WOMEN'S LABOR MARKET PARTICIPATION AFTER AN ADVERSE HEALTH EVENT

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ABSTRACT

An adverse health event can affect women's work capacity as they need time to recover. The institutional framework in the Netherlands provides employment protection during the first two years after the diagnosis. In this study, we have assessed the extent to which women's employment is affected in the short- and long term by an adverse health event. We have used administrative Dutch data which follow women aged 25 to 55 years for four years after a medical diagnosis. We found that diagnosed women start leaving employment during the protection period and four years later they were about one percentage point less likely to be employed. Women in permanent employment did not reduce their employment during the protection period and reduced their employment with less than 0.5 percentage points thereafter. Furthermore, we found minor adjustments in the working hours in the short term and no adjustments in the long term. Lastly, we found that for wages, and not for employment and hours, adjustments could be related to the severity of the health condition: women diagnosed with temporary health conditions experienced a short-term wage penalty of about 0.5−1.7 percent and those diagnosed with chronic and incapacitating conditions experienced a long-term wage

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penalty of about 0.5 percent, while women diagnosed with some chronic and nonincapacitating conditions, such as respiratory conditions, experienced no wage changes in the short or long term.

Keywords: Adverse health event; employment; wage; working hours; institutional setting; compositional structure; the Netherlands

JEL classifications: I12; I18; J21; J22; J31

1. INTRODUCTION

Adverse health events may cause individuals to stop working, reduce their hours of work, or decrease their wages. Previous studies such as Halla and Zweimüller (2013) and García-Gómez, Van Kippersluis, O'Donnell, and Van Doorslaer (2013) show that unhealthy women are less likely to be employed than healthy women and this difference in employment increases during the three years after an adverse health event. These empirical findings, however, are not in line with the Grossman model (1972), according to which the largest reduction in employment should be when the adverse health event occurs. At that point, the individuals lose part of their health capital and therefore they need to spend more time recovering it. As a result, they have less time available for work and leisure and ultimately work less. This discrepancy between the empirical evidence and the economic theory is likely to arise from the institutionalized employment protection system which is in place in most of the developed countries, and which is likely to mitigate the negative employment consequences of an adverse health event. In the Netherlands, the country investigated in this study, employees could take up to two years of sick leave after an adverse health event (Wet uitbreiding loondoorbetalingsplicht bij ziekte, 1996; Wet verlenging loondoorbetalingsplicht bij ziekte, 2003). During this time, the employee is entitled to her salary[1] and she could accommodate the (possible) reduction in her employment capacity by changing her working hours and/or job tasks. Furthermore, during this time she could not be laid off; however, if she is on a temporary contract, the employer is not obliged to extend her contract until the end of the second year.[2] As such, the system is designed to mitigate the short-term (financial and employment) impact of a health condition and enable the employee to recover in the meantime. Nevertheless, not all employees recover – some health conditions have a more permanent nature and lead to a permanent reduction of employment capacity. Employees with such health conditions can enter disability insurance

[1]A minimum of 170 percent of her last salary, which is spread over the two-year period.

[2]In case the employment contract finishes before that, the employee receives her salary from a government fund (Ziektewetuitkering) and there is a reintegration coach to help her find a new job.

after the two-year period.[3,4] Indeed, Pelkowski and Berger (2004) show that the long-term impact of health conditions on employment is related to the permanent nature of the health problem. However, García-Gómez (2011) argues that besides the severity of the health problem, the generosity of the social security system could partially explain the employment outcome.

The aim of this chapter is to investigate women's labor market adjustments after an adverse health event and whether the magnitude of these adjustments could be explained by the institutional job protection and/or the type of health condition. We analyze Dutch administrative data from 2004 to 2012, which follow women for four years after an adverse health event and report on their employment, working hours, and wage developments.

Our contributions are four-fold. First, we contribute to the literature on how labor market institutions affect the behavior of employees after an adverse health event by comparing the labor market participation of women during the period of institutionalized employment protection and the years after that. A study most close to ours is García-Gómez et al. (2013), who consider labor market adjustments of women after an acute hospitalization during a different institutional setting in the Netherlands.[5] They consider women diagnosed in 1999 when the institutionalized employment protection period is one year and the disability level required for entry in disability insurance is 15 percent; our study considers the years after 2004, when the protection is two years and the required disability level is 35 percent.[6,7]. Such a difference in the institutional setting is likely to result in stronger financial incentives for returning to work. Indeed, we find a smaller magnitude of employment adjustments − a reduction in employment of 1.06 percentage points four years after the adverse health event. The smaller magnitude, however, could be attributed to the changes in the social security system, as well as to the less severe health conditions that we consider. Furthermore, our results indicate that even though there is institutional protection, women leave employment in the short term and this continues throughout the four years after the adverse health event. We also observe that during the period of employment protection women adjust their working hours

[3]The minimum required reduction of employment capacity to enter DI is 35 percent.

[4]For details about the disability insurance system in the Netherlands, see Koning and Lindeboom (2015).

[5]Initially, they consider men and women together, and then separately.

[6]We also have data for 2003, the last year in which the employment protection period was one year. However, as the DI reforms as well entails other aspects like stricter screening, we use data from 2004 onward only and do not assess the effect of a change in the job protection period.

[7]Hullegie and Koning (2018) consider the combined impact of all DI reforms in the period 2000−2010 on the employment of individuals with health problems or disability. They find that the reforms have been beneficial for the individuals who were already employed: they are more likely to stay in employment in comparison to the unhealthy individuals before the reforms. However, the authors also suggest that the reforms have introduced further hiring barriers for unhealthy individuals.

and leave employment, while after the period of protection they predominantly leave employment.

Our second contribution is with respect to the degree of institutional employment protection. Markussen, Mykletun, and Røed (2012) outline the benefits of working part-time before the full recovery from the health condition. They find that employees who are required to work up to their available working capacity in order to receive their sickness benefits have better subsequent employment probability in comparison to employees who are not required to work until they fully recover. We build upon their research by considering women who have a permanent employment contract and therefore are employed during the sick leave period. We find no reduction in their employment probability during the two years of employment protection and only to a lesser extent in the third and fourth year after the diagnosis. Our results suggest that longer employment protection, or the possibility to return to work rather than look for a job, could be beneficial for the reintegration of women in the work environment.

Third, we contribute to the literature related to the impact of health conditions on labor market participation based on their severity by distinguishing among different types of adverse health events and comparing the labor market adjustments after each of them. The first study which considers the impact of severity on labor supply is Pelkowski and Berger (2004) and it shows that while temporary health conditions do not impact working hours and hourly wages, this is not the case for permanent health conditions. The study of Lundborg, Nilsson, and Vikström (2015) goes further in the comparison between health conditions and considers the 10 most common medical diagnoses in Sweden. The study assesses whether there are differential income adjustments between employees who suffer from the same disease but have different levels of education. The authors find similar magnitudes across diseases. However, they do not compare the income differential between employees who suffered from a health condition and those who did not.[8] We find that especially the wage developments are related to the type of health condition: while nonchronic conditions lead to a temporary reduction in the wage, chronic and incapacitating health conditions lead to a permanent reduction, and while some chronic and not-incapacitating conditions are not related to wage reductions, others are related to lower wages during the observed period. We find similar patterns for women in permanent employment, except for those who were diagnosed with a chronic and nonincapacitating condition.

Fourth, by considering simultaneously the severity of the health condition and the degree of institutional protection, we contribute to the literature that disentangles the two effects. To the best of our knowledge, there is no other study that attempts to do that. We find that while the employment adjustments differ between women in temporary and permanent employment, this is not the

[8]They find an educational gradient: individuals having a lower education (or low skills) suffer from a stronger negative impact on their earnings. They do not find any significant differences in the income differential across the disease groups.

case for the wage adjustments, except for the women diagnosed with chronic and nonincapacitating conditions. The wage adjustments, however, could be related to the severity of the health condition, while this is not the case for the employment adjustments.

The remainder of the chapter is organized as follows. Section 2 outlines the theoretical framework and the Dutch institutional setting. Section 3 describes the data and Section 4 describes the empirical methodology. Section 5 outlines the results, Section 6 outlines the robustness checks and Section 7 gives the discussion and conclusion.

2. THEORETICAL FRAMEWORK AND INSTITUTIONAL SETTING

Grossman (1972) argues that health shocks negatively impact the distribution of the individual's time between work and leisure, as they demand time for health recovery. Poor health also negatively affects productivity and taste for work, and as a result increases the marginal value of leisure (Bradley, Bednarek, & Neumark, 2002). This change in preferences moves the utility maximizing choice toward less time spent on work. Therefore, an individual suffering from a health condition would reduce her labor supply immediately after the health shock, but upon recovery, the impact should be smaller or may even disappear.

Upon return to work, the employee may not possess the same skill set. First, this could be a direct outcome of the health condition, for example, partial disability. Second, there could be depreciation or atrophy of skills due to not actively using the human capital (Mincer & Ofek, 1982). Such a setback may lead to lower productivity upon return to work, which ultimately would result in a lower wage. However, some of the "lost" knowledge could be restored in the short term. Relearning old skills is faster than acquiring new knowledge (Mincer & Ofek, 1982) and as a result, the productivity increase will be steeper during the former and the employee would return to her productivity level from before the work disruption.

Based on these theoretical insights, we expect that after an adverse health event, employees will reduce their labor supply and when they return to work, upon recovery, they may have lower productivity than before the adverse health event.

Previous studies have found that the labor supply immediately decreases after a health condition. For instance, Halla and Zweimüller (2013) consider how accidents to and from work impact the employment of the individual. They find an immediate negative impact on work in the form of absenteeism (on average 46 days), which is followed by increased probability of leaving work through unemployment, and later on an entry in disability retirement. The negative employment effects are present even five years after the accident and the individuals who stay in employment suffer from a continuous decrease in earnings.

García-Gómez et al. (2013) also find that the negative effect on employment after a health condition (acute hospitalization) increases over time: in the beginning, it is relatively small, it reaches 8.4 percentage points decrease in the second year, and there is no recovery six years later. The authors explain the small initial effect by the (possible) sick leave, which delays leaving employment.

Furthermore, they find that the employees who leave employment are likely to enter disability insurance and the one who stay employed experience a long-term reduction in annual income from the onset of the disease.

Jones, Rice, and Zantomio (2016) find as well an increase of the negative impact on employment over time of a health shock such as the incidence of cancer, stroke, or myocardial infarction in the United Kingdom. They estimate the decrease at 9.2 percent, three years after the shock. Interestingly, they observe a decrease in working hours in the second year after the shock, but not in the first year or the third year after the shock. The authors suggest that it is a result of an attempt to accommodating the health problem, followed by leaving the labor force since the reduction in employment probability decreases further.

Overall, studies have shown that adverse health events reduce the employment probability (e.g., García-Gómez et al., 2013; Halla & Zweimüller, 2013; Heinesen & Kolodziejczyk, 2013; Jones et al., 2016; Moran, Short, & Hollenbeak, 2011). However, this reduction increases over time which is the opposite of what the Grossman model (1972) predicts. The delayed impact on employment could be explained by the institutionalized employment protection period in the developed countries, during which the employee can take sick leave without losing her job while she recuperates. Furthermore, some countries also have integration policies, which encourage the employee to come back to work and, if needed, provide her with extra training. As such the institutional setting plays an important role in augmenting the relationship between adverse health events and employment. The institutional setting, according to García-Gómez (2011), could partially explain why employees in nine European countries reduced differently their employment after a health shock. The author shows that in countries where the disability policies have a lower integration dimension[9] (such as Ireland), individuals reduce more their labor market activity in comparison to individuals in countries where the integration dimension is higher (such as Denmark and the Netherlands). Bradley, Neumark, and Barkowski (2013) also find that the institutional setting is important for the employment decision of women after a severe health condition. After surviving breast cancer, the women who were not eligible for health insurance through their spouses were less likely to leave their job in order to keep their eligibility for health insurance.

In the Netherlands, since 2004, an employee can take up to two years of sick leave after an adverse health event.[10,11] During this time, the employee cannot be dismissed and is entitled to a total of 170 percent of their last years' salary

[9]The integration dimension consist of employment and rehabilitation measures: "coverage consistency, assessment structure, employer responsibility for job retention and accommodation, supported employment program, subsidized employment program, sheltered employment sector, vocational rehabilitation program, timing of rehabilitation, benefit suspension regulations and additional work incentives" (García-Gómez, 2011, p. 201).
[10]See Van den Bemd and Hassink (2012) for a more detailed description of absenteeism regulations in the Netherlands.
[11]See De Vos, Kapteyn, and Kalwij (2012) for a more detailed description of the Dutch disability insurance, pension, and unemployment schemes.

over a two-year period. In case the employee has a temporary contract, which expires during this two-year period, the employer has responsibility for payments until the end of the contractual time, after that the individual is entitled to sickness benefits from the government for the remainder of the time period (Sickness Benefit Act, Ziektewet). Furthermore, if the contract expires during the protection period, the law does not oblige the employer to extend the temporary contract until the end of the protection period. However, for the employee to be entitled to this protection period and benefits, she has to exert effort corresponding to her available work capacity, according to the Gatekeeper Improvement Act (Wet Verbetering Poortwachter, 2001). The Gatekeeper Act aims at improving the reintegration of the employee in the company and requires the employer to provide the employee with a participation plan for the sickness period. The plan may involve reducing the number of working hours, finding suitable tasks for the new physical situation of the employee, and/or readjusting the workplace to accommodate better the employee's needs. The law also specifies sanctions in case of noncompliance: an extension of the sick leave period during which the employee is entitled to salary (a maximum of one year) if the employer is not complying with the legislation; or no salary during the sick leave period if the employee is not complying with the legislation. As soon as the employee recovers, she is expected to return to work and her remuneration from that point onwards is related to her actual work effort. If the employee's health has not recovered after the two-year period, she could apply for disability insurance benefits. The decision, whether they are granted and for how long, is based on the level of disability, the expected recovery, and the integration efforts during the period of sickness absence.

In conclusion, the institutional framework in the Netherlands provides the employees with employment security in the event of an adverse health event. They can continue working during the first two years of the illness as it is required from the employer to find suitable tasks to accommodate their physical limitations. The income effects of the health condition are also limited in the short-term due to the continuation of the salary payment. Therefore, we expect that the (contractual) labor participation would change mostly after the institutional protection is over, namely two years after the adverse health event.

3. DATA

We use individual-level administrative data for the years 2000−2012 that contains information on employment, demographics, and health and that have been retrieved from five different sources and that are provided by Statistics Netherlands. First, the employment spells data were obtained from the Social Statistical data set on jobs (Bakker, Van Rooijen, & Van Toor, 2014; Sociaal Statistisch Bestand, SSB-banen, 2004−2012). Second, personal income and the socioeconomic status of the women were obtained from the Integrated Personal Income data set (Integraal Persoonlijk Inkomen, 2004−2012; CBS, 2016a), which has been collected by the tax authorities. Third, information about age, gender, and family situation was retrieved from the Municipality Registry (Gemeentelijke

Basisadministratie, GBA, 2004−2012; CBS, 2015). Fourth, the medical information, in the form of hospital entries, was obtained from the National Medical Registration (Landelijke Medische Registratie, LMR, 2000−2012; CBS, 2016b), which was provided to Statistics Netherlands by the foundation for Dutch Hospital Data (DHD, 2000–2012). Because of LMR's limited coverage in some of the years, we used the final data set − the Housing Registry (Woonruimteregister, WRG, 2000−2012; CBS, 2013), to correct for the coverage (see Appendix 1). The combined data follow about 9.35 million women who were registered in a Dutch municipality between 2004 and 2012. Women enter our data set in 2004 or in a later year if they reach the age of 25 or emigrated to the Netherlands. We cease observing women after 2012 or after an earlier year if they have died,[12] reached the age 56, or have immigrated from the Netherlands.

3.1. Sample Selection

For the period 2004 to 2012, we selected women who are between 25 and 55 years for all years of observation. We removed women younger than 25 as they can still be in education and older than 55 to avoid issues related to early retirement. This reduced our sample of about 56 percent. Furthermore, we excluded women who were classified according to their socioeconomic status as self-employed (5.91%)[13] and students (0.4%), because their main occupation is not contractual employment, which is what we can observe in the data.

Individuals living in certain areas of the country have been excluded because these areas are not covered by the Hospital registry (the LMR data set). Based on information from the Housing registry, we were able to determine which of the 415 municipalities were fully covered by the LMR. As it turned out, a minimum of seven municipalities in 2005 and a maximum of 44 in 2008 were not fully covered and women residing in these municipalities, and in those years, have been excluded from our sample (see Appendix 1 for more details). On an individual level, this caused a reduction in sample size of a minimum of 1.44 percent in 2005 and a maximum of 8.29 percent in 2008.

To identify women who suffered from an adverse health event, we considered women's medical history, which consists of diagnoses received during hospital admissions (clinical and daycare). If in a given year a woman received a medical diagnosis, but she did not receive one in the four years prior to that year, we define this diagnosis as a new diagnosis and it is referred to as an adverse health event.

A woman enters our sample after four consecutive years without a diagnosis. However, for some women, we do not observe four years before the diagnosis since our data start in 2000 and even though they received a diagnosis, we cannot identify whether it is an adverse health event or a repeated hospital visit.

[12]See Appendixes 2 and 3 for further information about the mortality rates by type of diagnosis and employment state.

[13]Even though they work, we do not observe their contractual working hours and hourly wage rate.

As a result, we excluded 209,780 women. The first adverse health event could be observed in 2004 and in total, we observe 1,086,073 adverse health events.[14]

Lastly, missing values on key variables caused a further reduction in the sample size. As a result, our final sample consists of 3,804,345 women and on average they are observed for 6 years from 2004 to 2012.

3.2. Types of Adverse Health Events

In the analysis, we first consider any diagnosis when defining an adverse health event and next we distinguish seven diagnoses during a hospital visit, namely breast cancer, other cancers, circulatory conditions, respiratory conditions, nutritional conditions, accidents, and other health conditions.[15] In the latter case, a diagnosis is considered new if the patient did not receive the same type of diagnosis during the previous four years.

We consider different groups of health conditions because if they are chronic and/or incapacitating, they may lead to different work adjustments in the short and long term. We expect that conditions that women can recover from, such as cancer, would lead to temporary work adjustments. Furthermore, chronic and incapacitating conditions, such as circulatory conditions, could lead to long-term adjustments in work participation, in order to accommodate the change in work capabilities. Lastly, we expect that chronic but not-incapacitating conditions, such as respiratory and nutritional conditions, would not impact the work adjustments since they do not impose long-term restrictions on the work capacity.

The incidence of an adverse health event increases with age (Fig. 1; top left graph). The incidences of adverse health events differ across disease types and all increase with increasing age except for respiratory health conditions (Fig. 1). The latter health conditions are often chronic and are often diagnosed already early in life.

Some women may receive more than one new diagnosis during the calendar year (see Table A3, Appendix 4). For example, 33.75 percent of the patients with breast cancer have received another diagnosis in the same year (maximum overlap), while this is the case for only 13.33 percent of the patients with respiratory conditions (minimum overlap). Considering each health condition, most of the overlap is with other health problems and the least with accidents.

3.3. Labor Market Participation

Labor market participation is described in this chapter by the employment status, the number of contractual hours of work and the hourly gross wage rate. Younger women, on average, are more likely to be employed (90% at age 25 vs 64% at age 55; Fig. A1, top left graph, Appendix 6), to work longer hours

[14]Cumulative number for the period 2004–2012.

[15]See Appendix 1 for details about the composition of other health conditions.

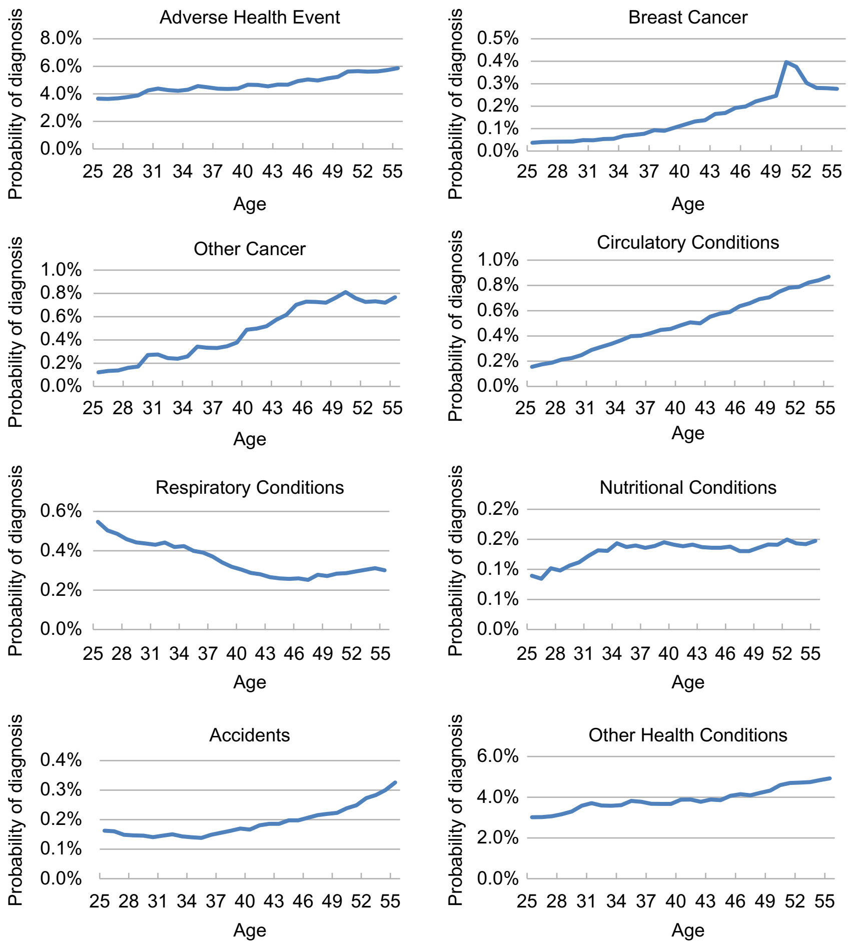

Fig. 1. Adverse Health Events by Age and Type of Diagnosis. *Notes*: Own calculations based on population data from Statistics Netherlands for the period 2004–2012.

(1670 hours per year at age 25 vs 1392 hours at age 55; top right graph), and to earn less (€13 at age 25 vs €17 per hour at age 55; bottom graph).

Since job protection differs between employees on temporary and permanent contracts, it is important to take this into account. According to Dutch law, employees cannot stay on a temporary contract in the company for more than three years. After the third year of employment, the contract has to become permanent or the employee is laid off. Therefore, we define that a woman has a permanent contract if she has been with the company for more than three years. Following this definition, we observe 52.05 percent women (67.44% of the employed sample) in permanent employment; 25.13 percent women (32.56% of the employed sample) in temporary employment; and 22.82 percent women not employed throughout the observed period. However, the employee may receive immediately a permanent contract or at any time after that, which implies that in the group of temporarily employed women, there may be women who already have a permanent employment contract, even though they have been with the company for less than three years. Since we cannot distinguish between those and the women with temporary employment contracts; and we have no official employment statistic about how big that group may be, we will use for the sub-sample empirical analysis only the sample of women with permanent employment contracts according to our definition.

Table 1 shows based on the type of contract, the demographic characteristics of the two groups. Women with a permanent contract are older (41 vs 38 years old), more likely to have a partner (78% vs 72%), and equally likely to have kids at home (55% vs 54%) in comparison to women with a temporary contract. Furthermore, Table 1 shows that the incidence of each type of health condition, as well as health conditions in general, is similar across the two groups.

3.4. *Before and After the Adverse Health Event*

Women may experience changes in their employment patterns after an adverse health event. Fig. 2 depicts the employment probability, average annual contractual working hours for those who are employed and the average hourly wage rate during the four years before and after the adverse health event. In the top left panel,

Table 1. Demographics and Health Conditions by type of Labor Contract.

	Permanently Employed		Temporary Employed	
	Mean	SD	Mean	SD
Age	41	8.295	38	8.597
Partner	0.784	0.412	0.720	0.449
No children	0.454	0.498	0.462	0.499
Adverse health event	0.047	0.211	0.045	0.207
Breast cancer	0.002	0.041	0.001	0.035
Other cancer	0.005	0.071	0.004	0.065
Circulatory	0.005	0.070	0.004	0.066
Respiratory	0.003	0.056	0.004	0.060
Nutritional	0.001	0.034	0.001	0.034
Accidents	0.002	0.043	0.002	0.044
Other health problems	0.039	0.192	0.037	0.190

Notes: Age is measured in years. Partner is equal to 1 if a woman has a partner, and 0 otherwise. No children are equal to 1 if there are no children in the household, and 0 otherwise. Adverse health event is equal to 1 if the woman received a diagnosis during the calendar year, and 0 otherwise. Breast cancer, Other cancer, Circulatory conditions, Respiratory conditions, Nutritional conditions, Accidents, and Other health problems are measured as follows: equal to 1 if the women received the specific diagnosis, and 0 otherwise. The statistics about permanently employed women is based on 11,944,304 observations, and the statistics about temporarily employed women is based on 5,768,012 observations.

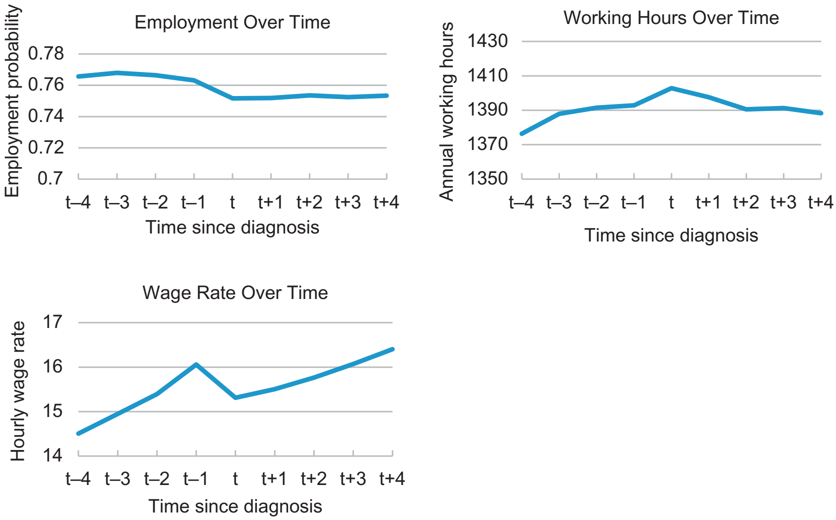

Fig. 2. Employment, Working Hours, and Wage Before and After the Adverse Health Event. *Notes*: Based on own calculation of the sample of women who experience an adverse health event in the period 2004–2012.

Table 2. Employment Trends by Type of Contract at the Time of Diagnosis.

Type of Contract at the Time of Diagnosis	Time Since Diagnosis				
	Year 0	Year 1	Year 2	Year 3	Year 4
Temporary	100.00%	91.63%	89.38%	88.60%	88.79%
Permanent	100.00%	98.33%	96.75%	95.26%	94.53%

Notes: The table reports the percentage of initially employed women per type of contract over the four years after the diagnosis.

we observe that women slowly leave employment in the years before the adverse health event and their employment probability does not return to the initial levels in the years after the adverse health event. With respect to the working hours (see top right panel), we observe an increase in the average annual contractual working hours in the years before the diagnosis and reduction in the first two years after the adverse health event. The magnitude of the difference is around 30 hours on a yearly basis, which is insignificant in economic terms. Lastly, we observe a positive trend in the average hourly wage (see bottom panel), which is likely to be related to the yearly increase in wage due to more experience, as well as to calendar effects. Furthermore, there is a drop in the average hourly wage rate in the year of diagnosis, after which the hourly wage rate returns to its previous positive trend.

Considering the women with a permanent and temporary contract, it is interesting to see if there are differences in their employment probability in the years after the adverse health event (see Table 2). We observe that women in temporary employment are more likely to leave employment and four years later the difference between the two groups is almost 6 percentage points.

4. EMPIRICAL FRAMEWORK

First, we estimate the effect of an adverse health event on employment using the following linear probability model (LPM):

$$Y_{i,t} = \beta_0 + \beta_1 H_{i,t} + \sum_{k=1}^{4} \beta_{k+1} H_{i,t-k} + \mathrm{X}_{i,t}\eta' + \delta_t + \alpha_i + \epsilon_{i,t} \qquad (1)$$

$$t = 2004, \ \ldots, \ 2012$$

where $Y_{i,t}$ represents the employment status (employed or nonemployed) of individual i and time t. $H_{i,t}$ denotes the health status of individual i in period t: it is equal to 1 if individual i had an adverse health event in period t, and 0 otherwise. Thus, the parameter β_1 is the difference in the employment probability between women who did not experience an adverse health event and women who experienced an adverse health event (c.p.). We include as well, the incidences of adverse health events in the previous four years, $H_{i,t-1}$ to $H_{i,t-4}$ to distinguish short- from long-term effects. For instance, $H_{i,t-1}$ is equal to 1 when a woman had an adverse health event at $t-1$, and if she has another hospital entry at t, $H_{i,t}$ is equal to 0, since it is not a "new" adverse health event. $H_{i,t-2}$ to $H_{i,t-4}$ are defined in a similar manner. The parameters $\beta_2 - \beta_5$ indicate differences in the employment probability due to previous adverse health events (c.p.). The row vector $\mathrm{X}_{i,t}$ includes household characteristics in year t, namely having a partner, the log of his income, log of the number of adults living in the household, and number and ages of the children (categorical variables). Then, δ_t is a time fixed effect, α_i is an individual specific effect, and $\epsilon_{i,t}$ is an idiosyncratic error term.

Time-invariant unobserved variables such as education level or type of occupation could be correlated to the observed characteristics, as well as having its own effects on labor market outcomes. We, therefore, next to a random-effects specification which can be miss-specified because of this, also estimate Equation (1) using a fixed-effects specification which takes such correlations into account.

Next, we estimate the adjustments in the working hours of women after an adverse health event using the following model:

$$T_{i,t} = \gamma_0 + \gamma_1 H_{i,t} + \sum_{k=1}^{4} \gamma_{k+1} H_{i,t-k} + \mathrm{X}_{\mathrm{i,t}}\pi' + \omega_t + \iota_i + \nu_{i,t} \qquad (2)$$

$$t = 2004, \ldots, 2012$$

where $\mathrm{T}_{i,t}$ denotes the contractual working hours of individual i in year t, measured on a yearly basis; ω_t is a time fixed effect; ι_i is an individual specific random effect; and $\nu_{i,t}$ is an idiosyncratic error term. The rest of the notation is identical to the one in Equation (1).

We first estimate Equation (2) as a random-effects Tobit model. The Tobit model is a nonlinear model which takes into account the censoring of the data, namely the fact that individuals cannot work less than 0 hours and more than full time during the whole year resulting in 2080 hours. In this model, the error term is assumed to be normally distributed. Then, we estimate a linear model with random effects on the same sample, which includes both employed and nonemployed women. Next, we consider the sample of employed women only. We estimate a linear model with random effects. However, as in the employment equation, it is likely that the time-invariant individual heterogeneity is correlated with the other explanatory variables; therefore, we also estimate the linear model with fixed effects.

Lastly, we observe a wage rate only for the employed individuals. To estimate how an adverse health event affects the earning capability of an individual, we will use Heckman's two-step procedure (Heckman, 1979), which corrects for the initial selection into employment, or the notion that women with better career possibilities and earning potential are more likely to be employed. First, we estimate an employment equation, similar to Equation (1) but using a random-effects Probit specification. That is, the error term of the model is assumed to be normally distributed. Based on the Probit estimates, we calculate the inverse Mills ratio. Then, we estimate an outcome equation for the sample of employed women using a random-effects specification:

$$W_{i,t} = \tau_0 + \tau_1 H_{i,t} + \sum_{k=1}^{4} \tau_{k+1} H_{i,t-k} + F_{i,t}\kappa' + \lambda_{i,t} + \rho_t + \varphi_i + \upsilon_{i,t} \tag{3}$$

$$t = 2004, \ldots, 2012$$

where $W_{i,t}$ denotes the log of the wage rate of individual i in year t; $F_{i,t}$ includes controls for previous health and age dummies; ρ_t is a time fixed effect; φ_i is an individual specific random effect; and $\upsilon_{i,t}$ is an idiosyncratic error term. $\lambda_{i,t}$ denotes the inverse Mills ratio for individual i in year t, which is calculated from Equation (1). Selection into employment is assumed to be dependent on the household characteristics in time t: namely, having a partner, log of his income, log of the number of adults living in the household, and number and age of the kids. Those variables are assumed not to impact the wage rate directly and therefore are excluded from the wage equation.

We compare the results from the Heckman-selection specification to a random-effects specification of the following linear model for the employed women:

$$W_{i,t} = \theta_0 + \theta_1 H_{i,t} + \sum_{k=1}^{4} \theta_{k+1} H_{i,t-k} + F_{i,t}\mu' + \varsigma_t + \ddot{\imath}_i + u_{i,t} \tag{4}$$

$$t = 2004, \ldots, 2012$$

where ς_t is a time fixed effect; $\ddot{\imath}_i$ is an individual specific random effect; and $u_{i,t}$ is an idiosyncratic error term. The difference between Equation (3) and Equation (4) is that the latter does not account for the selection into employment. A comparison between the results from the two specifications will indicate whether there is endogenous selection into employment.

Lastly, we estimate Equation (4) using a fixed-effects specification to allow the unobserved time-invariant individual heterogeneity to be correlated with the explanatory variables.

As a starting point, we estimate Equations (1), (2), (3) and (4) without distinguishing between the types of adverse health events. Subsequently, we consider the different types of adverse health events separately, namely: breast cancer, other cancers, circulatory conditions, respiratory conditions, nutritional conditions, accidents, and other health conditions. The inclusion of the different adverse health events simultaneously limits the misallocation of (estimated) effects across health conditions. The later problem arises from the possibility that an individual suffers from more than one type of adverse health event at a time.

Finally, we perform the whole analysis on a subsample of permanently employed women to investigate whether they have different adjustments in their labor market participation after an adverse health event in comparison to the full sample of women. Such differences, if present, would be related to the degree of institutional employment protection.

5. RESULTS

5.1. Employment Adjustments

First, we consider the employment adjustments of women after an adverse health event, without distinguishing between the different types of health conditions. We present the corresponding estimation results in Appendix 7 and below we graphically present the main findings. Fig. 3 (top left graph) shows the employment adjustments of women who have experienced an adverse health event at time zero (i.e., at the time of diagnosis). The adjustments are measured relatively to the ones of comparable women at that time, who did not experience an adverse health event. The estimates of the linear probability model with random effects show that an employment gap of 0.42 percentage points is already present at the time of diagnosis which may suggest that, on average, women prone to health conditions have a worse position on the labor market. This gap increases in the years thereafter and reaches 1.35 percentage points four years later. However, it is likely that the unobserved time-invariant individual heterogeneity is correlated to the explanatory variables and therefore we estimate a linear probability model with fixed effects. A Hausman test (Hausman, 1978) of the two specifications rejects random effects suggesting it is important to allow for fixed-effects. The estimates of the fixed-effects model show that there is a small employment gap at the time of diagnosis (0.23 percentage points) and that it reaches 1.09 percentage points in the following three years followed by a slight recovery to 1.06 percentage points after four years. The differences in the

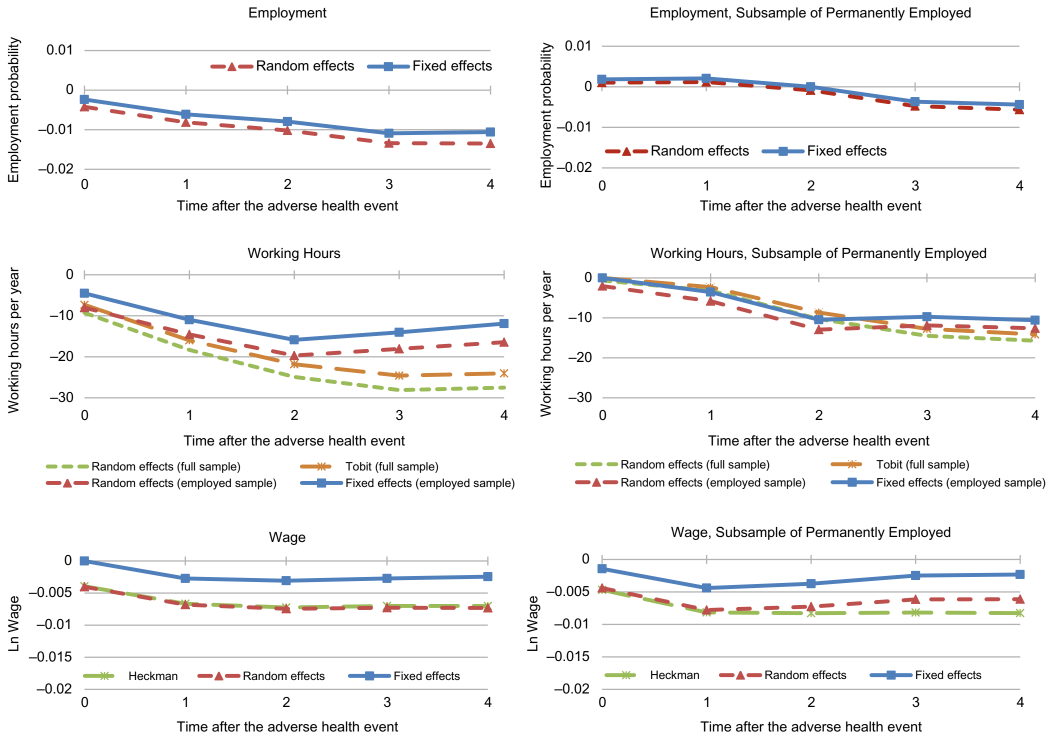

Fig. 3. Employment, Working Hours, and Wage Adjustments After an Adverse Health Event. *Notes*: The underlying estimates of the graphs can be found in Appendix 7. The top-left panel presents Models 1 and 2. The middle-left panel presents Models 3 to 6. The bottom-left panel presents Models 7.2 to 9. The top-right panel presents Models 10 and 12. The middle-right panel presents Models 13 to 16. The bottom-right panel presents Model 17.1 to Model 19. Full sample denotes all employed and nonemployed women. Employed sample denotes only the women in employment. The subsample of permanently employed women includes women in permanent employment and nonemployed women, that is, it excludes the women in temporary employment.

magnitude of the results of the random-effects and fixed-effects specifications most likely stem from the fact that nonemployed women are more likely to experience an adverse health event, as has been found in the literature on socio-economic status differences in health (Cutler, Lleras-Muney, & Vogl, 2011). Therefore, assuming a random-effects specification may result in larger estimates.[16]

Our findings are in line with García-Gómez et al. (2013), who found a small initial decrease in employment during the first year after acute hospitalization, which reaches 8.4 percentage points in the second year, with no recovery six years later. Since they look only at acute hospitalization, this can explain the stronger effect that they find. Other studies, such as Halla and Zweimüller (2013), also find this long-term negative effect of adverse health on employment.[17]

Even though we did not expect to observe a decrease in the employment probability of women during the first two years after the adverse health event, namely the time of the institutional protection period, we did observe such a decrease. However, when we consider women with permanent contracts separately, we do observe different employment adjustments (see Fig. 3, top right graph). As above, we first estimate an LPM with random effects. The estimates show that women who receive a diagnosis are more likely to be employed in the year of diagnosis (0.10 percentage points) and one year after (0.11 percentage points). After that, their employment slowly decreases over time in comparison to their peers who did not receive a diagnosis and the gap reaches 0.56 percentage points four years later. As before, the assumption of zero correlation between the unobserved time-invariant characteristics and the explanatory variables may be invalid. Therefore, we estimate a fixed-effects LPM and perform a Hausman test on the two specifications. The result of the test rejects random effects suggesting it is important to allow for fixed effects. The fixed-effects estimates show that after an adverse health event, women are more likely to be employed in comparison to their peers at the time of diagnosis (0.19 percentage points), year one after the diagnosis (0.21 percentage points), and year two (0.01 percentage point), but they are less likely to be employed in year three (0.37 percentage points) and four (0.44 percentage points). Such a pattern of employment adjustments can be explained with institutionalized employment protection for

[16]The employment patterns that we observe could also be influenced by income substitution between the spouses. However, this mechanism is likely to be very small given the institutional setting: women receive a replacement income during the first two years after the adverse health event and after that, they have the possibility to enter a disability insurance scheme. If this is not the case and they could work, but they do not have a job, they could receive unemployment benefits (see Section 2 for detailed description of the institutional setting). Nevertheless, since we do not have detailed information about all the sources of income for the family, an analysis of income substitution between the spouses would be highly inaccurate.

[17]A different work disruption event for women is birth giving. Fitzenberger, Sommerfeld, and Steffes (2013) find that the negative effect of birth giving on employment decreases during the first five-years as the child grows; however, it does not completely disappear. They estimate the reduction at 20 percentage points five years after the first child-birth.

women on permanent contracts during the first two years after the adverse health event. The finding that women who experienced an adverse health event are more likely to be employed in comparison to women who did not experience such events could be explained by the employment protection: while women who experience an adverse health event cannot be laid off in the next two years, this is not the case for the other women. However, once the protection period of two years is over, the unhealthy women are likely to leave employment and as a result are less likely to be employed than their peers. This pattern differs from our results on the full sample of women, where we observed immediately after the adverse health event that the affected women are less likely to be employed in comparison to their peers, and therefore, we did not observe the institutionalized employment protection. Furthermore, the reduction in employment for women on permanent contracts four years after the adverse health event (0.44 percentage points) is less than half of the reduction of the full sample (1.06 percentage points).

5.2. Working Hours Adjustments

Next, we consider the contractual working hours' adjustments after an adverse health event. Fig. 3, middle left graph, shows the estimates for of Equation (2) outlined in Section 4. The gap in contractual working hours represents the difference between the contractual working hours of women who have and those who have not experienced an adverse health event and have otherwise the same observed characteristics. All estimated parameters indicate that there is a gap and that it increases over time. The results of the random-effects Tobit model and the linear random-effects model (full sample, i.e., both employed and nonemployed women) are very similar, which suggests that the correction for the data censoring is not important. Furthermore, they estimate a larger increase in the gap than the other two models, which reaches 27 hours per year over the four years after the diagnosis. This difference could be explained by the underlying samples: since the Tobit and the linear model (full sample) consider all women, they compare not only the change of contractual working hours of the working women but also account for the move to zero hours of the women who leave work. As we found that women are more likely to stop working after an adverse health event, this could explain the size of those estimates. However, the linear random-effects (employed sample) and the linear fixed-effects estimates, in which we only consider the working population, show that women work slightly fewer hours at the time of diagnosis than their healthy peers: 8 hours per year and 4.5 hours per year, respectively, at the time of diagnosis; reaching four years later 16.5 hours per year and 12 hours per year. The difference between the two estimates can be explained by the underlying assumptions about the correlation between the unobserved time-invariant individual heterogeneity and the explanatory variables. A Hausman test on the two specifications rejects random effects suggesting it is important to allow for fixed effects. Though, the effects estimated by both specifications are so small that they are economically insignificant. Furthermore, according to the random-effects (employed sample) and the fixed-effects estimates, the minor adjustments in the working hours stop after the second year; however, according to the random-effects (full sample) and the Tobit estimates, they continue even in the fourth year. This difference could be explained by the different sample composition and it suggests that women are more likely to leave work rather than work contractually fewer hours during year 3 and 4. This trend could be traced back to the legislation. Because the law enables women to take sick leave for the first two years, they are likely to return back to work during this period and take action in adjusting contractually their working time to their new employment capacity and (possibly new) preferences[18].

With respect to the sample of permanently employed women, we performed a similar analysis and we found that their working hours' adjustments are similar in direction and slightly smaller in magnitude as the full sample (see Fig. 3, middle right graph).

Our results are in line with Jones et al. (2016) who find a reduction in working hours in the second years after the health shock and no reduction in the third year after the health shock.

5.3. *Wage Adjustments*

Last, we consider the wage adjustments after an adverse health event. In Fig. 3, bottom left graph, we observe differences between a Heckman-selection model, a linear random-effects model, and a linear fixed-effects model. First, the Heckman selection model allows for self-selection into employment – only women with better wage possibilities and/or better career development would (choose to) stay employed. Since those and the linear random-effects estimates of the wage gap between the women who experienced an adverse health event and those who did not are similar, this suggests that selection into employment is not an explanation for the wage gap.[19] Furthermore, while the Heckman-selection and the linear random-effect models consistently estimate a wage gap between the healthy and unhealthy women (0.40% at the time of diagnosis and around 0.73%, four years later), the fixed-effects model estimates it at zero percent in the year of diagnosis and expanding to 0.30 percent in year one, two, and three with a slight recovery to 0.24 percent in year four. We perform a Hausman test on the random-effects and fixed-effects specifications and the test rejects the random effects suggesting it is important to allow for fixed effects. As the latter specification estimates the wage differential closer to zero, this suggests that the correlation between the unobserved time-invariant individual characteristics and the other explanatory variables is important for (partially) explaining the wage gap; in other words, the wage development of the women

[18]Because the changes in working hours are related to actual adjustments in the contract, we are not able to observe if the employee works partially while she is on sick leave.

[19]The fraction of employed women in the group of women who receive a diagnosis is 75 percent, and in the group of women who do not receive a diagnosis is 77 percent. Since the fraction of women with a job in the two groups is similar, this suggests that the possible selection into employment is minor.

can be mostly related to unobserved characteristics which do not change over time (e.g., ability, education, and tenure).

Considering the permanently employed women, we observe similar adjustments in their wage (see Fig. 3, bottom right graph). At the time of diagnosis, women have 0.47 percent lower wage in comparison to their peers who are not diagnosed, according to the random-effects estimates. The difference increases four years later to 0.61 percent. In comparison, the main analysis estimated a difference in the wage adjustments in the fourth year of 0.73 percent. This suggests that women on permanent contracts experience similar "wage penalty" as women on temporary contracts. Nevertheless, the fixed-effects model estimates the wage differential close to zero in both samples, which suggests that the correlation between the unobserved time-invariant individual characteristics and the other explanatory variables is important for partially explaining the wage gap.

Overall, our results are in line with Jones et al. (2016) who find that the hourly wage is not affected by a severe health shock.[20,21]

5.4. The Distinction Between Different Types of Adverse Health Events

Women visit the hospital with different health conditions and sometimes they receive more than one diagnosis during the calendar year. We consider the different types of adverse health events simultaneously to compare the labor market adjustments after each of them. We present graphically the estimates of linear models with fixed effects since the above analysis concluded that this is the preferred specification. Appendix 8 presents the underlying estimates.

First, we consider the employment adjustments after different types of adverse health events. We find similar trends across the different diagnoses: there is an employment gap between the healthy and unhealthy women, which increases over time (Fig. 4, left column). However, the size of the gap differs across the different types of health events: in the fourth year after the diagnosis, the gap is between 0.37 percentage points after being diagnosed with respiratory conditions and 1.93 percentage points after being diagnosed with breast cancer. Exceptions are nutritional conditions, where the employment gap starts at 1.72 percentage points and decreases in the following four years to 0.52 percentage points. Furthermore, we do not observe the institutionalized job protection after any of the adverse health events. In comparison, women with permanent contracts experience different employment adjustments (Fig. 4, right column). We do not observe an immediate decrease in their employment probability after the adverse health event. The reduction in their employment probability occurs only after some time. We observe no reduction in employment probability until after the first year for women diagnosed with other cancer and respiratory conditions,

[20]In comparison, Ejrnaes and Kunze (2013) consider the impact of birth giving on the wage of the women when they return to work. They find a wage drop of 3−5.7 percent.

[21]Studies that consider earnings, rather than the hourly wage and the working hours separately, find around 2 percent reductions in the earnings after an adverse health event (García-Gómez et al., 2013; Halla & Zweimuller, 2013).

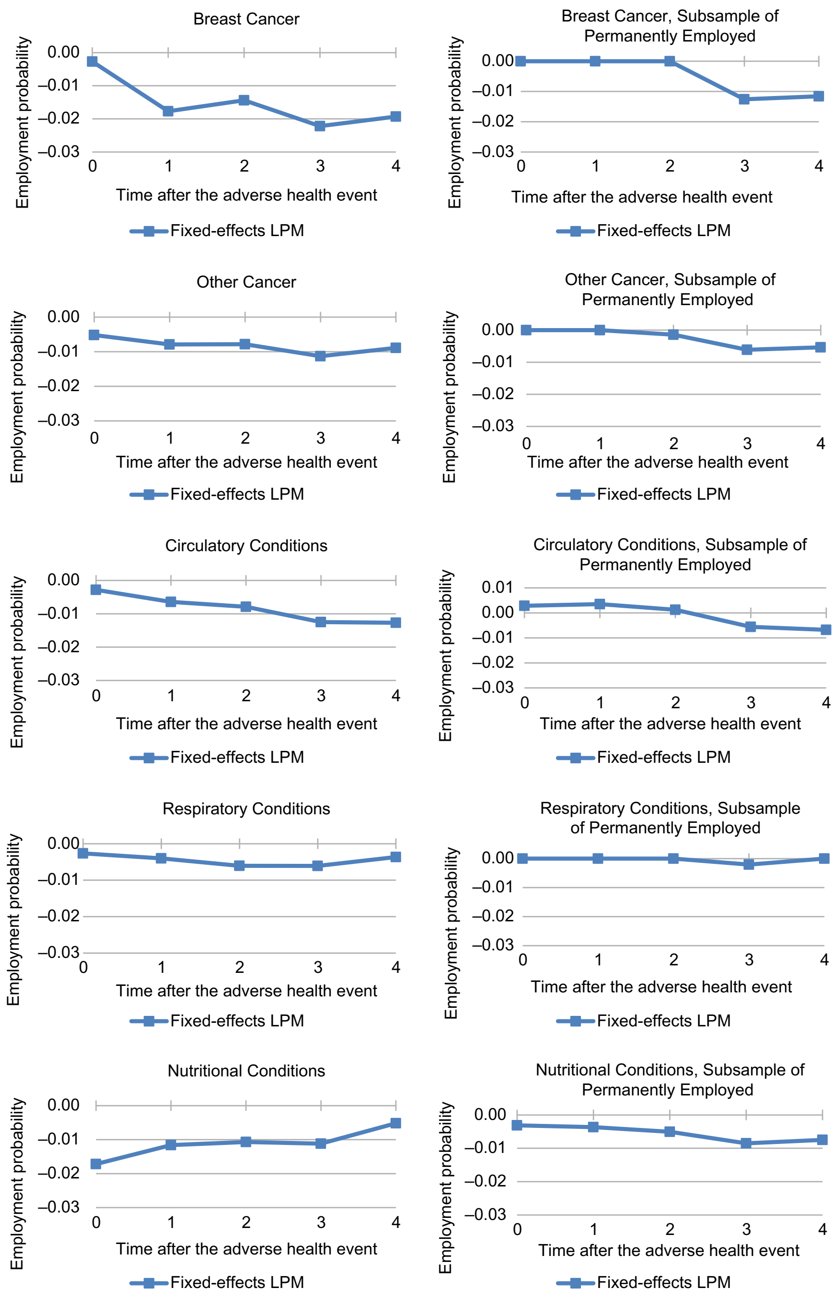

Fig. 4. Employment Probability After an Adverse Health Event by Type of Diagnosis., *Notes*: The underlying estimates can be found in Appendix 8. The left panels present Model 19 and the right panels Model 22.

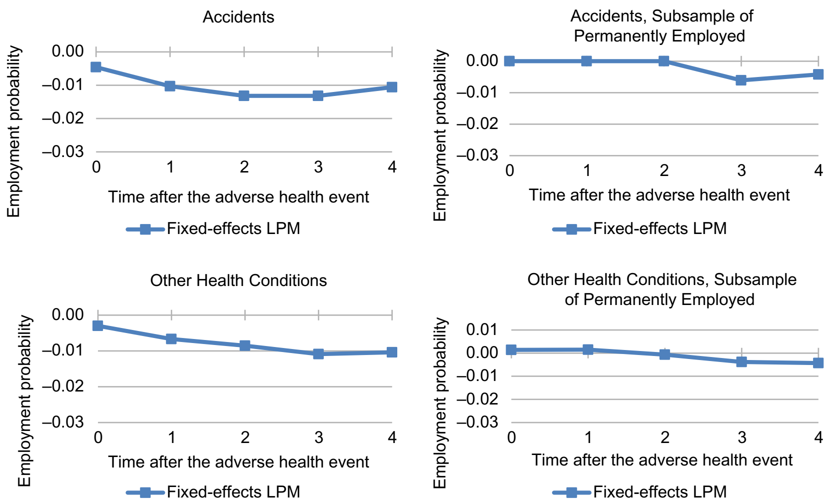

Fig. 4. (*Continued*)

for example; while for the rest of the health conditions, we observe no reduction in employment probability until after the second year. An exception is nutritional conditions, after which we observe an immediate reduction in the employment probability of the diagnosed women. This suggests that there is institutionalized job protection, which enables women with permanent contracts to stay longer in employment.

Second, we consider whether women adjust their contractual working hours after each adverse health event (Fig. 5). The strongest reduction of contractual working hours is observed in the group of women diagnosed with breast cancer (45 hours per year), followed by women with circulatory conditions (22 hours per year), and nutritional conditions (19 hours per year). However, the magnitudes of all adjustments are very small and may be considered economically insignificant. We observe comparable adjustments in the contractual working hours of the permanently employed women.

Last, we consider women's wage adjustments across the different types of adverse health events (Fig. 6). We compare their wage profiles to the wage profiles of comparable healthy women. We found that the health conditions that women could recover from, such as cancer, are related to a temporary decrease in the wage profile followed by partial to full recovery of the wage profile. Then, the chronic and incapacitating health conditions, such as circulatory conditions, are related to long-term reductions in the wage profile. With respect to the chronic and nonincapacitating health conditions we found two different patterns: after respiratory conditions, there seems to be no change in the wage profile, while after nutritional conditions, the wage profile is lower from the time of diagnosis up to and including the fourth year after the diagnosis. Lastly, we observe a lower wage profile during the first two years after an accident,

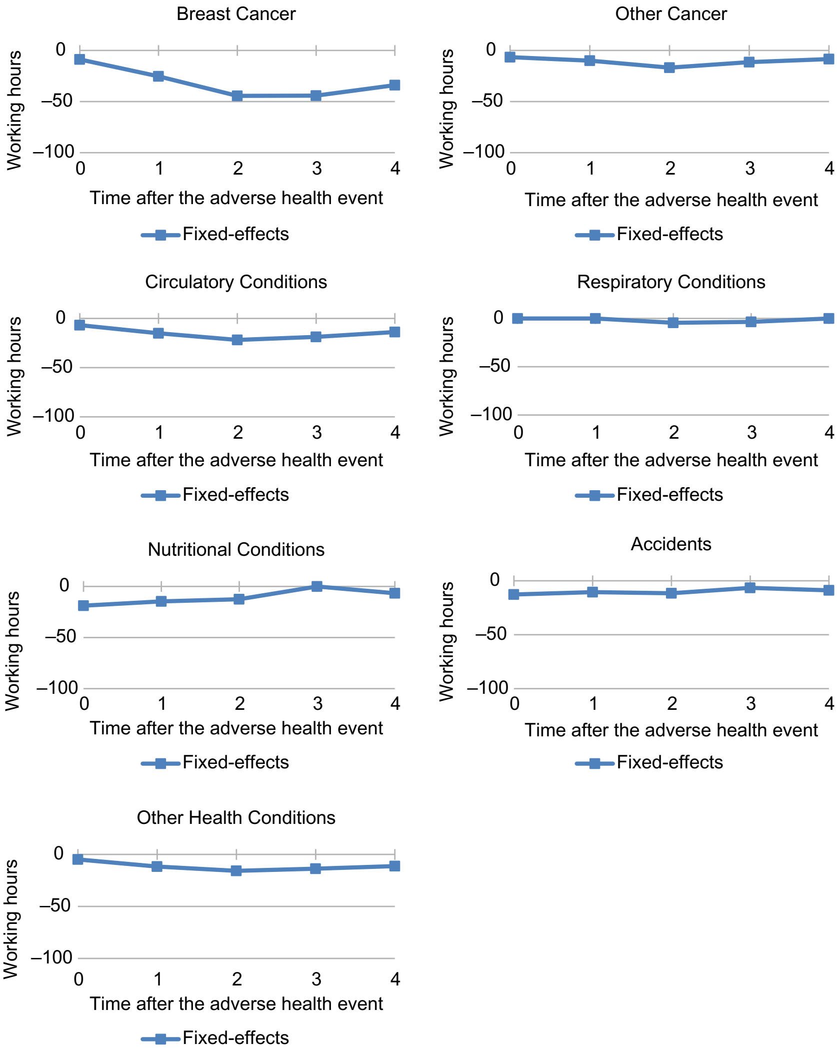

Fig. 5. Working Hours After an Adverse Health Event by Type of Diagnosis. *Notes*: The underlying estimates can be found in Appendix 8. The panels present Model 20.

followed by recovery of the wage profile in comparison to their healthy peers; and a minor long-term wage profile reduction after other health problems.

Permanently employed women experience similar adjustments in their wages, except for women diagnosed with chronic and nonincapacitating problems. We found that the women diagnosed with respiratory conditions and nutritional conditions have a lower wage in the year of diagnosis (0.34%, and 0.53%, respectively); however, the difference in the wage disappears in the following year.

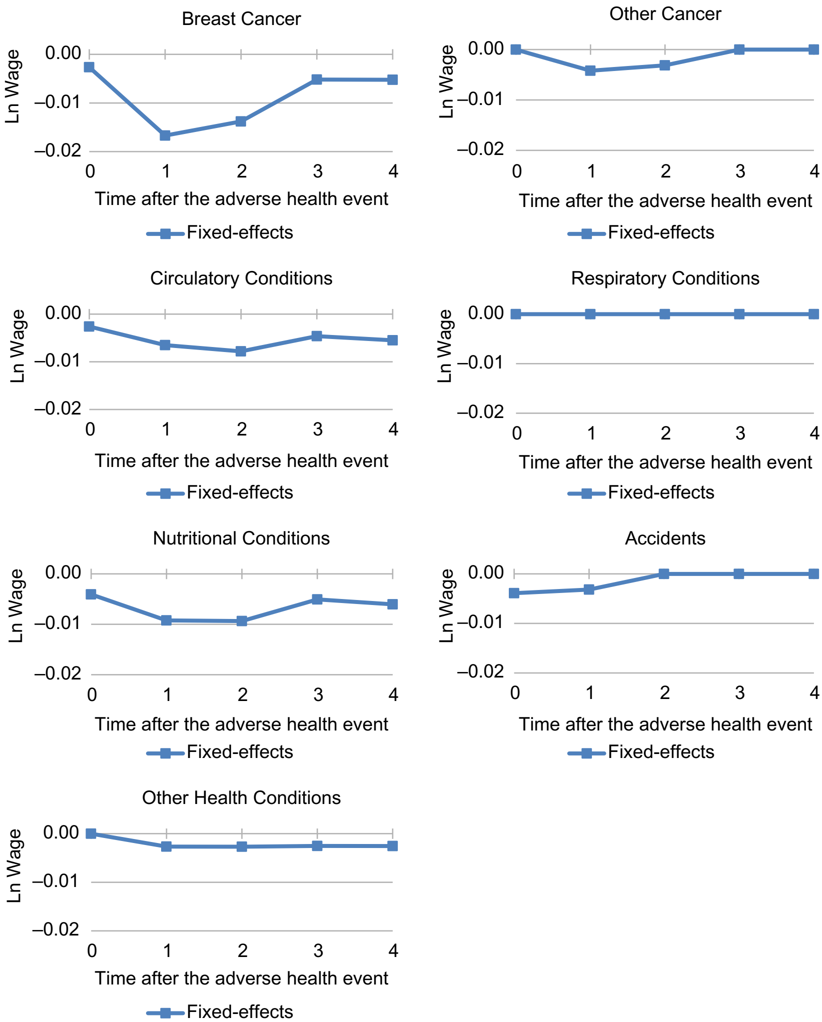

Fig. 6. Wage Rate Developments After an Adverse Health Event by Type of Diagnosis. *Notes*: The underlying estimates can be found in Appendix 8. The panels present Model 21.

6. ROBUSTNESS CHECKS

As a first robustness check, we randomly assigned to approximately 5 percent of the healthy women an adverse health event in a random year of the original period of observation, namely 2004 to 2012. The fraction of placebo diagnosis corresponds to the fraction of women who suffer from an adverse health event in the main analysis. We compared the labor market participation of the placebo diagnosed women and the other healthy women in the four years after the

Table 3. Placebo Diagnosis.

Variables	Model 27 Employment	Model 28 Hours	Model 29 LnWage
Placebo diagnosis	−0.000447	1.248	−0.00122
	(0.00117)	(1.851)	(0.00124)
Placebo diagnosis T-1	0.00127	0.299	−0.000433
	(0.00131)	(2.083)	(0.00135)
Placebo diagnosis T-2	−0.000375	2.502	−0.00163
	(0.00136)	(2.129)	(0.00141)
Placebo diagnosis T-3	0.000670	2.412	−0.000458
	(0.00132)	(2.050)	(0.00137)
Placebo diagnosis T-4	0.000462	−0.529	5.32e-06
	(0.00115)	(1.863)	(0.00125)
Constant	0.791***	1,478***	3.099***
	(0.00115)	(1.842)	(0.00113)
Family controls	Yes	Yes	No
Age dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	6,228,159	4,973,843	4,973,843
R^2	1,566,341	1,296,381	1,296,381
Number of ID	0.004	0.036	0.075

Notes: Clustered standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Models 27, 28, and 29 are estimations of Equation (1), Equation (2), and Equation (4), respectively.

placebo diagnosis. The results are presented in Table 3. The first column shows the estimate of a linear probability model with fixed effects. We do not observe any difference in the employment probability of the placebo diagnosed women and the healthy women in the four years after the placebo diagnosis. The second column reports the working hour estimates of a fixed-effect model. We do not observe any difference in the working hours of the placebo diagnosed women and the healthy women in the four years after the placebo diagnosis. Last, we compared the wage adjustments of the two groups by estimating a fixed-effect model. We do not observe any differences between the wage profiles of the two groups.[22] Based on these results, we can conclude that we capture the adverse health event in the main analysis.

As a second robustness check, we performed a subanalysis only on the sample of women who suffer from an adverse health event so that we can check whether those women have similar labor market participation before and after the adverse

[22]We performed for a second time this robustness check by giving a different random healthy group of women a placebo diagnosis. The results were the same: we did not observe any difference between the healthy and placebo diagnosed women.

health event.[23] We estimated Equations (1), (2), and (4) using fixed-effect models, where the comparison point is the employment of the women before they receive a diagnosis. The results in Table 4 shows a lower employment probability from the time of diagnosis up to and including four years later, in comparison to the years before the diagnosis. We observe also a decrease in working hours and the wage profile. This robustness check supports our main findings that an adverse health event is related to a decrease in employment probability, a minor decrease in working hours, and a decrease in the wage profile.

Table 4. Results of the Sample of Diagnosed Women.

Variables	Model 30 Employment	Model 31 Hours	Model 32 LnWage
Diagnosis	−0.00203***	−4.774***	0.000862***
	(0.000268)	(0.441)	(0.000308)
Diagnosis T-1	−0.00598***	−11.51***	−0.00133***
	(0.000323)	(0.517)	(0.000350)
Diagnosis T-2	−0.00804***	−17.33***	−0.00136***
	(0.000362)	(0.574)	(0.000376)
Diagnosis T-3	−0.0113***	−15.11***	−0.000694*
	(0.000390)	(0.613)	(0.000407)
Diagnosis T-4	−0.0103***	−13.25***	−0.000886**
	(0.000393)	(0.626)	(0.000423)
Constant	0.895***	1,781***	2.105***
	(0.00202)	(3.262)	(0.00200)
Family controls	Yes	Yes	No
Age dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	7,450,324	5,681,716	5,681,716
Number of id	1,040,761	869,507	869,507
R^2	0.010	0.061	0.131

Notes: Clustered standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Model 30, 31 and 32 are estimations of Equation (1), Equation (2), and Equation (4), respectively.

[23] In the main analysis, women are part of the control group until the moment that they suffer from an adverse health event. As a result, the composition of the control group changes dynamically: in the comparison of the labor market participation after the adverse health event, we compare women who receive a diagnosis not only with women who would never receive an adverse health event, but also with women who will later receive a diagnosis. We compare the labor market participation trends of the two sub-groups that form the control group. Our results show parallel trends in labor market participation before the adverse health event. The results are presented in Appendix 10.

7. DISCUSSION AND CONCLUSION

This chapter estimates the adjustments in employment status, working hours, and wage of women in the Netherlands after an adverse health event. Our findings show that women who experienced an adverse health event are likely to reduce their employment probability from the time of diagnosis up to four years later in comparison to their healthy peers, which is in line with previous studies (García-Gómez et al., 2013; Halla & Zweimüller, 2013; Jones et al., 2016). We observe about one percentage point reduction in employment probability in the fourth year after the diagnosis. To put this in perspective, the observed reduction is comparable to the additional observed mortality among this group of women over the same time period. Furthermore, our findings suggest that the employment adjustments after the adverse health event are related to the degree of job protection. For women who are in permanent employment and therefore cannot be laid off during the first two years after the onset of the health condition, we observe a reduction in their employment probability only after the protection period and to a lesser extent (0.44 percentage points). This result is in line with the idea that longer institutional employment protection provides the employee with more time to recover and as a result, the health condition would have a smaller impact on the employment probability of the individual. In line with Markussen et al. (2012), our result suggests that having a job to return to rather than looking for a job could be positive for the long-term employment of the individual.

For the women who stay in employment, we found that they are likely to work less hours contractually after an adverse health event, namely 4.5 hours a year in the year of diagnosis and 12 hours a year four years later in comparison to their healthy peers. These reductions, however, are negligible in economic terms. Furthermore, while we observe adjustments both in employment probability and contractual working hours during the first two years after the adverse health event, the adjustments are mainly in employment probability during the next two years. This result suggests that women adjust their contractual working hours only in the short term. Nevertheless, our finding that the reduction in working hours was negligible suggests that employment exit was the main mechanism of labor market adjustment, which is in line with Jones et al. (2016). Women in temporary and permanent employment adjusted similarly their working hours.

Lastly, considering the hourly wage adjustments, we did not find differences between the women who were and were not diagnosed, which is in accordance with the findings of Jones et al. (2016). Interestingly, this was also the case for the women in permanent employment. However, we found some important differences in the wage adjustments when we considered the different types of adverse health events. First, we found that temporary health conditions were related to a temporary decrease in the wage profile: 1.7 percent reduction one year after the diagnosis for breast cancer patients, and 0.5 percent for other cancer patients, followed by partial wage recovery for the former and full wage recovery for the later by the fourth year after the diagnosis. Second, we found that the chronic and incapacitating conditions such as circulatory conditions are related to a long-term decrease in the wage profile (approximately 0.5 percent). Third, we found two different patterns after chronic and nonincapacitating health conditions, namely no wage difference after respiratory conditions and continuously lower wage profile after nutritional conditions. Interestingly, the wage patterns were similar when we considered the permanently employed women, except for the women diagnosed with chronic and nonincapacitating health conditions. There we found an initially lower wage at the time of diagnosis, followed by a full wage recovery in the consequent year. While our results are in line with Pelkowski and Berger (2004) and point at the importance of considering the severity of the health condition when evaluating the consequent wage adjustments, they also show that the wage adjustments for the chronic and nonincapacitating health conditions are different between women with a different degree of institutional job protection.

Disentangling the two effects – institutions and severity – could be beneficial for further understanding of the labor market adjustments after adverse health events, as well as for improvements in the social security system. It is important to note that we do not observe the individual preferences toward work before and after the diagnosis. As a result, we cannot disentangle if it is a personal choice to change the labor supply or the observed adjustments are a result of changes in the labor demand. Further research would be beneficial for answering this question. Furthermore, the labor maker adjustments after an adverse health event that we observe for women may not be similar for men. Therefore, future investigations into how men behave after an adverse health event would be helpful to understand whether there are differences between the two genders.

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APPENDIX 1. LMR DESCRIPTION AND CORRECTION FOR DATA COVERAGE

An individual is considered as suffering from a disease throughout the year if she has visited a hospital and the condition has been recorded as the main diagnosis. The coding of the diagnosis follows the "Classification of Sicknesses, 1980" which is based on the International Statistical Classification of Diseases and Related Health Problems, 9 Revision, Clinical Modification. We divide the health conditions into the following groups: breast cancer; other type of cancer; circulatory conditions; diseases of the respiratory system; endocrine, nutritional, and metabolic diseases; accidents; and other health conditions. In cases when the individual has been in the hospital for cancer therapy, such as radiotherapy, chemotherapy, and/or immunotherapy, then this entry has been allocated to either breast cancer, other cancer, or to both based on the incidence of cancer up to three years before. Furthermore, we exclude hospital entries related to birth giving (1.36 % of the hospital entries).

The group Other health conditions consists of infectious and parasitic diseases (1.02%); diseases of the blood and blood-forming organs (1.07%); mental disorders (1.10%); diseases of the nervous system (4.72%); diseases of the sense organs (4.81%); diseases of the digestive system (14.77%); diseases of the genitourinary system (20.19%); diseases of skin and subcutaneous tissue (2.26%); diseases of musculoskeletal system and connective tissue (17.95%); congenital anomalies (0.68%); certain conditions originating in the perinatal period (0.02%); symptoms, signs, and ill-defined conditions (16.63%); and supplementary classification (19.65%). Since individuals can be diagnosed with more than one condition each year, the sum of all different diagnosis which are grouped in "other health conditions" may exceed 100 percent. The distribution of other health problems reflects the Dutch health care system, where an individual first goes to the general practitioner before having access to a hospital (unless it is an emergency). Due to the "gate-keeper" role of the general practitioners, we observe only a small fraction of mental health problems, for example, while the actual percentage is likely to be much higher across the Dutch population. Observing only hospital visits means that we observe mainly the more severe cases, which would have an impact on the work capabilities of the employee, and as such improves the validity of our results.

It is important to note that the Hospital registry does not contain exhaustive information pertaining to all hospitals in the Netherlands. Up to and including 2005, the data contain information about inpatient and daycare patients from all general and university hospitals in the Netherlands (García-Gómez et al, 2013). However, from 2006 the participation in the registry has become voluntary and, therefore, the coverage has decreased (García-Gómez and Gielen, 2018). Over all, according to Van der Laan (2013), the data provide record about approx. 88 percent of the inpatient hospital stays in the country, which is retrieved from general and university hospitals and one specialty hospital. This implies that if we do not correct for the limited coverage of the data, we would underestimate the cases of health conditions in the Dutch population and our results will suffer from attenuation bias. To limit this problem, we use the Housing registry to compute the percentage of people in each municipality who have visited a hospital. We use the postal code distribution across municipality borders from the year 2012, namely 415 municipalities, to avoid bias from changes in the borders. The percentage of individuals who have visited a hospital measured on a municipality level before the years of voluntary reporting is consistently above 5 percent, and after that it falls to 1 percent for some municipalities. This statistic guides us to choose 5 percent as a lower boundary for censoring the data. The result of the censoring is excluding a minimum of seven municipalities in 2005, and a maximum of 44 in 2008.

APPENDIX 2. MORTALITY

We observe the employment patterns only for the women who survive. As such it is important also to consider the differences in the mortality rates among the women diagnosed with different health conditions. We distinguish between women who are: healthy (they have not had a health condition during the last four years) and diagnosed for a first time with any health condition, breast cancer, other cancer, circulatory condition, respiratory condition, nutritional condition, other health condition or had an accident. Table A1 shows the four-year mortality rate from the time of diagnosis. We consider separately employed women (Panel A) and nonemployed women at the time of diagnosis (Panel B), because they could have different mortality rates (Martikainen & Valkonen, 1996).[24]

First, we observe that initially employed women have consistently lower mortality than initially nonemployed women, which is in line with the findings of Martikainen and Valkonen (1996). Second, we observe that unhealthy women have a higher mortality rate than the healthy one: the additional observed mortality among first-diagnosed women is 0.8 percentage points higher compared to healthy women in the group of initially employed women, and 1.6 percentage points higher in the group of initially nonemployed women. Third, women diagnosed with cancer have the highest mortality rate. However, while the mortality among women diagnosed with cancer decreases over time for the employed women, the one among the initially nonemployed women does not seem to have a trend. Last, the lowest mortality is observed in the group of women who suffer from other health conditions (for the initially nonemployed) and who have had an accident (for the initially employed).

[24]Table A1 does not include the women who are diagnosed and die in the same calendar year. They are not considered in the empirical analysis, since we always observe employment on December 31st of the calendar year. For these mortality statistics, see Appendix 3.

Table A1. Four-year Mortality Statistics by Employment Status and Type of Diagnosis.

Year	Healthy	First Diagnosed	Breast Cancer	Other Cancer	Circulatory Conditions	Respiratory Conditions	Nutritional Conditions	Other health Conditions	Accidents
Panel A: Employed Women at the Time of Diagnosis									
2004	0.29%	1.10%	7.59%	7.01%	1.18%	1.07%	1.46%	0.74%	0.97%
2005	0.28%	1.10%	6.81%	6.69%	1.16%	1.03%	1.23%	0.88%	1.00%
2006	0.28%	1.03%	6.27%	6.57%	1.04%	0.96%	0.88%	0.70%	0.96%
2007	0.28%	0.99%	5.79%	6.80%	1.06%	1.11%	1.39%	0.62%	0.90%
2008	0.29%	1.04%	6.01%	6.47%	1.08%	1.06%	1.31%	0.70%	0.95%
Panel B: Nonemployed Women at the Time of Diagnosis									
2004	0.70%	2.27%	10.31%	11.51%	2.85%	3.97%	4.41%	3.03%	2.12%
2005	0.70%	2.28%	9.92%	10.75%	2.75%	4.16%	3.53%	3.84%	2.14%
2006	0.71%	2.28%	9.88%	10.78%	2.66%	4.47%	4.17%	3.18%	2.12%
2007	0.74%	2.27%	9.23%	11.32%	2.82%	4.46%	5.19%	2.77%	2.13%
2008	0.74%	2.32%	8.54%	11.73%	2.87%	4.99%	3.59%	3.15%	2.25%

Notes: The table reports the four-year mortality statistic per type of adverse health event. The top panel reports the mortality statistic for the women who are employed at the time of diagnosis, and the bottom panel reports the mortality statistic for the women who are not employed at the time of diagnosis.

APPENDIX 3. MORTALITY UP TO THE END OF THE CALENDAR YEAR

Since we observe most of the characteristics on 31st December (such as family situation, work, and location), women must survive until then to be included in our sample. Table A2 shows the mortality rates before 31st December of women diagnosed with a specific type of disease in the corresponding calendar year. Comparing those with the four-year mortality statistics (Table A1), we observe similar trends: women diagnosed with cancer have the highest mortality probability; women who suffer from other health conditions and/or have had an accident have one of the lowest.

Table A2. Mortality Statistics up to the End of the Calendar Year.

Year	Breast Cancer	Other Cancer	Circulatory Conditions	Respiratory Conditions	Nutritional Conditions	Other Health Conditions	Accidents
2004	3.07%	7.34%	2.41%	1.28%	1.58%	0.70%	0.81%
2005	2.66%	7.01%	2.14%	1.70%	1.45%	0.70%	0.84%
2006	2.95%	6.89%	2.06%	1.63%	1.50%	0.67%	0.65%
2007	2.64%	6.34%	2.20%	1.56%	1.28%	0.62%	0.71%
2008	2.96%	6.19%	1.87%	1.72%	1.47%	0.64%	0.52%

Notes: The table reports the percentage of women who die before the end of the calendar year per type of adverse health event.

APPENDIX 4. SIMULTANEOUS OCCURRENCE OF ADVERSE HEALTH EVENTS

Table A3. Simultaneous Occurrence of Adverse Health Events.

Disease	Breast Cancer	Other Cancer	Circulatory Problems	Respiratory Problems	Nutritional Problems	Accidents	Other Health Problems
Breast cancer		2.53%	0.31%	0.40%	0.34%	0.21%	0.94%
Other cancer	7.93%		1.44%	1.26%	2.14%	0.61%	2.15%
Circulatory	1.02%	1.50%		1.29%	1.53%	0.91%	1.69%
Respiratory	0.86%	0.87%	0.85%		0.96%	0.44%	0.84%
Nutritional	0.29%	0.57%	0.39%	0.37%		0.26%	0.43%
Accidents	0.26%	0.24%	0.34%	0.25%	0.38%		0.70%
Other	23.40%	17.14%	12.84%	9.75%	12.75%	14.34%	
Overlap	33.75%	22.85%	16.18%	13.33%	18.11%	16.78%	6.75%
No overlap	66.25%	77.15%	83.82%	86.67%	81.89%	83.22%	93.25%
Total number	36307	113789	118860	78155	30425	44381	905554

Notes: The table reports the overlap of health conditions. Each column reports per type of health condition the percentage of woman who has been diagnosed with another type of health condition. The sum of the percentages and the percentage of women who did not receive another diagnosis is equal to 100%. The last row reports the total amount of women who received a specific diagnosis.

APPENDIX 5. WORKING HOURS

The first work indicator of interest is employment. An individual is considered as employed if she had a job in the Netherlands for at least one day throughout the calendar year. For the employed individuals, we are interested in their intensive margin of labor market participation. Therefore, we construct a normalized measure, which is a continuous variable ranging from 0 (denoting working 0 hours throughout the year) to 1 (working full time all year long). The variable is composed as follows:

$$\text{LMsupply} = \frac{\text{calendar days worked} * fte}{\text{total calendar days per year}}$$

Where *calendar days worked* stands for the calendar days the individual has had a job. The time span is corrected for job overlaps. *fte* denotes the weighted average of the full-time work equivalent from all the jobs the individual has had in that calendar year. It spans from 0, denoting no work, to 1, denoting full-time work. The weighting is based on the length of the job. Lastly, *total calendar days per year* is equal to the actual length of the calendar year.

From this labor supply indicator, we can retrieve the number of hours the individual has worked throughout the year:

$$\text{Hours worked} = \text{LMsupply} * 40 * 52$$

where 40 is the number of hours in the work week and 52 denotes the number of weeks in the year. Therefore, our initial indicator ranging from 0 to 1, now spans from 0 to 2080 hours per year. From this information and the gross yearly income of the individual we can retrieve the average hourly wage:

$$\text{Wage rate} = \frac{\text{cumulative gross yearly income}}{\text{hours worked}}$$

APPENDIX 6. EMPLOYMENT STATUS, ANNUAL HOURS OF WORK, AND HOURLY WAGE RATES BY AGE

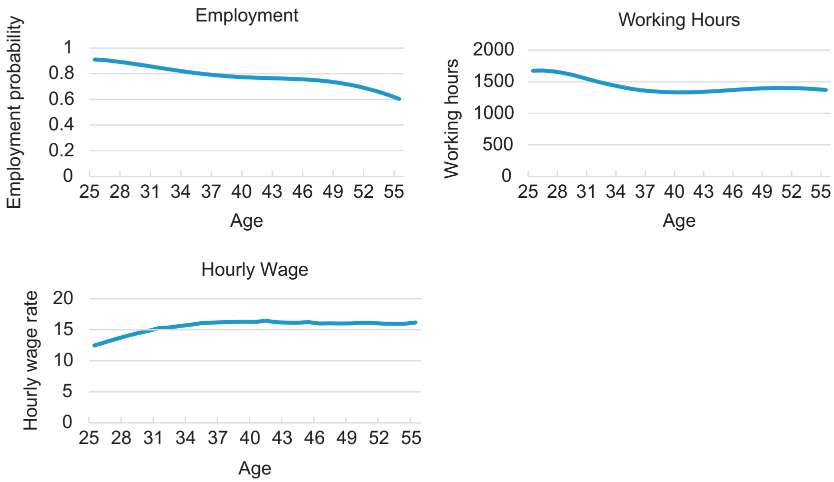

Fig. A1. Employment status, annual hours of work, and hourly wage rates by age. *Notes*: Own calculations based on population data from Statistics Netherlands for the period 2004–2012.

APPENDIX 7. EMPLOYMENT, WORKING HOURS AND WAGE ESTIMATES: NO DISTINCTION BETWEEN HEALTH CONDITIONS

Table A4. Employment, Working Hours and Wage: No Distinction between Health Conditions.

Variables	Model 1 RE Employment	Model 2 FE Employment	Model 3 Tobit Hours	Model 4 RE (fs) Hours	Model 5 RE (es) Hours	Model 6 FE Hours	Model 7.1 Heckman 1 Employment	Model 7.2 Heckman 2 LnWage	Model 8 RE LnWage	Model 9 FE LnWage
Diagnosis	−0.00422***	−0.00237***	−7.34***	−9.282***	−8.016***	−4.523***	−0.0587***	−0.00394***	−0.00402***	−0.000188
	(0.000249)	(0.000256)	(0.339)	(0.405)	(0.413)	(0.425)	(0.00311)	(0.000273)	(0.000290)	(0.000298)
Diagnosis T-1	−0.00812***	−0.00611***	−15.99***	−18.32***	−14.54***	−10.98***	−0.114***	−0.00665***	−0.00681***	−0.00273***
	(0.000284)	(0.000293)	(0.350)	(0.462)	(0.460)	(0.478)	(0.00318)	(0.000318)	(0.000319)	(0.000330)
Diagnosis T-2	−0.0102***	−0.00795***	−21.81***	−24.92***	−19.68***	−15.87***	−0.141***	−0.00724***	−0.00744***	−0.00308***
	(0.000302)	(0.000313)	(0.359)	(0.492)	(0.487)	(0.508)	(0.00323)	(0.000291)	(0.000334)	(0.000347)
Diagnosis T-3	−0.0134***	−0.0109***	−24.59***	−28.11***	−18.07***	−14.04***	−0.183***	−0.00701***	−0.00729***	−0.00272***
	(0.000310)	(0.000321)	(0.367)	(0.502)	(0.493)	(0.516)	(0.00328)	(0.000325)	(0.000341)	(0.000354)
Diagnosis T-4	−0.0135***	−0.0106***	−24.04***	−27.53***	−16.44***	−11.90***	−0.186***	−0.00701***	−0.00731***	−0.00244***
	(0.000300)	(0.000311)	(0.373)	(0.486)	(0.483)	(0.504)	(0.00332)	(0.000325)	(0.000335)	(0.000348)
Mills								−0.266***		
								(0.0165)		
Constant	0.944***	0.863***	1,942***	1,665***	1,782***	1,761***	2.734***	2.764***	2.505***	2.126***
	(0.000472)	(0.00101)	(1.503)	(0.982)	(0.835)	(1.620)	(0.00520)	(0.000556)	(0.000459)	(0.000985)
Family controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,948,460	22,948,460	22,948,460	22,948,460	17,712,316	17,712,316	22,948,460	17,712,316	17,712,316	17,712,316
Number of ID	3,804,345	3,804,345	3,804,345	3,804,345	3,109,970	3,109,970	3,804,345	3,109,970	3,109,970	3,109,970
R^2	0.0756	0.011		0.1567	0.1647	0.067		0.0128	0.0128	0.140

Notes: Clustered standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Model 1 and 2 are estimations of Equation (1). Model 3 to Model 6 are estimations of Equation (2). Model 7.1 is an estimation of Equation (3) and Models 7.2 to Model 9 are estimations of Equation (4). RE stands for a random-effects specification. FE stands for fixed effects specification. "fs" denotes full sample: both employed and nonemployed women. "es" denotes employed women only. Model 3 reports marginal effects of a random-effect Tobit specification. Model 7.1 reports random-effect Probit estimates. Mills denotes the inverse Mills ratio. Model 7.2 has bootstrapped standard errors from 200 replications.

Table A5. Employment, Working Hours and Wage: No Distinction Between Health Conditions, a Subsample of Permanently Employed.

Variables	Model 10 RE Employment	Model 11 FE Employment	Model 12 Tobit Hours	Model 13 RE (fs) Hours	Model 14 RE (es) Hours	Model 15 FE Hours	Model 16.1 Heckman 1 Employment	Model 16.2 Heckman 2 LnWage	Model 17 RE LnWage	Model 18 FE LnWage
Diagnosis	0.00102***	0.00184***	0.00157	−0.655*	−2.052***	−0.241	−0.0594***	−0.00470***	−0.00441***	−0.00145***
	(0.000175)	(0.000176)	(0.3049471)	(0.368)	(0.458)	(0.474)	(0.00680)	(0.000311)	(0.000334)	(0.000343)
Diagnosis T-1	0.00117***	0.00206***	−2.306***	−3.178***	−5.829***	−3.535***	−0.0742***	−0.00816***	−0.00778***	−0.00440***
	(0.000206)	(0.000208)	(0.3172155)	(0.428)	(0.518)	(0.543)	(0.00685)	(0.000334)	(0.000371)	(0.000384)
Diagnosis T-2	−0.000873***	0.000122	−8.673***	−10.29***	−12.95***	−10.48***	−0.163***	−0.00827***	−0.00727***	−0.00374***
	(0.000225)	(0.000227)	(0.326441)	(0.462)	(0.558)	(0.587)	(0.00687)	(0.000382)	(0.000392)	(0.000407)
Diagnosis T-3	−0.00476***	−0.00366***	−12.750***	−14.49***	−11.89***	−9.722***	−0.296***	−0.00817***	−0.00615***	−0.00248***
	(0.000234)	(0.000237)	(0.3335866)	(0.473)	(0.556)	(0.587)	(0.00681)	(0.000366)	(0.000392)	(0.000408)
Diagnosis T-4	−0.00564***	−0.00439***	−14.132***	−15.71***	−12.61***	−10.60***	−0.308***	−0.00826***	−0.00613***	−0.00233***
	(0.000223)	(0.000225)	(0.3380053)	(0.450)	(0.536)	(0.562)	(0.00706)	(0.000369)	(0.000384)	(0.000398)
Mills								0.0186***		
								(0.000515)		
Constant	0.754***	0.726***	1.621***	1.423***	1.982***	2.021***	−0.516***	2.823***	2.601***	2.205***
	(0.00104)	(0.00120)	(3.195)	(2.192)	(2.458)	(3.405)	(0.00863)	(0.000714)	(0.00166)	(0.00215)
Family controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,376,327	11,376,327	11,376,327	11,376,327	7,067,456	7,067,456	11,376,327	7,067,456	7,067,456	7,067,456
Number of ID	2,545,482	2,545,482	2,545,482	2,545,482	1,588,830	1,588,830	2,545,482	1,588,830	1,588,830	1,588,830
R^2	0.0265	0.019		0.0723	0.1803	0.068		0.0388	0.0371	0.170

Notes: Clustered standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Model 10 and 11 are estimations of Equation (1). Model 12 to Model 15 are estimations of Equation (2). Model 16.1 is an estimation of Equation (3) and Models 16.2 to Model 18 are estimations of Equation (4). RE stands for a random-effects specification. FE stands for fixed effects specification. "fs" denotes full sample: both employed and nonemployed women. "es" denotes employed women only. Model 12 reports marginal effects of a random-effect Tobit specification. Model 16.1 reports random-effect Probit estimates. Mills denotes the inverse Mills ratio. Model 16.2 has bootstrapped standard errors from 200 replications.

APPENDIX 8. EMPLOYMENT, WORKING HOURS AND WAGE: THE DISTINCTION BETWEEN HEALTH CONDITIONS

Variables	Model 19	Model 20 Full Sample	Model 21	Model 22	Model 23 Permanently Employed	Model 24
	Employment	Hours	LnWage	Employment	Hours	LnWage
BrCancerT	−0.00272**	−8.799***	−0.00265*	0.00103	−2.105	−0.00171
	(0.00133)	(2.203)	(0.00160)	(0.000933)	(2.317)	(0.00172)
BrCancerT-1	−0.0177***	−25.34***	−0.0167***	−0.000331	−10.78***	−0.0218***
	(0.00164)	(2.524)	(0.00192)	(0.00116)	(2.713)	(0.00200)
BrCancerT-2	−0.0144***	−44.38***	−0.0138***	−0.00217	−34.69***	−0.0185***
	(0.00181)	(2.946)	(0.00207)	(0.00133)	(3.357)	(0.00232)
BrCancerT-3	−0.0222***	−44.23***	−0.00518**	−0.0126***	−35.99***	−0.00691***
	(0.00202)	(3.164)	(0.00224)	(0.00157)	(3.517)	(0.00240)
BrCancerT-4	−0.0193***	−33.99***	−0.00522**	−0.0116***	−31.09***	−0.00754***
	(0.00206)	(3.233)	(0.00229)	(0.00153)	(3.556)	(0.00247)
OtherCancerT	−0.00518***	−6.548***	1.72e-05	0.000424	−3.136**	−0.00186*
	(0.000769)	(1.266)	(0.000906)	(0.000532)	(1.347)	(0.000998)
OthCancerT-1	−0.00792***	−9.953***	−0.00420***	0.000305	−7.857***	−0.00650***
	(0.000913)	(1.473)	(0.00105)	(0.000653)	(1.618)	(0.00120)
OthCancerT-2	−0.00785***	−16.80***	−0.00313***	−0.00145*	−14.34***	−0.00492***
	(0.00100)	(1.636)	(0.00114)	(0.000742)	(1.837)	(0.00126)
OthCancerT-3	−0.0113***	−11.36***	−0.000366	−0.00612***	−8.619***	−0.00256**
	(0.00108)	(1.706)	(0.00120)	(0.000822)	(1.839)	(0.00130)
OthCancerT-4	−0.00890***	−8.410***	0.000524	−0.00536***	−8.619***	−0.000498
	(0.00108)	(1.741)	(0.00123)	(0.000798)	(1.857)	(0.00133)
CirculatoryT	−0.00283***	−6.824***	−0.00259***	0.00285***	−5.023***	−0.000700
	(0.000783)	(1.291)	(0.000938)	(0.000516)	(1.425)	(0.00104)
CirculatoryT-1	−0.00644***	−15.11***	−0.00650***	0.00352***	−8.492***	−0.00483***
	(0.000917)	(1.474)	(0.00107)	(0.000622)	(1.648)	(0.00118)
CirculatoryT-2	−0.00792***	−21.87***	−0.00781***	0.00126*	−19.06***	−0.00492***
	(0.00101)	(1.629)	(0.00116)	(0.000712)	(1.887)	(0.00130)
CirculatoryT-3	−0.0125***	−18.77***	−0.00461***	−0.00559***	−15.62***	−0.00235*
	(0.00107)	(1.701)	(0.00123)	(0.000779)	(1.894)	(0.00135)
CirculatoryT-4	−0.0127***	−13.78***	−0.00549***	−0.00680***	−12.17***	−0.00292**
	(0.00107)	(1.714)	(0.00123)	(0.000758)	(1.876)	(0.00130)
RespiratoryT	−0.00265***	−1.296	−0.000745	−0.000136	−3.441*	−0.00338***
	(0.000957)	(1.590)	(0.00108)	(0.000718)	(1.883)	(0.00130)
RespiratT-1	−0.00402***	−1.715	0.000369	0.000936	−4.927**	−0.00126
	(0.00109)	(1.792)	(0.00120)	(0.000840)	(2.191)	(0.00156)

(*Continued*)

Variables	Model 19	Model 20 Full Sample	Model 21	Model 22	Model 23 Permanently Employed	Model 24
	Employment	Hours	LnWage	Employment	Hours	LnWage
RespiratT-2	−0.00606***	−4.431**	−0.000864	−0.00146	−5.458**	−0.000675
	(0.00116)	(1.891)	(0.00123)	(0.000950)	(2.341)	(0.00158)
RespiratT-3	−0.00607***	−3.512*	−0.000424	−0.00204**	−5.573**	−0.000297
	(0.00117)	(1.908)	(0.00126)	(0.000982)	(2.359)	(0.00162)
RespiratT-4	−0.00365***	−2.598	0.00129	−0.00124	−6.904***	−0.00134
	(0.00112)	(1.861)	(0.00122)	(0.000932)	(2.273)	(0.00159)
NutritionalT	−0.0172***	−18.76***	−0.00406**	−0.00312***	−9.775***	−0.00526**
	(0.00167)	(2.755)	(0.00196)	(0.00116)	(3.084)	(0.00207)
NutritionT-1	−0.0116***	−14.59***	−0.00923***	−0.00366***	−10.55***	−0.00379
	(0.00198)	(3.237)	(0.00225)	(0.00139)	(3.704)	(0.00246)
NutritionT-2	−0.0107***	−12.55***	−0.00936***	−0.00504***	−15.58***	−0.00393
	(0.00217)	(3.582)	(0.00244)	(0.00156)	(4.234)	(0.00291)
NutritionT-3	−0.0112***	−4.602	−0.00506**	−0.00850***	−10.65**	−0.00311
	(0.00231)	(3.683)	(0.00255)	(0.00162)	(4.208)	(0.00288)
NutritionT-4	−0.00519**	−6.625*	−0.00603**	−0.00748***	−12.03***	−0.000864
	(0.00232)	(3.788)	(0.00258)	(0.00161)	(4.157)	(0.00280)
AccidentsT	−0.00457***	−12.75***	−0.00390***	0.000506	−4.070*	−0.00262
	(0.00126)	(2.128)	(0.00146)	(0.000878)	(2.303)	(0.00168)
AccidentsT-1	−0.0103***	−10.54***	−0.00316*	−6.45e-05	−2.804	−0.00373**
	(0.00147)	(2.439)	(0.00164)	(0.00107)	(2.668)	(0.00184)
AccidentsT-2	−0.0132***	−11.57***	−0.00106	4.64e-05	−8.933***	0.00176
	(0.00161)	(2.644)	(0.00179)	(0.00120)	(3.092)	(0.00214)
AccidentsT-3	−0.0132***	−6.499**	−0.00200	−0.00607***	0.624	−0.000878
	(0.00172)	(2.807)	(0.00191)	(0.00133)	(3.115)	(0.00226)
AccidentsT-4	−0.0106***	−8.825***	0.00277	−0.00423***	−2.788	−0.000403
	(0.00168)	(2.797)	(0.00193)	(0.00127)	(3.152)	(0.00230)
OthHealthPr	−0.00300***	−4.779***	0.000146	0.00138***	−0.420	−0.00164***
	(0.000283)	(0.470)	(0.000327)	(0.000196)	(0.526)	(0.000377)
OthHProbT-1	−0.00667***	−11.64***	−0.00266***	0.00147***	−3.814***	−0.00422***
	(0.000327)	(0.533)	(0.000366)	(0.000234)	(0.609)	(0.000426)
OthHProbT-2	−0.00854***	−15.76***	−0.00269***	−0.000660**	−10.13***	−0.00331***
	(0.000353)	(0.573)	(0.000389)	(0.000257)	(0.661)	(0.000457)
OthHProbT-3	−0.0109***	−13.66***	−0.00252***	−0.00381***	−9.572***	−0.00212***
	(0.000365)	(0.588)	(0.000401)	(0.000269)	(0.671)	(0.000463)
OthHProbT-4	−0.0104***	−11.19***	−0.00254***	−0.00429***	−10.09***	−0.00219***
	(0.000360)	(0.583)	(0.000401)	(0.000259)	(0.651)	(0.000461)
Constant	−0.00272**	−8.799***	2.126***	0.00103	−2.105	2.204***
	(0.00133)	(2.203)	(0.000985)	(0.000933)	(2.317)	(0.00215)

(*Continued*)

Variables	Model 19	Model 20 Full Sample	Model 21	Model 22	Model 23 Permanently Employed	Model 24
	Employment	Hours	LnWage	Employment	Hours	LnWage
Family controls	Yes	Yes	No	Yes	Yes	No
Age dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,948,460	17,712,316	17,712,316	11,376,327	7,067,456	7,067,456
Number of ID	3,804,345	3,109,970	3,109,970	2,545,482	1,588,830	1,588,830
R^2	0.011	0.067	0.140	0.019	0.068	0.170

Notes: Clustered standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.10$. Models 19 and 22 are estimations of Equation (1). Models 20 and 23 are estimations of Equation (2). Models 21 and 24 are estimations of Equation (4). Models 22 to 24 are estimated on a subsample of permanently employed women. We use a fixed-effects specification for all estimates.

APPENDIX 9. AGE GRADIENT IN THE EMPLOYMENT ADJUSTMENT

It is likely that the employment adjustments after an adverse health event are different for younger and older women. To determine whether this is the case, we estimate Equation (1) as a fixed-effects model where we allow for an interaction effect between age and the adverse health event. We divide the women into three age groups: 25−35; 36−45; and 46−55. The youngest group is used as a reference category.

Our results show that while women from all age groups reduce their employment, the magnitude of the reduction increases with age. The age heterogeneity is similar for the women in permanent employment; though, the adjustments for those women are smaller in magnitude, which is comparable to our main results. Furthermore, we observe the two-year job protection in the analysis of the permanently employed women, as we did in the main analysis.

Table A6. Age Gradient in Employment Adjustments.

	Model 25			Model 26		
Variables	Full Sample			Permanently Employed		
	Employment			Employment		
Age:	Main Effect	35−45	46−55	Main Effect	35−45	46−55
Diagnosis	−0.00104**	−0.00145**	−0.00262***	0.00253***	−0.000754	−0.00106**
	(0.000500)	(0.000650)	(0.000627)	(0.000469)	(0.000532)	(0.000526)
Diagnosis T-1	−0.00430***	−0.00173**	−0.00361***	0.00331***	−0.00138**	−0.00177***
	(0.000565)	(0.000720)	(0.000713)	(0.000539)	(0.000602)	(0.000608)
Diagnosis T-2	−0.00563***	−0.00119	−0.00537***	0.000711	−0.000173	−0.00128*
	(0.000602)	(0.000757)	(0.000762)	(0.000578)	(0.000640)	(0.000656)
Diagnosis T-3	−0.00569***	−0.00328***	−0.0107***	−0.000867	−0.00129**	−0.00497***
	(0.000618)	(0.000777)	(0.000786)	(0.000586)	(0.000654)	(0.000674)
Diagnosis T-4	−0.00460***	−0.00345***	−0.0123***	−0.00143**	−0.00110*	−0.00540***
	(0.000604)	(0.000766)	(0.000769)	(0.000564)	(0.000636)	(0.000649)
Constant		0.863***			0.726***	
		(0.00101)			(0.00120)	
Family controls		Yes			Yes	
Age dummies		Yes			Yes	
Year dummies		Yes			Yes	
Observations		22,948,460			11,376,327	
Number of ID		3,804,345			2,545,482	
R^2		0.011			0.019	

Notes: Clustered standard errors in parentheses. Fixed effects specification. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

APPENDIX 10. PARALLEL TRENDS IN LABOR MARKET PARTICIPATION BEFORE THE ADVERSE HEALTH EVENT

As an additional robustness check, we perform a "weak" test of the parallel trends in labor market participation of the women who will suffer from an adverse health event and those that would not suffer from an adverse health event. It is a weak test, because the composition of the control group changes dynamically, as explained in Footnote 23: we compare the labor market participation of women who receive a diagnosis not only with women who would not suffer from an adverse health event in the time span that we observe but also with women who will receive a diagnosis later in time.

To determine whether there are parallel trends, we estimate Equations (1), (2), and (4) as fixed-effects models where we include variables denoting the future occurrence of an adverse health event, namely Diagnosis T + 1, Diagnosis T + 2, and Diagnosis T + 3. Each of those is a binary variable which is equal to 1 if the woman suffers from an adverse health event in the respective future period (T + 1, T + 2, and T + 3, respectively), and equal to 0 otherwise. The results of Model 33, presented in Table A7, show that the employment probability difference between the women who suffer from an adverse health event and those that do not is stable in the three years before the diagnosis, namely, it is about 9 percentage points. This result suggests parallel trends in the employment probability of the two groups. With respect to the working hours, Model 34 shows that the working hours on a yearly basis differ between the two groups with about 9.5 hours three years before the diagnosis and the gap increases to 13.5 hours in the year before the diagnosis. Even though those results are statistically significant, they are not economically significant. Lastly, with respect to the wage development, we observe a stable difference of about 0.2 percentage points throughout the three years before the adverse health event.

To sum up, we observe parallel trends in the labor market participation between women who will and will not suffer from an adverse health event in the three years before the event.

Table A7. Parallel Trends Before the Adverse Health Event.

Variables	Model 33 Employment	Model 34 Hours	Model 35 LnWage
Diagnosis T + 3	0.00872***	9.641***	0.00237***
	(0.000353)	(0.596)	(0.000425)
Diagnosis T + 2	0.00941***	12.13***	0.00222***
	(0.000369)	(0.609)	(0.000418)
Diagnosis T + 1	0.00861***	13.66***	0.00180***
	(0.000372)	(0.601)	(0.000408)
Diagnosis	0.00288***	2.816***	0.000893**
	(0.000371)	(0.595)	(0.000400)
Diagnosis T-1	−0.00110***	−3.998***	−0.00169***
	(0.000375)	(0.600)	(0.000406)
Diagnosis T-2	−0.00349***	−9.576***	−0.00211***
	(0.000369)	(0.593)	(0.000402)
Diagnosis T-3	−0.00707***	−8.632***	−0.00187***
	(0.000356)	(0.571)	(0.000391)
Diagnosis T-4	−0.00743***	−7.580***	−0.00176***
	(0.000329)	(0.534)	(0.000368)
Constant	0.858***	1,754***	2.125***
	(0.00103)	(1.648)	(0.00103)
Family Controls	Yes	Yes	No
Age Dummies	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Observations	22,948,460	17,712,316	17,712,316
Number of ID	3,804,345	3,109,970	3,109,970
R^2	0.011	0.067	0.141

Notes: Clustered standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$. Model 33, 34, and 35 are estimations of Equation (1), Equation (2), and Equation (4), respectively.