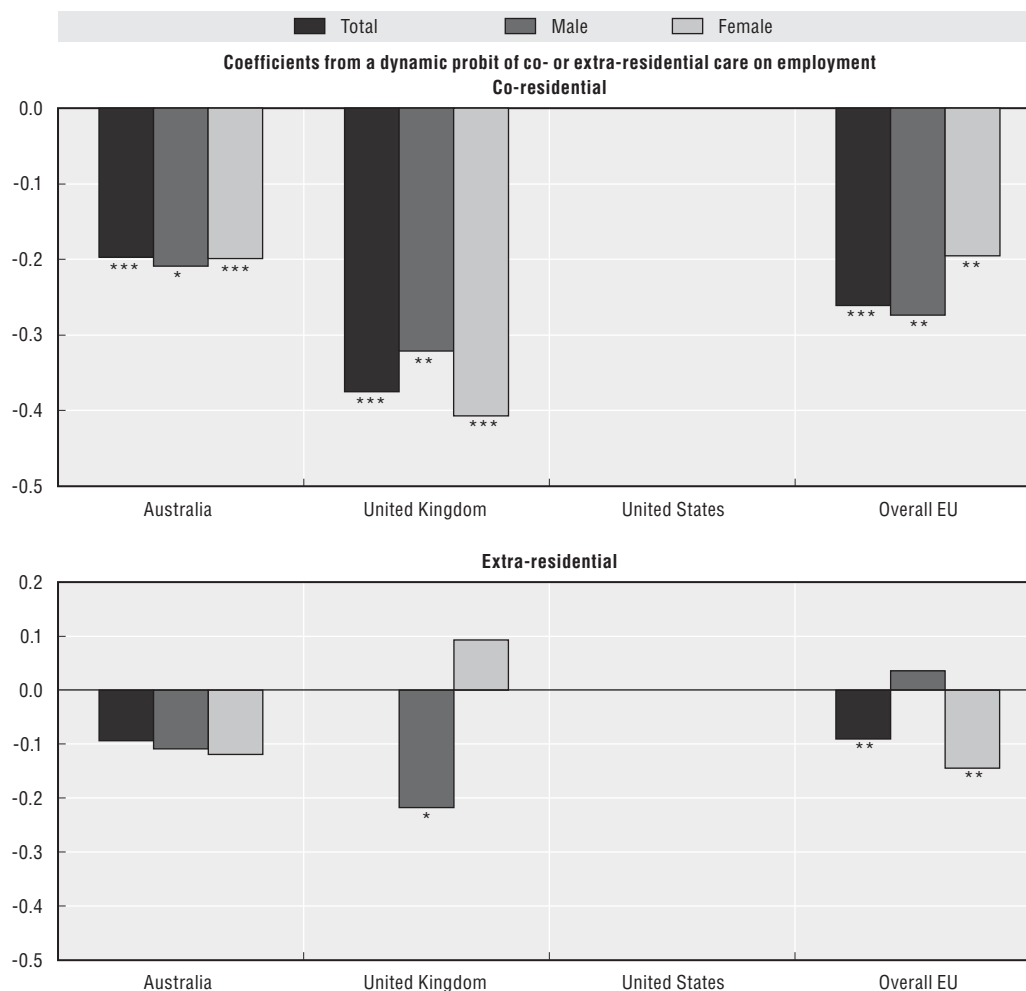
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Figure 3.A2.1. **Higher care intensity and co-residential care have a stronger negative impact on employment (cont.)**



\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: Samples include persons below age 65 in Australia and the United Kingdom, aged 50 to 65 in other European countries and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the same controls as in Figure 3.6. The United States includes care provided to parents only. Lagged employment and initial employment status are included in all except for European countries (except the United Kingdom).

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.


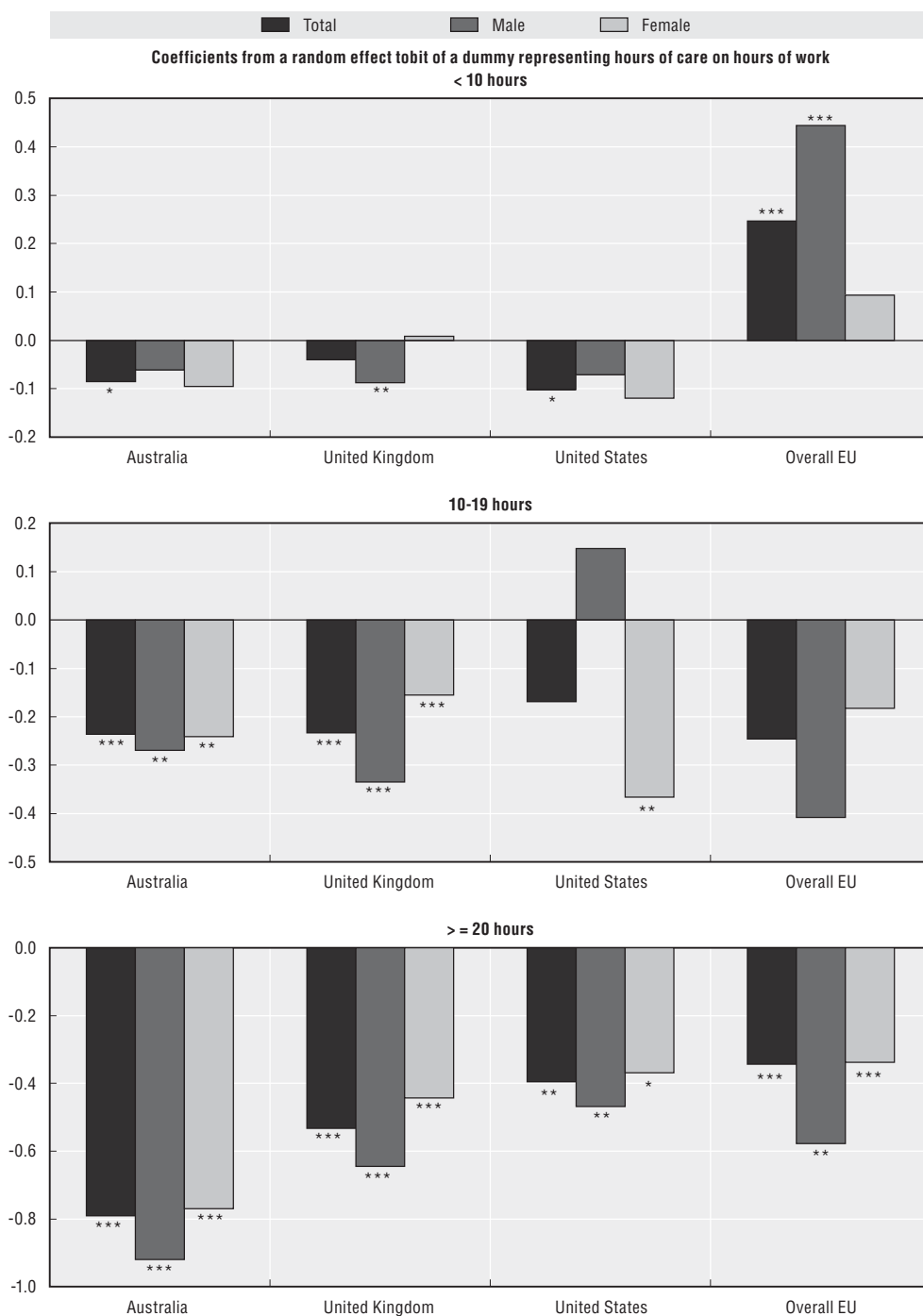
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Figure 3.A2.2. **Higher care intensity and co-residential care have a stronger negative impact on hours of work**



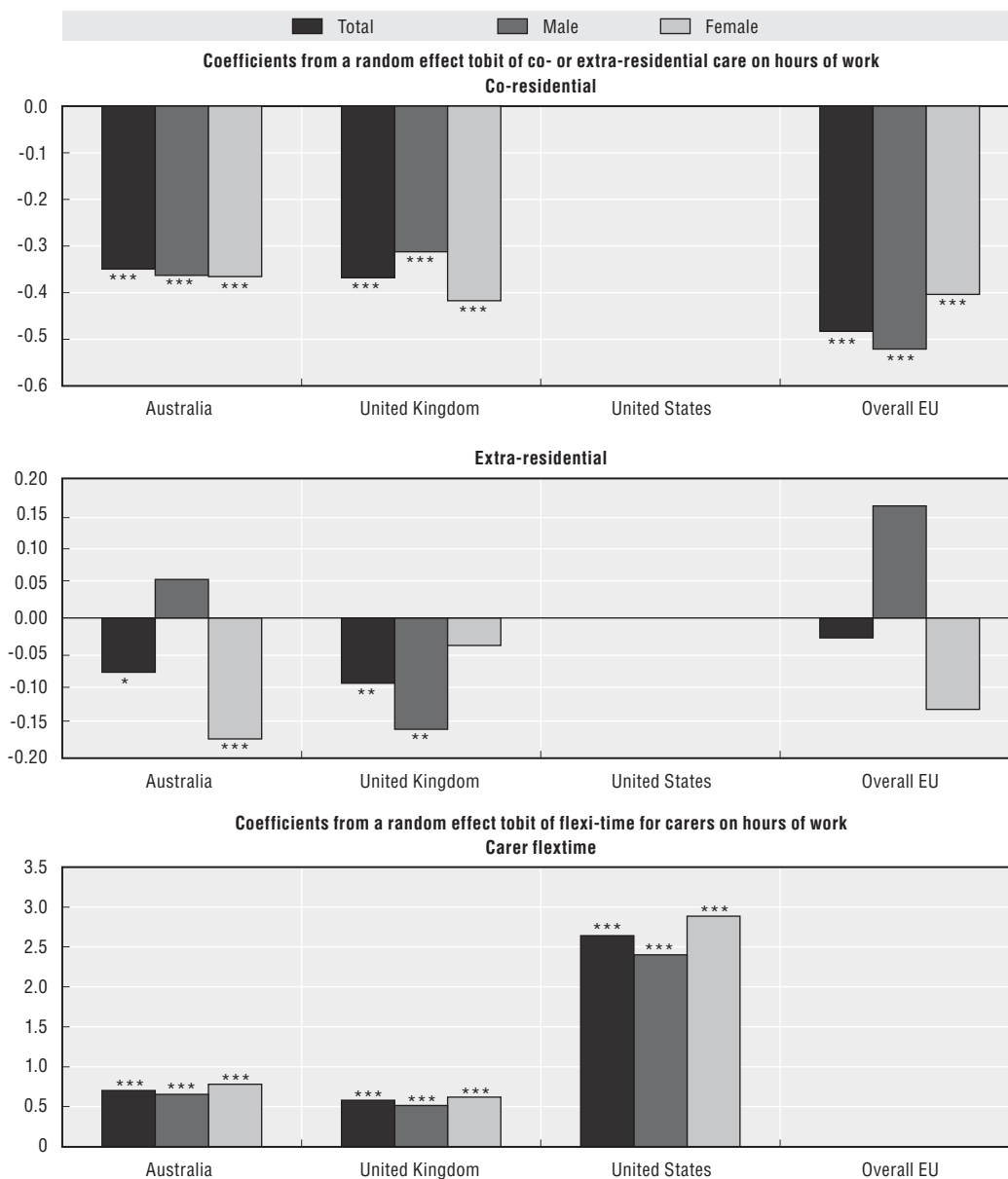
\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: Samples include persons below age 65 in Australia and the United Kingdom, aged 50 to 65 in other European countries and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the same controls as in Figure 3.6. The United States includes care provided to parents only.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

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Figure 3.A2.2. **Higher care intensity and co-residential care have a stronger negative impact on hours of work (cont.)**



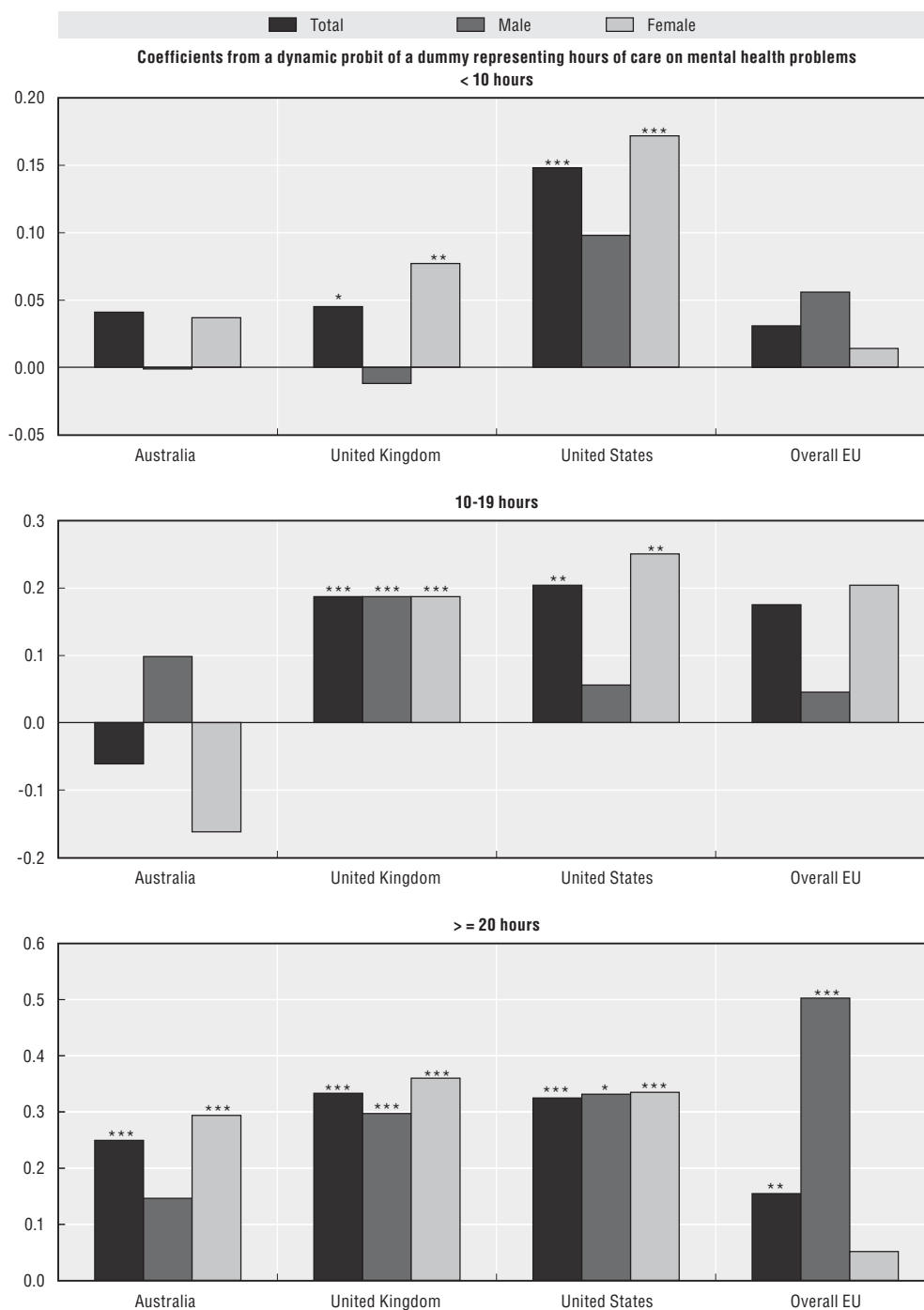
\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: Samples include persons below age 65 in Australia and the United Kingdom, aged 50 to 65 in other European countries and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the same controls as in Figure 3.6. The United States includes care provided to parents only.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

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**Figure 3.A2.3. Higher care intensity and co-residential care have a stronger negative impact on mental health problems**



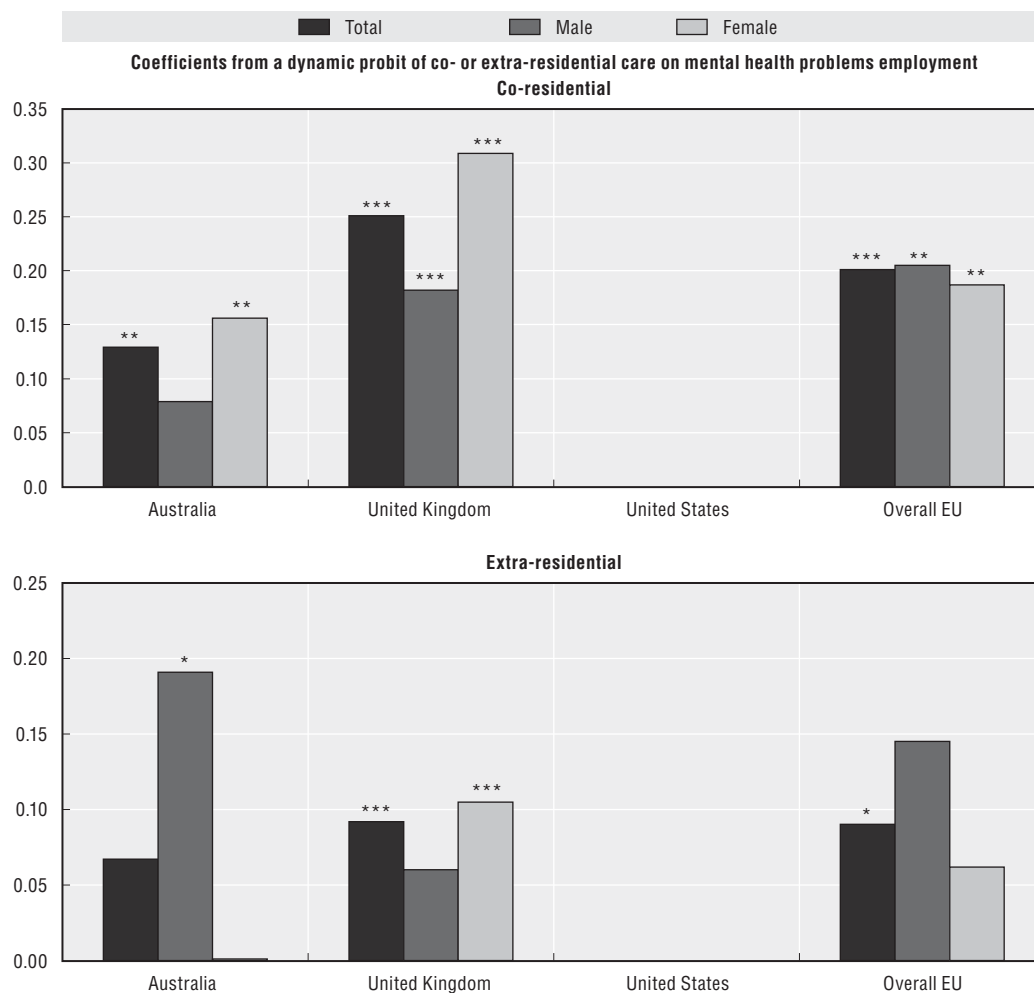
\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: A positive coefficient indicates a higher probability of mental health problems. Samples include persons aged 50 and above European countries other than the United Kingdom and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the same controls as in Figure 3.6. Lagged mental health is also included. The United States includes care provided to parents only.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

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Figure 3.A2.3. **Higher care intensity and co-residential care have a stronger negative impact on mental health problems (cont.)**



\*, \*\*, \*\*\*: Statistically significant at the 10%, 5% and 1% level, respectively.

Note: A positive coefficient indicates a higher probability of mental health problems. Samples include persons aged 50 and above European countries other than the United Kingdom and the United States. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; and 1996-2006 for the United States. The sample includes individuals present in at least three consecutive waves in Australia, the United Kingdom and the United States. All regressions include the same controls as in Figure 3.6. Lagged mental health is also included. The United States includes care provided to parents only.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.


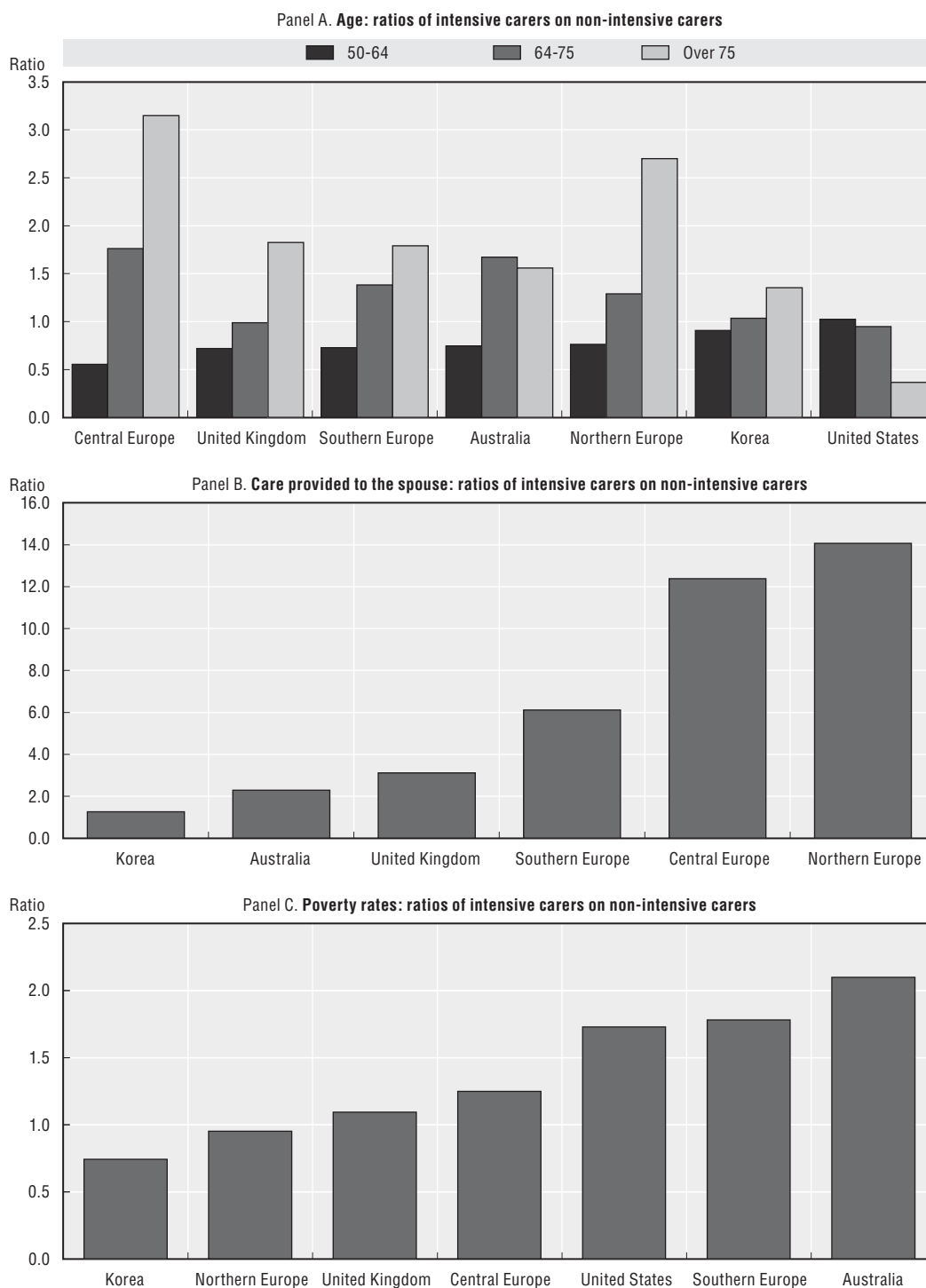
StatLink  <http://dx.doi.org/10.1787/888932401349>

Figure 3.A2.4. **Intensive carers more likely to be older and more disadvantaged**

Note: Samples include persons aged 50 and above (with the exception of Korea where 45 and older are considered). The United States includes care provided to parents only. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; 2005 for Korea and 1996-2006 for the United States.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.


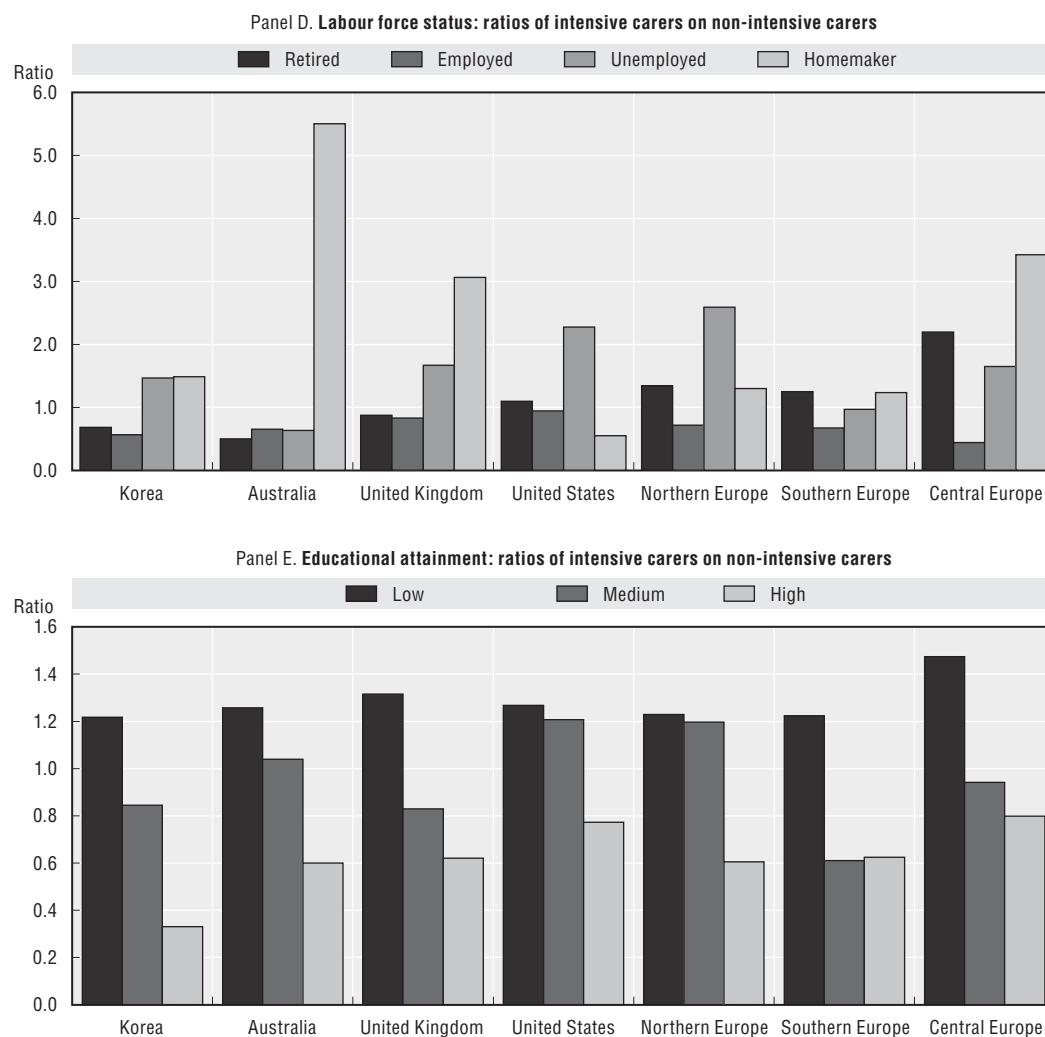

StatLink  <http://dx.doi.org/10.1787/888932401368>

Figure 3.A2.4. **Intensive carers more likely to be older and more disadvantaged** (cont.)

Note: Samples include persons aged 50 and above (with the exception of Korea where 45 and older are considered). The United States includes care provided to parents only. The following years are considered for each country: 2005-07 for Australia; 1991-2007 for the United Kingdom; 2004-06 for other European countries; 2005 for Korea and 1996-2006 for the United States.

Source: OECD estimates based on HILDA for Australia, BHPS for the United Kingdom, Survey of Health, Ageing and Retirement in Europe (SHARE) for other European countries, and HRS for the United States.

StatLink  <http://dx.doi.org/10.1787/888932401368>

## ANNEX 3.A3

## *Estimating the Impact of Caring on Work Characteristics of Carers*

### Probability of being in employment

A lagged dependent variable model is used for the analysis of employment: a dynamic probit model. This model estimates the probability of being in employment as a function of previous employment status ( $d$ ), Caring ( $C$ ) and demographic characteristics as well as work characteristics ( $X$ ), controlling for initial conditions ( $\delta$ ) for individual  $i$  at time  $t$ :

$$\Pr(d_{it} = 1 | d_{it-1}, X_{it}, \delta_i) = \Phi(d_{it-1}'\phi + X_{it}'\beta + C_{it}'\gamma + \delta_i)$$

Initial conditions are specified as suggested by Wooldridge (2002) by including means of the time-varying regressors and the initial value of the dependent variable. Because the random effects probit estimates are biased in the presence of feedback effects, the pooled estimator is used as it provides consistent but inefficient estimates.

### Hours of work

Hours of work is a continuous variable but the range is constrained because it is zero for a substantial part of the population (the non-workers) but positive for the rest, that is:

$$\begin{aligned} y_{it} &= z'_{it}\theta + \alpha_i + \varepsilon_{it} \\ \text{while } y_{it} &= y^*_{it} \text{ if } y^*_{it} \geq 0 \\ y_{it} &= 0 \text{ if } y^*_{it} \leq 0 \end{aligned}$$

where  $y$  represents hours of work,  $z$  are a set of individual characteristics,  $\varepsilon$  is an idiosyncratic error term and  $\alpha$  are individual effects.

A random effects tobit model is used where the likelihood function of hours of work is:

$$f(y_{it} | x_{it}, \alpha_i, \theta) = 1 - \Phi\left(\frac{z'_{it}\theta + \alpha_i}{\sigma_\varepsilon}\right)$$

### Multinomial logit

To model the individual choice between not working, working part-time and working full-time, a multinomial model is used. For the purpose of this analysis, the multinomial

logit looks at the impact of caring and other individual characteristics on the probability of being in part-time work or non-employment, where probabilities of each alternative are:

$$P\{l_i = j\} = \frac{\exp\{\omega_{ij}'\nu\}}{1 + \exp\{\omega_{i2}'\nu\} + \dots + \exp\{\omega_{iM}'\nu\}} \quad j = 1, 2, \dots, M$$

For individual  $i$  and alternative  $j$  where  $M = 3$ .  $M$  refers to the three possible labour force status mentioned above.

Sensitivity analysis was performed for all estimations as follows: 1) using continuous hours of care per week (in log) instead of a dummy variable to model caring status; 2) using three categories for the hours of care per week to capture the care intensity (less than 10 hours per week, 10 to 20 hours and above 20 hours of care). In addition, the analysis was also performed separately for outside/inside household care.

## ANNEX 3.A4

*How to Measure the Impact of Caring on Wages*

This annex assesses the wage penalty of informal caring using hourly wages in several longitudinal datasets. Since wages can only be observed for people in work, observed wages may suffer from a sample selection problem if the unobserved determinants of wages also affect individuals' labour force participation decisions.

In cross-sectional analysis, Heckman's two-step estimation is used. Within a longitudinal analysis, Wooldridge's correction procedure is used. This consists of calculating the inverse Mills ratio from a probit model for the selection equation. The inverse Mills ratio is then included in a pooled two-stage least squares estimator where the first stage includes a participation equation.

$$w_{it} = x'_{it} \beta + \gamma_i + \hat{\lambda}_{it} + \mu_{it}$$

$$p^*_{it} = z'_{it} \nu + \alpha_i + \varepsilon_{it}$$

$$p_{it} = 1[p^*_{it} \geq 0]$$

where in the wage equation  $w$  is the log hourly wage for individual  $i$  at time  $t$ , as a function of several socio-demographic variables, including the decision and the inverse mills ratio. In the participation equation,  $p$  is a dummy variable which takes 1 if the individual participates in the labour market and 0 if s/he does not. The decision to participate depends on a number of explanatory variables  $z$ , and individual time-invariant effects as well as a time-varying error. The explanatory variables in the participation equation include additional variables which affect selection but not wages.

Wage equations suffer from possible heterogeneity and endogeneity problems. Sensitivity analysis was performed for the United Kingdom and the United States (where sufficient time lags are present) to correct for such problems. Semykina and Wooldridge (2005) suggest using averages of the strictly exogenous variables as instruments.