ANALYSES OF SICKNESS ABSENCE

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Chapter 1
Introduction

Sickness absence is an empirical phenomenon of all time. Generally, it has a medical cause. However, other factors also appear to have an impact on the actual rate of sickness absence, such as the institutional setting, the business cycle and the economic structure. Many questions on the different dimensions of sickness absence are still not fully answered, since there are great differences between countries, firms and individuals.

Sickness absence is comparable to two other empirical phenomena on the labour market, strikes and unemployment, in the sense that the employees are not productive at work. Therefore, these three phenomena all represent lost labour time. Yet sickness absence has not received as much scholarly and media attention as strikes (Ashenfelter and Johnson, 1969) or unemployment (Layard et al., 1991). Strikes are a form of industrial disruption and as such have received much academic attention, but they are less common than sickness absence (Treble and Barmby, 2011). The same imbalance can be noticed between unemployment and sickness absence. When quantifying unemployment and sickness absence as two measures of inactivity, it appears that the Dutch sickness absence rate of 4.1 percent in 2012 corresponds to a labour loss of 320,000 employees, whereas the unemployment rate of 6.5 percent in 2012 affects 510,000 potential employees. The rate of sickness absence thus amounts to two-thirds to that of unemployment and yet unemployment is given

much more attention by the media and academics (Hassink, 2011). The opposite of these three concepts of unproductive labour time, overtime, has also received much more academic attention. Overtime working implies that actual working hours have exceeded contracted working hours and the remuneration rate often differs from that for standard hours (Hart, 2004).

One of the causes of the relative limited attention to sickness absence may be that this kind of absence is viewed as being unavoidable, it being a natural occurrence that employees become ill and report absent from work. There are, however, many differences between employees, firms and countries with regard to sickness absenteeism.

Sickness absence is clearly an important empirical phenomenon. It is, however, a highly fragmented topic of research, because studies of it arise in the medical sciences, sociology, psychology, labour economics, social insurance, health economics and industrial relations. Sickness absence research has gained more attention over the past few decades. In particular, the development of datasets and the movement of data collection taking place from an aggregated to an individual level, together with the accessibility of more firm-level case studies have improved the research potential. As more administrative employee-employer matched data have become available (Abowd and Kramarz, 1999), differences not only between employees but also between firms have begun to be studied empirically (Barmby et al., 2002).

Making use of the data developments, this dissertation provides an analysis of Dutch sickness absence at times of job

transition and health shocks. Nowadays, we can trace firms, employees and their health status over time in order to gain more insights into the underlying economic mechanisms. Since patterns of sickness absence vary from one employer or employee to another, it is essential to investigate the specific transitions or shocks that employees undergo. Examining sickness absence behaviour in relation to job transitions and health shocks should shed more light on the relation between sickness absence and incentives, selection and health.

Therefore, all the analyses in this dissertation are methodologically similar, in the sense that they involve a change, transition or shock for which we include the situation before, after, or both. Part I of the study focuses on sickness absence at a time when there are transitions in the labour market. How do employees change their effort on the work floor in such periods? We first focus on those who are moving from one job to another and study the effect of these transitions on the procyclical nature of absence. Then we concentrate on newly hired workers after a period of unemployment and investigate what incentives they respond to. Part II of this dissertation examines two specific health shocks, pregnancies and fractures, which influence sickness absence behaviour. We first investigate how the intensity of the condition affects absence behaviour, after which we focus on the triangle of health, absenteeism and social status.

The remaining part of this introduction is constructed as follows. Section 1.1 contains an overview of different perspectives on absenteeism. Since we make use of Dutch data in this dissertation, the Dutch institutional setting is given in Section 1.2. The aim of the

dissertation and more details of Parts I and II are provided in Section 1.3.

1.1 Different perspectives on absenteeism

1.1.1 Different disciplines researching absenteeism

Research on sickness absence has been carried out in several different disciplines, but there has been little interaction between them. Not only do the approaches of the different fields differ with respect to research objectives and data analyses, but so do the ways in which conclusions are drawn and results are presented.

In the medical sciences, for example, the subjects are usually patients or employees. Clinical research studying the development and prognosis of diseases in individuals often uses clinical trials to research the effects of various treatments.

Epidemiological research studies investigate effects at a group level, focusing on the way that exposure can influence the course of the disease. Medical examinations are necessary in the sick-reporting process and medical models relate diseases to some impairment of the ability to work and also on working conditions (Allebeck and Mastekaasa, 2004).

Sociological research on sickness absence focuses on group characteristics or on the conditions to which employees are exposed, such as the work environment, living conditions and the social security system. Theories on absence cultures are part of this, for norms regarding absence in the workplace may vary between firms. Data are often collected through questionnaires or interviews (Allebeck and Mastekaasa, 2004).

In the psychological research area, it is often the personal, psychological, social and organizational characteristics that are analysed in relation to sickness absence outcomes. Sickness absence is studied in relation to, amongst other things, the withdrawal hypothesis, which aims to explain the fact that employees with low job satisfaction report absent more often than others (Schaufeli et al., 2009). Data gathering here is often carried out through interviews as well. There is a comprehensive body of literature studying the relation between job satisfaction and absence behaviour. The relation, however, is inconsistent, and therefore theories and models are needed which include more explanatory variables (Allebeck and Mastekaasa, 2004).

Within economics, there is also a strand of literature on sickness absence that evolves over time; this strand is discussed next.

1.1.2 The development of economic research on absenteeism

Until the beginning of the 1990s, relatively little economic research had been carried out on the causes and effects of sickness absence (Brown and Sessions, 1996; Allebeck and Mastekaasa, 2004). Treble and Barmby (2011) report on some early contributions, such as that of Douglas (1919), who was among the first to research absenteeism and gave an overview of the studies current at the time. Stone reported on absence in an Elizabethan coal mine (1950), while Buzzard and Shaw considered the introduction of sick pay schemes (1952). During the 1970s, there were some economic research papers which studied a range of implications of absence related to overtime (Ehrenberg, 1970), job satisfaction (Flanagan et al., 1974), a firm's employment

decisions (Reza, 1975) and simultaneous presence on the work floor (Deardorff and Stafford, 1976). These studies were still not very coherent or coordinated (Brown and Sessions, 1996).

Steers and Rhodes (1987) wrote the first study (actually in the field of applied psychology) to include both work and personal characteristics; it used a model in which absence results from motivation and ability to be present. The process model gives not so much a unified theory with empirical validity, but rather an overview of the linkages of possible effects on the decision to be present or absent (Steers and Rhodes, 1978). The model was criticized by Barmby et al. (1991) and Steel et al. (2007) on the grounds that many of its concepts such as 'role stress' and 'personal work ethic' were too vague and its directions were not clearly specified. Although the Steers and Rhodes model (1978) was not very convincing, it is still considered an important contribution since it combined the personal characteristics of individual workers with job characteristics (Barmby et al., 1991; Brown and Sessions, 1996).

Freeman (1978) and Borjas (1979) suggested a positive correlation between job satisfaction and wages, after which, in the 1980s, there was a focal shift in sickness absence studies from job satisfaction to wages. From an economic point of view, absence was mostly analysed from a neoclassical labour supply perspective in a labour-leisure choice approach. Individual employees maximize their utility, depending on consumption goods (and thus work) and leisure, subject to time and budget constraints. Consequently, employees determined whether or not to be absent on the basis of their valuation of time at work relative to time elsewhere. If the employment contract

specifies contractual hours and the contract is accepted by the employee, the employee will absent him/herself as soon as the contractual hours exceed the desired hours at work at the going wage rate. When presence hours are flexible, this is less of a problem. In studies focusing on the labour supply side, the relation between absence and wages has been extensively researched. Wages can influence absence levels in both directions. On the one hand, higher wages are associated with a given level of consumption involving fewer hours worked and thus increased absence, reflecting the income effect. On the other hand, higher wages are related to increased economic losses when absent or dismissed, reflecting the substitution effect. Empirical evidence suggests that the substitution effect dominates the income effect, since a number of studies report the negative relationship between absence and wages (Allen, 1981a; Paringer, 1983; Allen, 1984; Dunn and Youngblood, 1986; Chaudhury and Ng, 1992; Drago and Wooden, 1992; Brown and Sessions, 1996; Vistnes, 1997). Other personal characteristics that are commonly included in these papers are gender, age, race, marital status, the presence of children, the part-time factor and unionization. In all these studies, employees try to align the actual hours worked with the desired hours at work by reporting absent. The firm acts passively, while the employees respond to a given wage structure.

The above studies refer to the supply side only; Allen (1981b) was the first to attempt to combine the labour supply and demand sides which are interrelated. He modelled an offer function for every employer with combinations of wages and the absence rates that they are willing to provide at a given profit level, as well as indifference

curves between wages and absence for each individual worker. The introduction of the labour demand side is inextricably linked to the imposition of a presence requirement. If the contractual presence hours were not defined, then the phenomenon of absenteeism (rather than sickness absenteeism) would not exist.[1] Firms and employees who are bound by contracts with more flexibility towards presence on the work floor usually experience lower absence levels. Therefore, absence amongst part-time workers (Chaudhury and Ng, 1992) and white-collar workers (Leigh, 1985) is lower because they have more flexible employment agreements. Barmby et al. (1994) introduce an efficiency wage approach, in which the firm no longer behaves passively. In order to ensure attendance, employers increase wages when monitoring costs are high. The costs of absence for a firm depend on the organization of the production process, the nature of the assembly-line technology (Weiss, 1985; Coles and Treble, 1993; Coles and Treble, 1996), the degree of complementarity among production factors (Coles et al., 2007) or teamwork (Heywood and Jirjahn, 2004; Heywood et al., 2008), performance-related pay (Pouliakas and Theodoropoulos, 2012) and firm size (Barmby and Stephan, 2000; Heywood and Jirjahn, 2004). Firms facing higher costs of absence will pay higher wages to discourage absence (Chatterji and Tilley, 2002).

[1] In this dissertation, we use the terms 'sickness absenteeism and 'absenteeism' interchangeably.

1.1.3 Different perspectives on absenteeism within the economic discipline

Within the current economic research on sickness absence, different approaches are distinguishable, related to the fields of labour economics, social insurance, health economics and industrial relations.

Labour economics

Sickness absence is a phenomenon related to the field of labour economics, because this field looks upon lost labour time as a consequence of which production is disrupted, substitutes need to be trained and absent employees need to be compensated. This may be caused by the characteristics of both labour supply and labour demand. An important concept in economic research on sickness absence is the role of incentives. Individual employees are assumed to make rational choices which have economic consequences. Moreover, they are perceived to be maximizing their utilities, in line with their desired work and leisure times (Brown and Sessions, 1996).

Sickness absence can be perceived as an indicator of lost productivity and hence it can be interpreted as an indicator of the employee's effort (Treble and Barmby, 2011). Therefore, studying sickness absence increases our knowledge of the way in which labour markets function and incentives given on the labour market work. Incentives which typically influence sickness absence are wages (Coles and Treble, 1993; Coles and Treble, 1996), sick pay and sickness insurance benefits (Barmby, 2002; Markussen et al., 2011; Treble and Barmby, 2011), production methods (Lanfranchi and Treble, 2010), job security (Ichino and Riphahn, 2004; Ichino and

Riphahn, 2005), bonuses (Hassink and Koning, 2009) and the business cycle (Arai and Thoursie, 2005; Askildsen et al., 2005; Nordberg and Røed, 2009). As a result of collecting data for research into these incentives from registers, administrative data are now increasingly available (Allebeck and Mastekaasa, 2004).

Some of the factors that influence individual sickness absence also explain changes over time in the levels of sickness absence, such as changes in the institutional framework or labour market conditions. Changed legislation, such as a privatized sickness benefits system that makes the system stricter, can lower the level of sickness absence. In addition, labour market conditions are also essential for explaining changes over time in the levels of sickness absence. First, increased unemployment induces a disciplinary effect on the absence rate, due to the fear of an increased probability of losing one's job. Second, the labour composition effect in times of economic downturn can also decrease the absence rate, since employees with high absenteeism may be more likely to be dismissed. Third, in times of economic growth, sickness absence may be high because of a true health effect caused by greater pressure at work (Allebeck and Mastekaasa, 2004). In addition, economic conditions are also related to health outcomes (Ruhm, 2000).

Theoretical models in the labour economic literature on absenteeism often do not include the health of individuals. Theories are often formulated for absence in general terms rather than specifically for sickness absence. In addition, empirical studies have rarely included health (unlike, e.g., Allen, 1981a; Paringer, 1983; Leigh, 1991). Obviously, absence is a function of illnesses or specific

conditions, so it is remarkable that health is so often excluded from both theoretical and empirical models. An explanation for this could be that the reason for absence and the type of illness are often not registered. Differences in absence levels between employers and employees can be due to the heterogeneity in the employees' duty to report absent in case of a given level of sickness, or to heterogeneity in the firms' norms of what constitutes an 'acceptable' level of sickness that would justify absence. Moreover, an employee's panel doctor can influence the propensity to report absent (Markussen et al., 2011).

The idea of minimising absence to a zero-tolerance level is not desirable, for minor or major sicknesses are constantly threatening (Treble and Barmby, 2011). Trying to push absence to an excessively low incidence is not consistent with profit maximization. If an employee is seriously ill, no incentives will be effective in making him or her hasten the return to work and absence control becomes ineffective. Attempting to pursue a zero-tolerance level of absence is in no way preferable, since this could encourage presenteeism, which means employees turning up for work, despite health problems, and being less productive there. Presenteeism is costly, since ill workers are less productive and may infect other employees (Chatterji and Tilley, 2002; Barmby and Larguem, 2009). However, the idea of exerting no influence on absence is not desirable either, because employees who reported absent are simply unable to work. In the Netherlands, absence rates rose steeply in the 1980s, due to generous benefits in the case of sickness absence and consequent disability. Different legislation and incentives, however, have shown to be

effective in reducing the absence rate. As a result, sickness absence has declined considerably. Since the absence rate includes more than merely sickness absence, there is room for influencing the level of sickness absence at the margins (Brown and Sessions, 1996).

It is apparent that the literature of sickness absence addresses a variety of themes in labour economics, such as procyclicality, adverse selection, incentives, sorting and supply and demand. These matters are at the heart of the discipline of labour economics and will be touched upon in this dissertation. Moreover, it is noteworthy that the theoretical models in the sickness absence literature do not deal with health, since obviously some questions may arise regarding the relationship between health, sickness absence and social status. Issues of this kind will also be addressed in this dissertation.

Social insurance

In the case of sickness absence, employees need some form of insurance to protect them from loss of income during absence. In general, there are three sources of income security: governments, employers or employees themselves. There is a great difference between the systems used in the United States and in Europe. In most European countries, sickness absence is covered by forms of social insurance and financed by the government through a general fund. In the United States, in contrast, there is a private provision system, meaning that employees are themselves responsible for income loss during sickness absence. There are, however, some forms of state intervention, such as job protection when employees are on leave. Europe displays many differences, from little state control in Britain

to generous government-financed insurance coverage in Sweden and Norway (Treble, 2009). In some countries, such as Greece and Denmark, leave benefits are more generous for low-wage employees than for median-wage workers (Heymann et al., 2010). In the Netherlands, sickness absence is covered by employers, who can choose to insure themselves for the financial consequences of sickness absence on the part of employees.

A central issue in economic research on sickness absence concerns the negative effects of the social security system. Directly related to the provision of social insurance are issues associated with asymmetric information, namely, adverse selection and moral hazard, which are addressed in this dissertation. On the one hand, adverse selection can take place, referring to high-risk employees selecting themselves to make use of favourable insurance systems. On the other, moral hazard describes the changing behaviour of employees as a result of the system, whereby more favourable conditions will yield more absence. The moral hazard problem can be settled by using experience-rated contracts, where the terms of sick pay depend on the claims made by each worker individually, which should ensure that workers did not take excessive sick leave (Treble, 2009; Treble and Barmby, 2011). If firms supply sick pay, a standard principal-agent reason for doing so is that employers take over the risk of sickness, and as a consequence they can pay lower wages. Heterogeneity across firms related to the production processes, complementarity among production factors and the costs of absence can together create a situation in which sick pay is paid by some employers but not by others.

Health economics

In the case of illnesses, diseases or health shocks, employees demand health care and report absent. The field of health economics in general deals with costs and benefits related to health and health care. In health economics, direct and indirect costs are seen as distinct. Direct costs are related to medical costs and patients' costs, such as prevention, diagnostics, therapy, rehabilitation and care. Indirect costs are mainly associated with the loss of productivity. Within health economics, estimating the indirect costs of diseases, expressed as productivity losses due to poor health, is an important topic (Koopmanschap et al., 1995; Zhang et al., 2011), as is that of disease-adjusted working years and productivity losses due to illnesses and disability (Eysink et al., 2010).

In addition to productivity losses due to employees' reporting absent from work, there are also productivity losses in case of sickness presenteeism (Brouwer et al., 1999; Brouwer et al., 2002; Meerding et al., 2005). Some measurement issues arise here because it is hard to monetize the exact productivity losses attributable to illness. For instance, it is more complicated to measure productivity losses as a result of presenteeism than as a result of absenteeism, since most jobs do not have easily measurable outputs (Mattke et al., 2007; Zhang et al., 2011).

Industrial relations and working conditions

Finally, there are absence studies that are linked to working conditions. The Dutch Working Conditions Act is based on the European Council directive 89/391/EEG, which regulates principles

such as the prevention of risks at work and the protection of safety. Certain conditions at work can be a cause of sickness absence, such as physically demanding conditions, physically damaging circumstances such as extreme noise or stench, challenging intellectual features and work under time pressure. There is some empirical evidence on the influence of working conditions on sickness absence (Allen, 1981a; Drago and Wooden, 1992; Johansson and Palme, 1996; Brown et al., 1999).

If the workplace is a poor working environment, absence will be higher, for two reasons. First, if the risks in the workplace are higher, the employee will report absent more often in order to reduce exposure to these hazards. There may be a mitigating effect from self-selection on the part of risk-averse employees who want to be employed in low risk jobs. Second, a higher risk in the workplace is related to the higher probability that employees will report absent due to work-related illnesses or injuries. A higher wage rate is frequently offered in compensation for higher risk at the workplace (Johansson and Palme, 1996).

Ose (2005) introduces a theoretical model which includes working conditions. Her model is based on the Shapiro and Stiglitz efficiency wage model (1984) that wages are paid above the market-clearing level in order to reduce the incentive to shirk. The Ose (2005) model predicts that voluntary absence will increase when employees' wages do not fully compensate for increased risk. The empirical results here support the theoretical predictions. If employees are not fully compensated for hazardous working conditions, sickness absence is higher. Pouliakas and Theodossiou (2013) provide an overview of

the occupational safety and health literature in a survey paper. Theoretically, the essential feature is the compensating wage differential, but many other features, such as incentives, inefficiencies, externalities and regulations, also have a part to play.

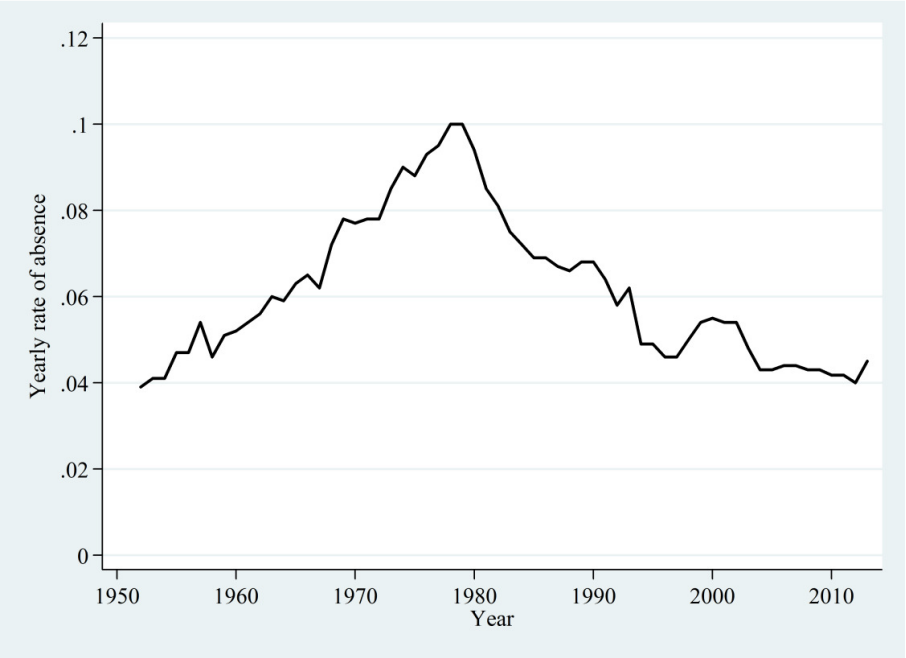
1.2 Dutch institutional setting

One aspect of the international literature on sickness absence is the role of institutions. The present research was carried out in a Dutch context and makes use of Dutch data and therefore it may be helpful to describe the Dutch institutional setting.

In the Netherlands, there was a sharp peak in sickness absence in the 1980s, as can be seen from Figure 1.1. This was due to generous benefits in cases of sickness absence and consequent disability. The government was responsible for maintaining sickness absence and disability insurance benefits. In order to reduce the high expenditure and the accompanying inflow into the disability benefit scheme, it was made no longer possible to receive full benefits in cases of partial disability and the benefits were lowered from 80% to 70% of wages. Furthermore, in the 1990s the absenteeism schemes were privatized, meaning that the financial responsibility for absent employees was moved from the government to employers. In 1994, as a first step, small firms became obliged to finance the first two weeks of sickness absence, whereas large firms were compelled to pay for the first six weeks of it. In 1996, the period for which firms had to pay the wages of sick employees was extended to 52 weeks for all firms, and in 2004 this was again extended to 104 weeks. In the Netherlands, some groups are exempted from the privatization arrangements, namely, the

so-called 'safety-netters' (*vangnetters*). 'Safety-netters' is the name for high-risk groups of employees, who are financed by the government when they have sick leave, for example, organ donors, temporary workers and pregnant women who are sick due to pregnancy (Molenaar-Cox and Veerman, 2006).

Figure 1.1 – Sickness absenteeism in the Netherlands 1950-2013



Source: Statistics Netherlands (2013)

Another way of reducing the sickness absence rate was a new law introduced to encourage absent employees to return to work. In order to reduce sickness absence and reduce disability benefits (WIA, former WAO), the Gatekeeper Improvement Act (GIA) of 2002 was implemented. It aims at preventing disability benefits for sick employees after 52 weeks of sickness absence (or, as a result of the

statutory change in 2004, after 104 weeks). This act regulates that both employers and employees should meet stricter requirements regarding the reintegration of sick employees. The Social Benefit Administration (*Uitvoeringsinstituut Werknemersverze-kering, UWV*) acts as the gatekeeper of the reintegration process. The sickness of an employee must be reported to the employer. Employees must be seen by a company doctor in the first six weeks after their illness began; the doctor diagnoses the illness and gives advice about future reintegration. On the basis of this analysis of the problem, the employer sets up an approach to bring the employee back to work. During the reintegration period, the company doctor keeps in touch with the employee. The employer informs the UWV of the sickness and, together with the employee, briefs this body about the reintegration process after twelve months. Should the reintegration process fail, after two years of sickness the employee can apply for WIA benefits (De Jong, 2012).

Both the employer and the employee can be penalised for not putting sufficient effort into the reintegration process. For instance, the employer can be sanctioned for not meeting his obligations as stated in, for example, the Dutch Civil Code (art. 7:658a BW), since s/he has to make suitable arrangements for sick employees and offer work adapted to their reintegration. If the employer fails to do so, the UWV may after two years of sickness impose a wage sanction of one additional year at most (art. 25, paragraph 9, WIA). Equally, if the employee falls short and makes too little effort to reintegrate, sanctions may include dismissal, the withholding of pay by the employer, or the denial or reduction of disability benefits. This means

that the UWV can suspend the disability benefits of absent employees for a maximum of eight weeks, since they are obliged to cooperate with the reintegration plan and accept suitable work (art. 7:660a BW and art. 39, paragraph 5, WIA). In the Netherlands, employees are obliged to take out basic health insurance and there are supposedly no barriers to accessing health care.

Figure 1.1 suggests that moral hazard probably played a role in the 1980s. It also shows that the subsequent reform was successful, since the sickness absence rate decreased considerably. Employees may now be more inclined to take account of the long-term costs of absence, such as job loss, foregone wage increases, missed promotion possibilities and learning opportunities. Adverse selection may be an issue in the Netherlands. However, since sickness absence is covered by private insurance, the government supports high-risk groups of employees and firms are legally forbidden to inquire into anyone's health, this issue is not so serious.

Compared to other European countries, Norway, Sweden, the Netherlands and Finland have a sickness rate of around 4%, which is still relatively high (Lusinyan and Bonato, 2007; Livanos and Zangelidis, 2013). In the Netherlands, the distinctiveness from most European countries may be due to labour supply characteristics, such as the differences in participation within the labour force, in particular of women and older workers; insurance provisions, such as generous and lenient social security schemes; and idiosyncratic institutions in the labour market. When comparing Dutch institutions with those of other European countries, a notable difference is that the Dutch absenteeism schemes were fully privatized in 1996 and employers

bear full responsibility for their costs. In most of the rest of Europe, the government largely bear the costs. In Norway, for example, the first sixteen days of sickness absence are normally covered by the employer, after which the public social security system takes over (Markussen et al., 2011). Most Dutch firms reinsure their sick pay obligations with private insurance companies, reducing the incentive for employers to lower the absence rate. Nevertheless, this privatization caused a sharp decline in absences[2] and the reinsurance did not lead to adverse moral hazard effects (De Jong and Lindeboom, 2004).

1.3 Aim of the dissertation

With respect to sickness absence, there are many differences among employees, firms and countries. Therefore, we study the consequences of specific transitions or shocks that employees undergo. By doing so, we can shed more light on the relationship between sickness absence and incentives, selection and health. The aim of this dissertation is to provide an analysis of sickness absence at times of job transition and health shocks, by incorporating not only the labour supply but also the demand side. This empirical dissertation focuses on two topics which are related to sickness absence at times of transitions, changes or shocks and makes use of a combination of labour economics, social security, health economics and macroeconomics.

First, we investigate sickness absence in the period before, during and after job transitions on the labour market. We focus on employees who make a job transition and on employees who move

[2] The decline in absences occurred in a period of high economic growth, when higher sickness absence rates are usually reported.

from unemployment to employment. This part of the dissertation focuses on the procyclical nature of absence, sickness absence in both previous and current jobs, incentives, selection and spells of unemployment.

The second topic that we examine refers to health shocks which affect sickness absence behaviour. This part of the dissertation isolates two specific health risks which may affect some employees: pregnancies and fractures. In studying them, we take into account the development of intensity in the employees' condition. For expectant employees, the intensity of pregnancy increases, whereas for employees with broken bones, the intensity of a fracture declines. This part of the dissertation investigates in detail how sickness absence and health are related.

1.3.1 Part I: Examining absenteeism at times of job transition

The first part of this dissertation (Chapters 2 and 3) focuses on changes in sickness absence in periods of transitions in the labour market. Since it involves labour-related transitions from one state to another, it takes a dynamic approach. We consider sickness absence in the way that it may be perceived, i.e., as an indicator of less productivity and hence as an indicator of the employee's effort (Treble and Barmby, 2011).

Chapter 2 examines absenteeism for employees who make a job transition and considers the procyclical nature of absenteeism in the period around transitions between jobs. Both sickness absence and job-to-job transitions are procyclical. In a tight labour market, the sickness absence rate is higher because it may be easier to find a new

job and because more absence-prone employees may be selected to return to the labour market. Consequently, in a tight labour market more employees make job-to-job transitions, since it is easier to find a new job in an economic boom. In the period around job-to-job transitions, we find the pulsation of the absence rate. Before a job transition, in the final months of one's employment contract, sickness absence is higher. Conversely, after the move, sickness absence in the new job is lower. We use economy-wide employer-employee matched data for Dutch job-to-job movers focusing on the period 2004-05. We consider employees in the period before and after making a job-to-job transition. The estimates indicate a positive net increase of 0.62 percentage points in an employee's absence in the period around job-to-job transitions. The decrease in absences during the probationary period is smaller than the increase in absence after the notification of termination of the employment contract. The net increase of sickness absence in the period around job transition intensifies the procyclical nature of sickness absence.

Chapter 3 takes the period 2004-05 and investigates its rates of absenteeism among newly hired Dutch employees after a period of unemployment in 2002-05. The specific question of Chapter 3 is to examine the impact on sickness absence in the current job of past individual unemployment. A related literature, focusing on the effect of the business cycle on sickness absence, shows that incentives rather than sorting are important in explaining the procyclical nature of absence. Two hypotheses are put forward regarding the effect of individual unemployment spells before becoming re-employed and the subsequent absence rates. The first hypothesis presumes a negative

relationship between sickness absence and the duration of previous unemployment spells. This could indicate the dominance of economic incentives, since employees who have been unemployed for a long period could to be more willing to put in more effort. The second hypothesis presumes a positive relationship between absence and unemployment spells. This suggests the effect of a sorting mechanism, because the relatively absence-prone employees may be the ones to be unemployed longer. We observe sickness absence during employment spells in 2004 and 2005, whereas from 2002 to 2005 we observe whether employees were unemployed. Therefore, we can analyse sickness absence spells during employment in 2004 and 2005 for employees who have been unemployed in the period 2002 to 2005. Our results, contrary to the ones in the business cycle literature, show that employees do not react strongly to the incentive of being long-term unemployed, since sickness absence is 1.3 percentage points higher for employees who have been unemployed for more than a year, which suggests that a sorting mechanism dominates the incentive effect. Therefore, in a new job after a spell of unemployment, the disciplining effect of this spell on sickness absence is not dominant.

1.3.2 Part II: Examining absenteeism at times of health shocks

The second part of this dissertation (Chapters 4 and 5) focuses on health shocks and their effect on sickness absence behaviour. This part of the dissertation concentrates on two specific health shocks, pregnancies and fractures, which influence sickness absence behaviour. We take into account the development of the intensity of the condition for employees. Fractures, unlike pregnancies, are

exogenous health shocks, and often the consequence of an accident. When studying pregnancies, we have to take into account forward-looking behaviour, for both employers as well as employees know that the intensity of the condition is increasing over time. The advantage of studying pregnancies, however, is that, unlike fractures, it can be analysed for a homogeneous group of employees. We would expect sickness absence patterns resulting from specific medical conditions to be similar among individuals because of a comparable physical burden. We test whether this is the case by studying pregnancies and fractures. We find that the patterns that emerge from these two specific conditions are dissimilar among individuals, offering room for explanations of labour supply and demand. So, this part of the dissertation investigates in detail the differences that can be found in the sickness absence behaviour of different groups of employees suffering the same condition. It also illustrates, as intuition would suggest, that health is an important determinant of absence.

Chapter 4 studies absenteeism in relation to the intensity of the condition. Empirical studies of absenteeism have not corrected for the seriousness of the health condition, but the reason for a worker's absence may be an important variable in the analysis of absenteeism. Therefore, the specific question of Chapter 4 is to examine what happens to sickness absence figures when we include the intensity of the health condition. We consider the consequences of including the intensity of the condition in the absence equation by focusing on the development of absence for a homogeneous group of female workers during forty weeks of pregnancy. We do this by including the weeks of the condition or illness, in the course of which the intensity is

increasing. It is hypothesized that, on the one hand, the intensity of the condition is independent of the explanatory factors found in the literature, such as age, wages and firm size. On the other hand, if the intensity of the condition is dependent of the explanatory factors found in the literature, there are two alternative explanations. The intensity of the condition may weaken the effect of the explanatory factors or the intensity of the condition may strengthen their effect. We use employer-employee matched data from 2004-05. We find that, during pregnancy, sickness absence increases from about 5 percent 40 weeks before the birth to about 18 percent in the final 6 weeks. The results suggest that the intensity of the pregnancy strengthens the explanatory factors of sickness absence consistent with the relationships suggested in the literature. There are multiple explanations for these differences between employees, such as dissimilar classical labour supply characteristics, employees' different career concerns, the varying costs of monitoring and differing levels of job complexity.

Chapter 5 explores absenteeism after fractures. As the social gradient, health and sickness absence are interrelated, the specific question of Chapter 5 is to investigate whether, after controlling for health, there still is a social gradient in sickness absence. In order to address this question, we make use of an unexpected health shock that may lead to sickness absenteeism for one specific medical reason: fractures. One may claim that sickness absenteeism would be independent of social status. A fracture would cause all workers to be hospitalized and unable to work. In this case, both lower-salaried and higher-salaried workers would be incapable of working and would

report absent. Alternative models, however, would predict the persistent effect of social gradient on sickness absence. High-salaried workers may be more inclined to return to work early because of career concern. In addition, high-salaried workers have more varied tasks, so that some of their non-physical tasks can be done as soon as they return to work. We use employer-employee matched data for Dutch workers suffering a fracture in the period 2004-05. The increase in sickness absence directly after a fracture is significantly lower for highly paid employees than for lower paid employees, namely, 66 versus 75.2 percentage points. This is strong evidence of a social gradient in sickness absence, since the increase is higher for the latter group than the former.

Before proceeding with the main chapters of this dissertation, one point should be noted: the following chapters were written as independent research papers, with the result that there may be some overlap.

PART I

ABSENTEEISM AT TIMES OF JOB TRANSITION

Chapter 2

Employees' Efforts in the Period around Job-To-Job Transitions

2.1 Introduction

Cyclicality is an important phenomenon in the area of health and the workplace. Generally, the literature demonstrates a procyclical pattern of sickness absenteeism, which implies that sickness absence rises in a tight labour market (Leigh, 1985; Kaivanto, 1997). The economic studies on sickness absence provide two opposed explanations. According to the incentives explanation, the costs of absenteeism to the worker are lower (higher) in a tight (slack) labour market. The threat of dismissal –associated with shirking– is less effective in a tight labour market, because other possible outside employers are available. The alternative explanation of sorting, however, claims that in a tight labour market unhealthy or absence-prone workers, who are more inclined to report absent, are more prone to be hired. When the labour market slackens, these employees with a high propensity to be absent are the first ones to be laid off again. The empirical findings tend towards supporting the incentive explanation (Arai and Thoursie, 2005; Askildsen et al., 2005; Nordberg and Røed, 2009).

In this chapter we introduce a further explanation. We examine sickness absence in the period around job-to-job transitions. It is based on insights from previous studies which have not hitherto been combined. Absenteeism may increase in the months before a job

transition whereas it may be lower during the probationary period of the first months in a new job. Our explanation is grounded on partial empirical evidence of the pattern of absenteeism. With regard to the separations of employees, Drago and Wooden (1992) demonstrate that the effort of employees in Australia, Canada, New Zealand, and the United States is lower at times when they are searching for a new job. Their study has no information about the change in effort on behalf of the current employer after accepting a job offer. To account for the hiring aspect of our explanation, Ichino and Riphahn (2005) show that employees in an Italian bank made greater efforts during the period of probation and that these declined as soon as this period was finished. They had no access to information about the employees' effort on behalf of their previous employer.

In our additional explanation, we combine the increase in sickness absence from the old firm with the decline in sickness absence from the new employment. Overall, the net effect of the change of absenteeism in the period around job-to-job turnover may affect the procyclical pattern of sickness absence. On the one hand, job-to-job turnover will reinforce the procyclical nature of sickness absence if the increase in absenteeism before the transition is greater than the decline after. On the other, the procyclical nature of sickness absence will be reduced if the net effect is negative, meaning if the decline in absenteeism after the job transition outweighs the increase in absenteeism before the job-to-job move. So far, the size and sign of both partial effects have not been established.

To gauge the net effect, this chapter adopts the following setting. Our empirical investigation is based on a unique set of

administrative data on Dutch job-to-job movers in 2004 and 2005. Following other studies in this area (see Treble and Barmby, 2011), we interpret their sickness absence as an indicator of an employee's effort. We focus on employees in the period after their labour contract has been terminated, but while they are still employed with the firm. In the Netherlands, employees are obliged to give one month's notice before terminating their labour contract. In cases of dismissal, generally an employer must give between one and four months' notice, depending on the tenure of the employee. We juxtapose the increase in absenteeism (decline in effort) before the job-to-job transition with the decline in absenteeism in the new job after the transition.

It results in a pattern of absenteeism that straddles the period before and after the job transition. Job-to-job movers exhibit two opposite pulsations of absenteeism, one before and one after a job transition. They generate an upward spike in absence at the old firm and a downward spike in absence from the new employment. Overall, the net effect on absenteeism is positive, indicating that the increase in effort during the probationary period is smaller than the decline in effort shortly before the job transition. This suggests that the procyclical nature of sickness absence is strengthened by job-to-job transitions. This outcome is robust for distinguishing between job-to-job transitions and transitions with an intervening period of unemployment.

The structure of this chapter is as follows. In Section 2.2 we formulate the hypothesis. Section 2.3 describes the data. Section 2.4 documents the patterns of absenteeism in the period around a job-to-

job transition. Section 2.5 features a discussion of the estimates, which is followed by robustness checks in Section 2.6. In Section 2.7 we offer our conclusion.

2.2 Theoretical framework and hypothesis

Sickness absence appears to be procyclical and in the economic literature two explanations for this phenomenon have been developed.[1] The procyclical nature of absence refers on the one hand to the role of economic incentives. Sickness absence may be high in a tight labour market because fired workers are not only harder to replace, but also have a higher probability of finding a new job (Leigh, 1985; Arai and Thoursie, 2005; Askildsen et al., 2005). Nordberg and Røed (2009) distinguish between three effects. Employee incentives are procyclical, since it is easier to get a new job in a tight labour market. Employer incentives, correspondingly, are countercyclical, because monitoring increases in a tight labour market where absence is more costly.[2] Finally, there is a procyclical direct health effect, since economic booms are related to more stress-related diseases and workplace accidents. Nordberg and Røed find that sickness absence responds in a procyclical way to business fluctuations. The well-known sorting or selection mechanism, however, has also been put

[1] In addition to these two economic explanations, other factors might be influencing the rise of the sickness absence rate as well. Sickness absence can increase due to the lack of job satisfaction or due to stress related to a quit or dismissal. Besides, there may be health effects associated with the end of an employment contract, since the work pressure to end everything carefully might be high. Also, the job might be too difficult.

[2] In addition, opportunity costs of absence also might be higher in a tight labour market.

forward. In economic upturns absence-prone employees are sent back into the labour market (Leigh, 1985; Allebeck and Mastekaasa, 2004).

In addition to the procyclical nature of sickness absence, job-to-job transitions are also influenced by economic conditions. Job-to-job moves, or job transitions without an intervening unemployment spell, are procyclical. In tight labour markets, when the unemployment rate is low, there will be more job-to-job moves since the probability of employees finding a new job is higher (Blanchard and Diamond, 1990; Mortensen, 1994).

In our additional explanation, we combine the procyclical nature of sickness absence and job-to-job transitions with the partial evidence of sickness absence behaviour in the period around job transitions. Sickness absence will fluctuate in the period around a job transition. People in employment can be searching for another job. In this process, employees may report absent and hence display higher sickness absence rates shortly before moving to another firm. Drago and Wooden (1992) include the end of an employment contract in their analysis and find that job search increases sickness absence, though they do not include the new contract for employees in transition in their study. In their analysis, however, Ichino and Riphahn (2005) take account of the beginning of an employment spell. They show that when entering new employment with a new work contract, sickness absence is significantly lower during the probationary period. When the probationary period ends and employment protection is granted, the sickness absence rate makes a discrete jump. This study includes no information on absenteeism before the new employment contract.

Employees behave differently before and after a job transition, and we combine the partial evidences with the procyclical influences around sickness absence and job-to-job transitions. In what follows, the firm that the employee leaves is referred to as the 'old firm' and the firm that the employee moves to as the 'new firm'. Simply put, when focusing on employees who make job-to-job transitions, we first consider

$$Abs_{ijt} = \sum_{\substack{s=-3 \\ s\neq 0}}^{3} \tau_s DT_s + c_t + \varepsilon_{ijt}, \qquad (2.1)$$

$i = 1, \dots, N; j = 1, \dots, M; t = 1, \dots, T,$

where the dependent variable Abs is the monthly rate of absenteeism. Subscripts i, j and t refer to the employee, firm and month, respectively. The six dummy variables DT_s refer to the three months before (negative subscript *s*) and the three months after the job-to-job transition (positive subscript *s*). Job-to-job transitions are procyclical. The calendar month dummies are denoted by c_t: they can capture the procyclical nature of sickness absence, related to the incentive and the selection mechanism. We consider how the size of the total reduction in effort, and hence the increase of absence, at the old firm (negative subscript *s*), is related to the increase in effort, or the decline of absence, at the new firm (positive subscript *s*). A job-to-job transition corresponds with increased absenteeism, if the sum of the fluctuations of absence is positive, meaning $\sum_{s=-3}^{3} \tau_s DT_s > 0$. Conversely, a job-to-job move relates to reduced absenteeism, if the sum of the fluctuations of absence is negative, when $\sum_{s=-3}^{3} \tau_s DT_s < 0$. A net increase (decline) of absenteeism in a period of job-to-job movement

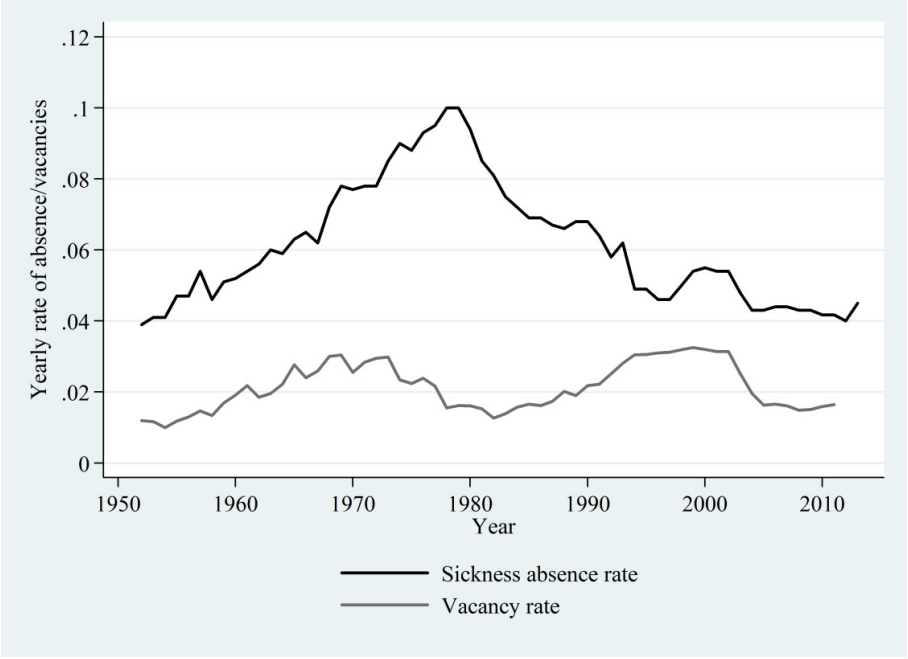
strengthens (weakens) the procyclical nature of absenteeism. Therefore, the first hypothesis is:

Hypothesis 2.1: Job-to-job transitions may affect the procyclical character of absenteeism.

2.3 Data

Sickness absence in the Netherlands appears to be procyclical. Figure 2.1 shows the development of the sickness absence rate and the vacancy rate from the 1950s onwards. It suggests that favourable economic circumstances are accompanied by a higher sickness

Figure 2.1 – Development of sickness absence rate and vacancy rate



absence rate. It is, however, difficult to draw conclusions from this, since the peak in sickness absence in the 1980s and the period around is related to a changing institutional setting. The high sickness absence rate of the 1980s and the accompanying inflow into the disability benefit scheme was tackled by the privatization of the absenteeism schemes and the introduction of supplementary legislation.

We used Dutch National Absence Statistics (*Nationale Verzuimstatistiek, NVS*) for 5,866,773 employees, collected by Statistics Netherlands over the period 2004-05. These administrative data cover about 71 percent of all employees in 2004, and 66 percent of all employees in 2005. Because it is a matched employer-employee data set, we can trace the movements of employees across employers, including the exact dates of separation from the old firm and commencement at the new firm. In addition, we had information on all the employees for both firms involved in transitions. Absence statistics were included because firms were required to deliver this to the Health and Safety Executives (*Arbo-organisaties*). There was information on the starting date and final date of a spell of sickness. The administrative Social Statistical Dataset on Jobs 2002-05 (*Sociaal Statistisch Bestand, SSB – Banen*) was used to complete the information on employment spells.[3] Furthermore, we matched the data to administrative information about the Municipal Administration (*Gemeentelijke Basisadministratie, GBA*) to include individual characteristics.

[3] Employees who had not been registered sick in 2004 and 2005 were lacking firm codes in the Dutch National Absence Statistics. Therefore, we turned to the Social Statistical Dataset on Jobs 2002-05 to include these employees.

We focus on employees who in 2004 and 2005 made job-to-job transitions with no intervening unemployment spell. We consider the spells to be uninterrupted or without an intervening unemployment spell if the new employment contract started within three days of the termination of the previous contract. This is a reasonable assumption, given that the termination of an old employment contract is likely to be conditional on having found a new job.[4] In total 516,834 transitions were made, out of which 180,656 were uninterrupted and 336,178 were interrupted. The number of firms in which these transitions took place was 37,860.

We excluded from the dataset employees with missing firm information. We restricted ourselves to firms with more than 10 employees and to workers who were between 16 years and 65 years old. Some employees moved more than once, but we focus only on non-overlapping single moves. We excluded some employees with salaries lower than the minimum wage. We include only employees who moved once and whose new employment spell started after the old one had been terminated, since otherwise the incentives provided at the beginning and end of the employment spell may have overlapped.[5] As a result, due to the memory restrictions in the

[4] As soon as an unemployment spell continues for two days at most, it can be included as an uninterrupted employment contract. These two days do not change the results much, since for all job transitions, about 31 percent of new employment contracts start the day immediately after the termination of the old, whereas only 2 percentage points more (about 33 percent in total) starts within three days after a previous termination.

[5] We focus on single moves in order to observe a sufficient time span before and after the job transition. Multiple job transitions within these two years cause employment spells to be shorter. We concentrate on non-overlapping moves, since occasionally the employee starts a new employment contract before the old one has been terminated. In this case, the incentives coming from the old and the new job cannot be distinguished. Therefore, we only include non-overlapping job transitions.

statistical software, we use information on 18,188 employees with job-to-job transitions without an intervening unemployment spell, working in 9,223 different firms.[6] We are left with a sample of 18,188 employees with job-to-job moves, or 10 percent of all job-to-job transitions in 2004 and 2005.

Figure 2.2 shows the distribution of job transitions, demonstrating that job transitions seem to follow a quarterly pattern. Figure 2.3 shows the rate of absence among the stayers in our sample, meaning 'employees who stayed with the same employer over the sample period', and of the movers in different months in 2004 and 2005. The figure shows that the average monthly rate of absenteeism fluctuates between 4 and 8 percent, and that it is higher in winter and lower in summer.

Next, we discuss the averages of the variables. The employee's monthly rate of sickness absence is defined as the total number of sickness days in a specific month divided by the total number of contracted working days in this specific month. The first column in Table 2.1 displays summary statistics for employees without intervening unemployment spells. Table 2.1 shows that the average monthly rate of absence is 6.9 percent for employees with uninterrupted employment spells.

We define net firm-level absence rates as the total number of days absent divided by the total number of contracted working days in the firm, excluding individual employees who change jobs. Table 2.1 shows that firm-level absence rates are on average 5.7 and 6.0 percent for job-to-job movers in the old and new firms, respectively.

[6] This sample is taken randomly from the dataset, but checks with other random samples give similar results.

Figure 2.2 – Distribution of job transitions in 2004 and 2005

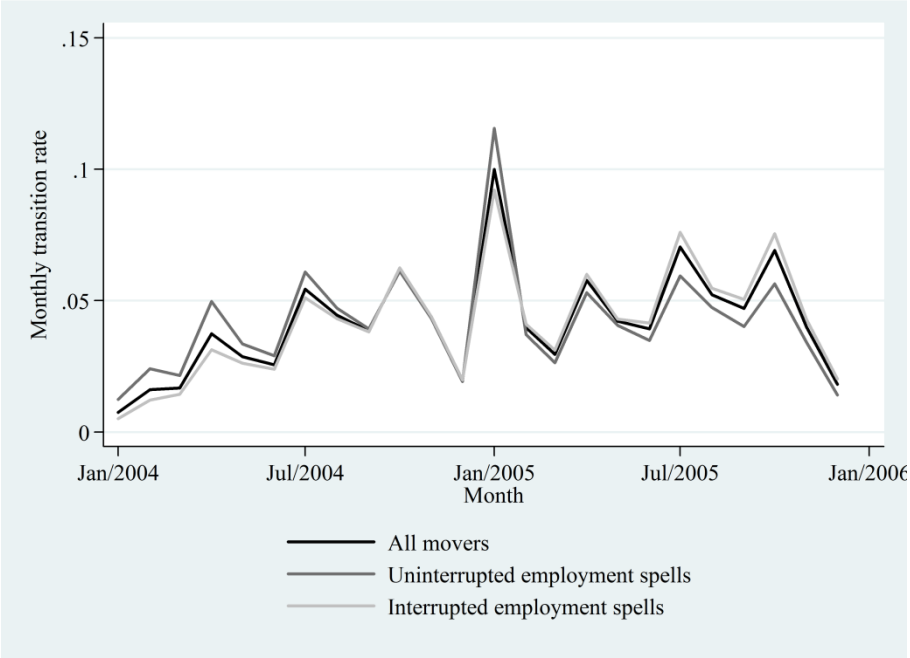
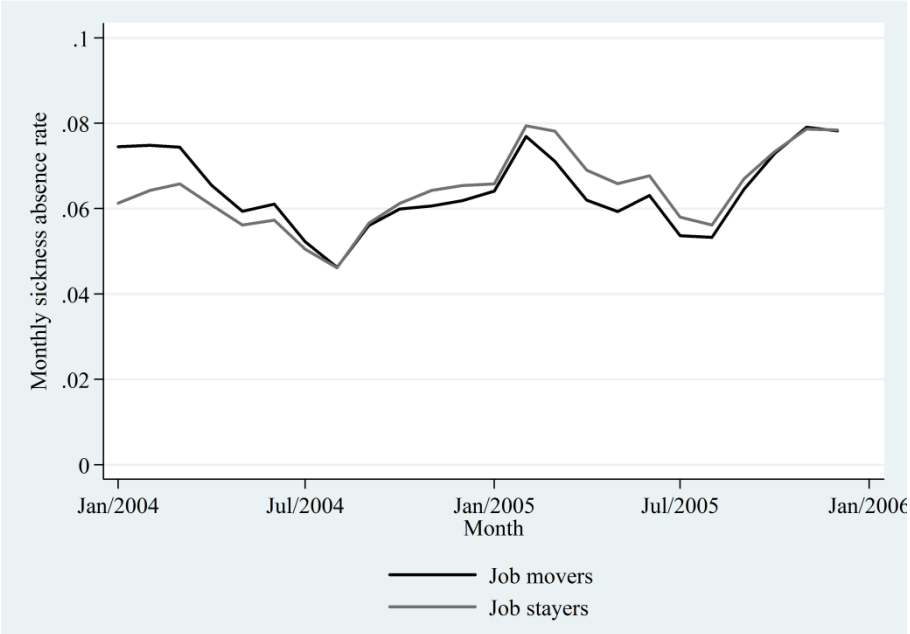


Figure 2.3 – Sickness absence rate over the months of 2004 and 2005



Firm size is measured by the number of employees, and is observed at the firm level.[7] Average firm size for employees with uninterrupted separations is about 1,850. In addition, salary refers to the gross fiscal annual wage (measured in Euros). Table 2.1 shows the average gross annual salary to be about 26,200 Euros. Furthermore, the sector dummies show the distribution of our sample for both the old and the new employment contract of employees who made job-to-job transitions over thirteen different sectors. Therefore, the sector dummies represent the rates of employees working in this specific sector. 53.7 percent of the job movers without an intervening spell of unemployment are males, as opposed to 46.3 percent of females. The average age of employees making uninterrupted transitions is 35.3. On average, employees who move to another firm have about 1.1 children. With respect to the marital status of the job-to-job movers, 50.6 percent of them are unmarried, 42.1 percent are married, 6.9 percent are divorced and 0.4 percent are widowed.

To check the robustness, we also include employees who made a job transition with an intervening unemployment spell, meaning interrupted separations. Regarding interrupted employment spells, we include spells ranging between 3 and 468 days. We use information on 13,366 employees with an intervening unemployment spell, working in 7,389 different firms. The average monthly rate of absence for employees with interrupted employment spells is 5.8 percent.

[7] As firm size is measured at the firm level, not the plant level, firms in this sample range from 10 to about 30,440 employees, with the median at 238 employees. Therefore, only inter-firm transitions rather than intra-firm moves are considered.

Table 2.1 – Summary Statistics [a)]

	Movers: uninterrupted employment spells [b)]	Movers: interrupted employment spells [b)]	Stayers [b), c)]
Employee level			
Absence rate	0.069 (0.209)	0.058 (0.190)	0.060 (0.194)
Firm level			
Absence rate (old firm)	0.057 (0.026)	0.054 (0.026)	0.060 (0.027)
Absence rate (new firm)	0.060 (0.028)	0.054 (0.027)	
Firm characteristics			
Number of employees in old firm	1,829 (5,303)	2,628 (6,654)	1,996 (5,402)
Number of employees in new firm	1,901 (4,833)	3,011 (6,919)	
Salary in old firm (in Euros)	26,208 (16,856)	26,215 (16,922)	28,141 (16,817)
Salary in new firm (in Euros)	26,187 (16,904)	26,171 (16,789)	
Old construction sector	0.060 (0.237)	0.062 (0.241)	0.066 (0.248)
Old mineral extraction sector	0.002 (0.041)	0.001 (0.036)	0.001 (0.038)
Old industry sector	0.145 (0.352)	0.140 (0.347)	0.153 (0.360)
Old energy production sector	0.006 (0.077)	0.005 (0.068)	0.004 (0.067)
Old consumer goods production sector	0.131 (0.337)	0.137 (0.344)	0.136 (0.343)
Old catering sector	0.019 (0.138)	0.018 (0.134)	0.019 (0.136)
Old transport sector	0.071 (0.257)	0.073 (0.260)	0.074 (0.261)
Old financial institutions sector	0.016 (0.127)	0.017 (0.130)	0.015 (0.122)
Old service sector	0.213 (0.409)	0.208 (0.406)	0.164 (0.371)
Old public sector	0.091 (0.287)	0.091 (0.289)	0.102 (0.303)
Old education sector	0.070 (0.256)	0.074 (0.262)	0.079 (0.269)
Old health care sector	0.142 (0.349)	0.138 (0.344)	0.150 (0.357)
Old environmental and remaining services sector	0.034 (0.182)	0.036 (0.186)	0.037 (0.188)
New construction sector	0.057 (0.233)	0.058 (0.234)	
New mineral extraction sector	0.001 (0.026)	0.001 (0.036)	
New industry sector	0.143 (0.350)	0.145 (0.352)	
New energy production sector	0.006 (0.074)	0.005 (0.069)	
New consumer goods production sector	0.138 (0.345)	0.137 (0.344)	
New catering sector	0.021 (0.143)	0.018 (0.134)	
New transport sector	0.070 (0.256)	0.072 (0.259)	

New financial institutions sector	0.018 (0.132)	0.016 (0.125)	
New service sector	0.205 (0.403)	0.200 (0.400)	
New public sector	0.092 (0.290)	0.090 (0.287)	
New education sector	0.069 (0.253)	0.076 (0.264)	
New health care sector	0.146 (0.353)	0.144 (0.351)	
New environmental and remaining services sector	0.034 (0.182)	0.038 (0.191)	
Individual characteristics			
Gender (0=female, 1=male)	0.537 (0.499)	0.551 (0.497)	0.575 (0.494)
Age	35.321 (10.365)	32.939 (10.410)	40.394 (10.892)
Number of children	1.066 (1.161)	1.112 (1.180)	1.054 (1.120)
Unmarried (0-1 indicator)	0.506 (0.500)	0.599 (0.490)	0.369 (0.483)
Married (0-1 indicator)	0.421 (0.494)	0.335 (0.472)	0.546 (0.498)
Divorced (0-1 indicator)	0.069 (0.254)	0.062 (0.240)	0.077 (0.267)
Widowed (0-1 indicator)	0.004 (0.066)	0.004 (0.066)	0.008 (0.087)
Number of firms	9,233	7,389	40,910
Number of employees	18,188	13,366	2,565,315
Number of job transitions	18,188	13,366	0

a) Standard deviations in parentheses.
b) Employees with uninterrupted employment spells start their new employment spell immediately after the previous one has ended, without experiencing a period of unemployment. Employees with interrupted employment spells start their new employment spell sometime after the previous one has ended, experiencing a period of unemployment in between the two employment contracts. 'Stayers' refers to employees who did not make a job transition.
c) For employees who did not make a job transition, the summary statistics do not concern the old firm, but are applicable to their current employment contract.

The average sickness absence in the firms which they move from and to is 5.4 percent, whereas average firm size equals about 2,600 and 3,000 employees, respectively. Average gross annual salary is about 26,200 Euros. 55.1 percent of the sample of employees who move to a new job with an intervening unemployment spell is male, with an average age of 32.9. On average, they have 1.1 children. Regarding marital status, Table 2.1 shows that 59.9 percent is unmarried compared to the 33.5 percent of them who are married.

Selectivity may be an issue for the sample of job-to-job movers in the analyses and job-unemployment-job movers in the robustness checks. Therefore, we include the summary statistics of the stayers, but it appears that the differences between the stayers and the averages for the job movers are not great. We report information on 2,565,315 employees working in 40,910 different firms who did not make a job transition. The average for sickness absence is 6 percent, which lies between the averages of employees with uninterrupted and those with interrupted employment spells. The average absence in the firm equals 6 percent as well. The average firm size is about 2,000 employees. The gross annual salary for employees who did not make a job transition is about 28,000 Euros. The distribution between male and female employees shows that 57.5 percent are males and 42.5 percent are females. The average age for stayers is higher, namely, 40.4, whereas the number of children is approximately comparable. Regarding marital status, 36.9 percent of the stayers is unmarried, compared to 54.6 percent being married.

2.4 Absenteeism in the period around the job transition

We consider the hypothesis by reporting the patterns of absence in the 200 days before and after a job transition. First, we discuss absence for the sub-selection of workers who had an uninterrupted employment transition between the two employers. For all employees, absence is reported in relation to the day of job transition. We define their first day of employment at the new firm as $\delta = 1$. In this section, absence is registered as an indicator variable at the daily level. We considered absence for the last 200 working days (weekends included)

in the old firm before $\delta = 1$ as well as for the first 200 working days in the new firm.

Figure 2.4 indicates the average daily absence rates for job-to-job movers. The solid vertical line marks the moment of transition, $\delta = 1$, and the dashed vertical lines indicate 30, 60 and 90 working days or one, two and three months, before and after the transition.[8] If employees move voluntarily, as noted above, they must give one month's notice, which is indicated by the first dashed line before $\delta = 1$. If, however, they are dismissed, the term of notice is generally between one and four months, depending on tenure. The probationary period at the new employer is generally one month, indicated by the dashed line 30 days after $\delta = 1$ and for permanent employment contracts may be 60 days.

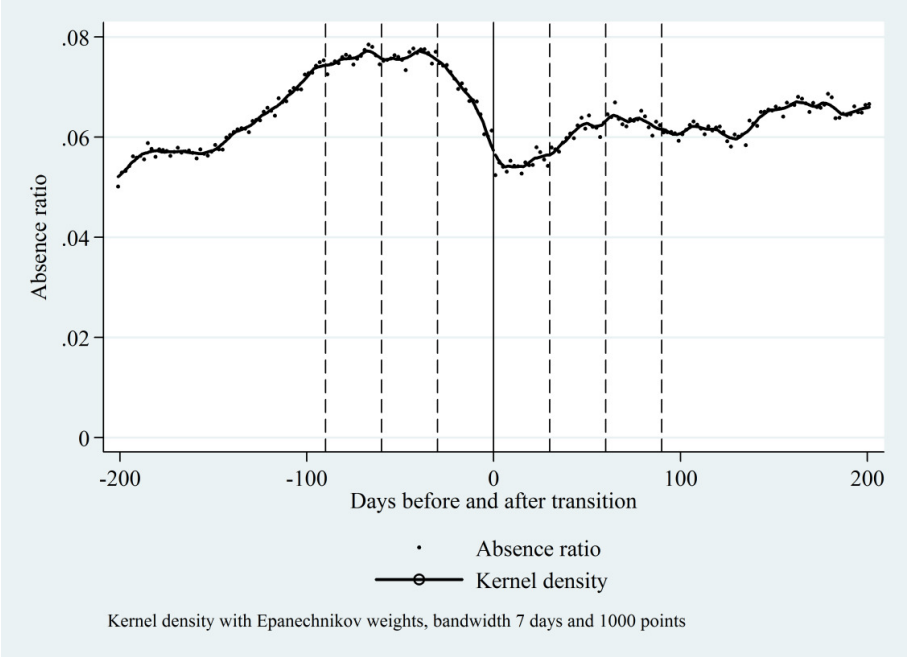
In Figure 2.4 there are two notable changes in the pattern of absence in the period around the job-to-job transition. Before the job-to-job move, absenteeism increases to a peak of about 8 percent at $\delta = -30$. In the last days before the transition, there is a rapid decrease in the average absence rate, which we may attribute to the fact that employees tend to use up their holiday leave in the final month before separation. On the day of a job-to-job move, average absence is relatively low at 5.2 percent, but it increases steadily afterwards to 6.3 percent, which is about the same level of absence as before the job move.

Figure 2.4 presents a novel finding. After employees have either received or given notice that their contract will be terminating, they increase their rate of absence. In addition, the figure confirms

[8] Full-time and part-time employees are both included.

existing knowledge that job seekers have higher rates of absence, showing an increase in the rate of absenteeism from an average of 6.9 percent to about 8 percent. Furthermore, there seems to be a lower rate of absence during the probationary period in the new firm.

Figure 2.4 – Absence ratio of job movers without an intervening unemployment spell before and after the job move



We calculated the overall change in absence over the final 200 working days at the old firm and the first 200 working days at the new firm. The total sum of days absent is 13.26 days for the period before the job change and 12.24 days for the period after the job move. It suggests that the decline in absence after the job-to-job transition is smaller than the increase in absence before the move. There is a net increase in absence, because the increase in the total sum of days

absent before the move is greater (in absolute terms) than the decrease in the number of days absent after the move.

2.5 Estimates

Because of the cyclicality of job-to-job transitions and absence, we consider the pattern of absenteeism in the period which includes job-to-job moves, after correcting for the calendar month, observable characteristics of both firms such as peer effects, firm size, wages and sector and the observed and unobserved characteristics of the employee. The regression equation, for which the dependent variable is the monthly rate of absenteeism, contains worker-specific effects.

The equation is as follows:

$$Abs_{ijt} = \sum_{\substack{s=-3 \\ s\neq 0}}^{3} \tau_s DT_s + \lambda_1 D_{ijt}^1 \overline{SA}_{(i)j} + \lambda_2 D_{ijt}^2 \overline{SA}_{(i)j} + \beta_1' D_{ijt}^1 F_j + \beta_2' D_{ijt}^2 F_j + c_t + \alpha_i + \varepsilon_{ijt}, \quad (2.2)$$

$i = 1, \dots, N; j = 1, \dots, M; t = 1, \dots, T,$

where the dependent variable Abs is the monthly rate of absenteeism. D_{ijt}^1 and D_{ijt}^2 are dummy variables that take the value one if the firm in which the worker is employed is relevant to the situation before job transition (D_{ijt}^1), or after (D_{ijt}^2). The variable $\overline{SA}_{(i)j}$ registers the average rate of absence in 2004 and 2005 in firm j, excluding the absence of employee i, so that it captures the effects of co-workers. F is a vector of firm characteristics. c_t are dummy variables for calendar month in 2004 and 2005. α_i is a worker-specific error term and ε_{ijt} is an idiosyncratic error term. τ_s and β_k, $k = 1,2$, are (vectors) of parameters.

We estimate Equation (2.2) as both a fixed-effects and a random-effects specification for all employees who made a job-to-job transition, meaning that they made an uninterrupted job move. Table 2.2 reports the estimated coefficients for the fixed-effects and random-effects estimates without and with control variables, respectively. The fixed-effects estimates without controlling for other variables (first column in Table 2.2) indicate that absenteeism increases before the job move and declines after the job move. The estimated parameters on τ_{-3}, τ_{-2} and τ_{-1} are positive and significant, representing an increase of 0.7, 1.2 and 1.1 percentage points, respectively. They are negative and significant for τ_{+1}, τ_{+2} and τ_{+3}, namely, -0.8, -0.5 and -0.7 percentage points, respectively. On average, sickness absence increases by 1.0 percentage point in the months preceding the job-to-job transition and declines by 0.64 percentage points after the job-to-job move. The net effect, a difference of 0.36 percentage points, is positive and significant.

When controlling for firm characteristics (second column Table 2.2), the three months preceding the job-to-job transition display a positive significant increase, with 0.8, 0.8 and 0.5 percentage points at three, two and one month before the transition, respectively. The period after the job-to-job move, however, does not display a significant decline in the first months after transitioning when fixed-effects are included.[9] The average increase during the three months before the job moves of 0.70 percentage points outweighs the insignificant decline after the job transition. Therefore, the sum of fluctuations in the period around a job transition of a 0.62 percentage

[9] There is a significant decrease when estimating this with random-effects (Table 2.2, column 4).

Table 2.2 – Estimation results (Equation 2.2) for employees without an intervening unemployment spell [a)]

	Individual sickness absence [b)] (fixed-effects) [c)]		Individual sickness absence [b)] (random-effects) [c)]	
$\tau - 3$	0.007*	0.008*	0.007*	0.008*
	(0.002)	(0.002)	(0.002)	(0.002)
$\tau - 2$	0.012*	0.008*	0.012*	0.009*
	(0.002)	(0.002)	(0.002)	(0.002)
$\tau - 1$	0.011*	0.005*	0.011*	0.006*
	(0.002)	(0.002)	(0.002)	(0.002)
$\tau + 1$	-0.008*	-0.002	-0.008*	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
$\tau + 2$	-0.005*	-0.0002	-0.005*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
$\tau + 3$	-0.007*	-0.0002	-0.007*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Absence rate (old firm) [d)]		0.502*		0.583*
		(0.060)		(0.054)
Absence rate (new firm)		0.611*		0.703*
		(0.062)		(0.053)
Joint significance: Number of employees (old firm) (9)[e)]		2.51*		24.52*
Joint significance: Number of employees (new firm) (9)[e)]		1.85***		18.65**
Joint significance: Salary (old firm) (10) [e)]		0.51		7.33
Joint significance: Salary (new firm) (10) [e)]		0.46		3.82
Joint significance: Sector (old firm) (12) [e)]		0.56		6.59
Joint significance: Sector (new firm) (12) [e)]		0.65		7.29
Gender (0=female, 1=male)				-0.020*
				(0.002)
Joint significance: Age (9) [e)]				194.55*
Number of children				-0.001***
				(0.001)
Unmarried				-0.013
				(0.017)
Married				-0.007
				(0.017)
Divorced				0.020
				(0.018)

Joint significance: Marital Status (3) [e)]				51.30*
Joint significance: Monthly dummies (23) [e)]		40.05*		919.40*
Total number of employees	18,188	18,188	18,188	18,188
Number of transitions	18,188	18,188	18,188	18,188
Number of firms	9,223	9,223	9,223	9,223
Number of explanatory variables	6	93	6	107

a) Employees with uninterrupted employment spells start their new spell of employment immediately after the previous one has ended, without experiencing an interval of unemployment.
b) Clustered standard errors in parentheses.
c) The dependent variable is the monthly individual sickness absence rate in 2004 and 2005 during the months in which the employee was employed.
d) The firm that the employee moves from is called the "old" firm, whereas the firm the employee moves to is called the "new" firm.
e) The *F*-statistic is presented. The number of restrictions under the null-hypothesis is given behind the explanatory variable.
* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

points increase is positive and significant when controlling for firm characteristics.[10] The estimated parameters on the absence of the co-workers are 0.502 (old firm) and 0.611 (new firm) percent. The dummies for firm size are jointly significant (F-values: 2.51 and 1.85 for old and new firms, respectively). Salary and sector do not have a joint significant effect. Moreover, the month dummies are jointly significant (F-value: 40.05).

In the third and fourth column of Table 2.2 the estimated coefficients for the random-effects estimates are reported. The pattern is confirmed as reported, with the fixed-effects estimates and the net increase in sickness absence occurring in the period around the job-to-job transitions.

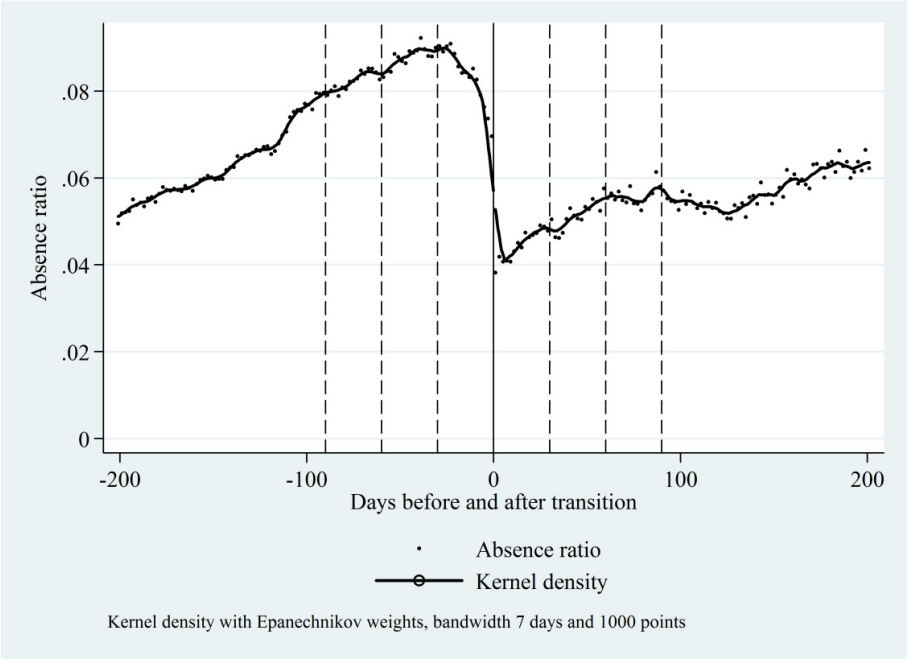
[10] The net effect is somewhat lower than 0.70 percentage points, since it is corrected for the period after the job-to-job move.

These estimates provide evidence in support of our hypothesis, that there is a net increase in absence in the period around job-to-job transitions. The decrease in rates of effort (increase in sickness absence) in the final months before the separation outweighs the increase in efforts (decrease in sickness absence) during the probationary period.

2.6 Robustness checks

Next, as a robustness check, we consider the employees who experience an interval of unemployment between the transition from the old to the new firm. The first day of work in the new firm is defined as $\delta = 1$, whereas $\delta = -1$ refers to the last working day in the old firm. Figure 2.5 reports the average absence of such employees in the last 200 working days with the old firm and the first 200 working days with the new firm. In comparison with the job-to-job transitions, the upward spike before the job transition is about 9 percent and the downward spike is 3.8 percent after the transition, relative to the average of 5.8 percent for employees whose employment is interrupted. It implies that the increase in sickness absence before the job move and the decline in sickness absence after the job move are both greater for employees with interrupted employment contracts than for employees who make a job-to-job transition. Furthermore, the total number of days of sick leave is 14.55 during the last 200 working days with the old employer and is 10.89 in the first 200 working days with the new employer. This suggests that for employees who experience a spell of unemployment between consecutive jobs there is a net increase in absence as well.

Figure 2.5 – Absence ratio of job movers with an intervening unemployment spell before and after the job move



Next,[11] we estimate Equation (2.2) for employees who have interrupted spells of employment. Both sickness absenteeism and job-to-job moves are procyclical. Layoffs, in contrast, are countercyclical. In tight labour markets, there will be fewer dismissals since employees are harder to replace (Blanchard and Diamond, 1990; Mortensen, 1994).[12] Table 2.3 reports the estimated coefficients. The

[11] As a robustness check, we also distinguished between men and women. For both genders, it appears that the increase in sickness absence before the job transition outweighs the decline in sickness absence after the job transition. The net increase in sickness absence in the period around job-to-job transitions is not sensitive to gender.

[12] We do not claim that employment spells with intervening periods of unemployment are unquestionably the consequence of dismissals, but it is more likely that employees did not leave a firm voluntarily if they experienced a period of unemployment between this job and the next.

fixed-effects estimates without controls (first column in Table 2.3) indicate the estimated parameters on τ_{-3}, τ_{-2} and τ_{-1} for employees with intervening unemployment spells, representing increases of 1.5, 2.0 and 2.1 percentage points, with an average increase of 1.87 percentage points. The ones on τ_{+1}, τ_{+2} and τ_{+3}, are -1.7, -1.3 and -1.4, with an average decline of 1.46 percentage points. The increase in absenteeism before the job transition is greater than the decline in absenteeism after the job move and hence the sum of fluctuations of 0.46 percentage points is positive and significant.

When controlling for the firm characteristics (second column Table 2.3), the estimated coefficients representing the final months at the old firm are positive and significant, like those in Table 2.2. The estimated coefficients for the months at the new firm show that there is a significant decline in the first month. For employees with interrupted employment spells, the average increase before the transition equals 0.99 percentage points, compared the 0.3 percentage points in the first month after starting the new job. The average effect over the three months after the transition is not significant. When taking into account the last three months at the old job and the first three months at the new job, the sum of fluctuations in the period around job-unemployment-job transitions is also positive, with an average increase of 0.87 percentage points. The estimates on the control variables and the random-effects estimates show comparable results to those in Table 2.2.

Table 2.3 – Estimation results (Equation 2.2) for employees with an intervening unemployment spell [a)]

	Individual sickness absence [b)] (fixed-effects) [c)]		Individual sickness absence [b)] (random-effects) [c)]	
$\tau - 3$	0.015*	0.008*	0.015*	0.009*
	(0.002)	(0.002)	(0.002)	(0.002)
$\tau - 2$	0.020*	0.011*	0.020*	0.012*
	(0.002)	(0.002)	(0.002)	(0.002)
$\tau - 1$	0.021*	0.011*	0.022*	0.012*
	(0.002)	(0.002)	(0.002)	(0.002)
$\tau + 1$	-0.017*	-0.003***	-0.016*	-0.004**
	(0.001)	(0.001)	(0.001)	(0.001)
$\tau + 2$	-0.013*	-0.001	-0.013*	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)
$\tau + 3$	-0.014*	-0.0002	-0.014*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)
Absence rate (old firm) [d)]		0.715*		0.755*
		(0.069)		(0.064)
Absence rate (new firm)		0.479*		0.577*
		(0.070)		(0.054)
Joint significance: Number of employees (old firm) (9) [e)]		1.93**		18.37**
Joint significance: Number of employees (new firm) (9) [e)]		2.50*		22.00*
Joint significance: Salary (old firm) (10) [e)]		0.99		8.87
Joint significance: Salary (new firm) (10) [e)]		1.88**		22.88**
Joint significance: Sector (old firm) (12) [e)]		1.49		19.85***
Joint significance: Sector (new firm) (12) [e)]		1.26		16.78
Gender (0=female, 1=male)				-0.012*
				(0.002)
Joint significance: Age (9) [e)]				96.82*
Number of children				-0.002*
				(0.001)
Unmarried				-0.001
				(0.014)
Married				0.004
				(0.014)
Divorced				0.026***
				(0.014)
Joint significance: Marital Status (3) [e)]				27.36*

Joint significance: Monthly dummies (23) [e]		29.84*		678.05*
Total number of employees	13,366	13,366	13,366	13,366
Number of transitions	13,366	13,366	13,366	13,366
Number of firms	7,389	7,389	7,389	7,389
Number of explanatory variables	6	93	6	107

a) Employees with interrupted spells of employment do not start their new employment spell directly after the previous one has ended, but undergo a period of unemployment.
b) Clustered standard errors in parentheses.
c) The dependent variable is the monthly individual sickness absence rate in 2004 and 2005 during the months in which the employee was employed.
d) The firm that the employee moves from is called the "old" firm, whereas the firm the employee moves to is called the "new" firm.
e) The *F*-statistic is presented. The number of restrictions under the null-hypothesis is given behind the explanatory variable.
* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

The positive sum of fluctuations of sickness absence in the period around job transitions is not only for employees with job-to-job moves, but also for employees who experience a period without work between two consecutive employment contracts. Therefore, both types of employees contribute to the strengthening of the procyclical pattern of absenteeism around job transitions.

2.7 Conclusion

This chapter has investigated the absenteeism of workers who make a job-to-job transition. We combine the net effect of sickness absence behaviour in the period around job transitions with the cyclicality not only of absenteeism but also of job-to-job transitions.

Sickness absence appears to be procyclical. In a tight labour market, the propensity to report absent is higher, for which two possible explanations are usually put forward. On the one hand, the

role of economic incentives may be effective and there may be more sickness absence reports because the probability of finding a new job is higher in a tight labour market. On the other hand, there may be a selection mechanism, meaning that sickness absence is higher because absence-prone workers are selected into the labour market when the labour market is tight. Not only is sickness absence procyclical, but job-to-job transitions are also. In the case of an economic upturn and with a low unemployment rate, employees will make more job-to-job transitions but without an intervening period of unemployment.

In the period around these job-to-job transitions, we observed a so-called 'pulsation' of the rate of absenteeism during the period of the job-to-job transition. This is a novel empirical finding, because it combines two separate empirical findings that were established by previous studies. It was found that absence increases in the period before the job-to-job move (Drago and Wooden, 1992) and that it declines in the first months with the new employer (Ichino and Riphahn, 2005). We compared the size of both changes before and after the job transition, where it became clear that in all three months before a job transition a positive effect on sickness absence could be observed which outweighs the negative effect in the months after this job-to-job transition.

Overall, there is a net increase of 0.62 percentage points, even when controlling for other explanatory influences. Therefore, the procyclical nature of absenteeism is strengthened by job-to-job transitions. The consequence of this finding is that it adds to the literature an additional reason why absenteeism may be higher in a tight labour market. Previous studies have focused on the effect of

economic incentives and sorting mechanisms on employees' effort (e.g. Arai and Thoursie, 2005; Røed and Fevang, 2007). Our estimates indicate that in a period of high worker turnover, there is a net increase of absenteeism, implying the strengthening of the procyclical nature of absenteeism.

Our robustness checks suggested that there is even an increase in absenteeism for employees with consecutive employment contracts that are interrupted by an unemployment spell. Even though dismissals, which are more likely the cause of an intervening unemployment period than a quit, are countercyclical, we find a net increase in the period around these job transitions. To be precise, our estimates indicate there is a net increase in absenteeism of 0.87 percentage points for employees with uninterrupted moves.

In addition to the procyclical nature of both sickness absence and job-to-job moves, which may be driven by fluctuations in labour demand, there also might be job-to-job changes unrelated to the business cycle. The decision to find a new job might depend on e.g. lack of job satisfaction, irrespective of the tightness of the labour market, which also can cause an increase in sickness absence shortly before transitioning to the other firm. It is interesting to investigate whether the increases in absence rates at the end of the employment contract are the same for these two types of job-to-job moves.

A deeper examination of uninterrupted and interrupted employment spells is needed to distinguish between voluntary (employee-initiated) and involuntary (firm-initiated) job transitions, since incentives may differ. Moreover, the differences in the relative size of the net effect in the period around employee-initiated and firm-

initiated separations can be studied. The job search motivation among both groups of employees and the accompanying differences of this motivation for both groups of workers should be researched more intensively in the future. Moreover, duration dependence analyses should be considered to account for possible differences in the size of the increases and declines in sickness absence, since it seems as if employees with interrupted employment contracts have a greater increase before the job transition and a greater decline after the job move. For employees with interrupted spells of employment, this relatively great increase in sickness absence before the transition may cause the relatively great decline in sickness absence when starting a new job, since even more absence may have more far-reaching consequence. Further attention should be paid to the role of outside employers on employees who move voluntarily, since they can sometimes determine their sickness absence behaviour in the old job.

Chapter 3

Incentives versus Selection: Sickness Absence after Spells of Unemployment

3.1 Introduction

Generally, a procyclical pattern of sickness absence is found in the literature and many studies have focused on this negative relationship between unemployment and sickness absence. There are two opposing hypotheses regarding the mechanisms that attribute to the procyclical nature of absence (Leigh, 1985; Arai and Thoursie, 2005; Askildsen et al., 2005; Nordberg and Røed, 2009). In case of a tight labour market, a high sickness absence rate may be explained by either economic incentives or selection mechanisms.

Economic incentives arise from the unemployment rate, which affects the costs of being absent. When the unemployment rate is high, the probability of losing one's job is higher for those who are often absent, and therefore the reported rate of absence will be lower. Selection mechanisms are related to the behaviour of employees at the lower end of the productivity distribution. We refer to these workers as absence-prone employees, who enter or leave the labour market according to the business cycle. When the unemployment rate is high, a sorting mechanism causes absence-prone employees to be the first ones to be dismissed, as a consequence of which absence rates fall. From previous studies of the macro-level of unemployment, it was concluded that the incentive effect was dominant. The literature has

remained silent on the effect on an individual's sickness absence in the current job of his/her past spells of unemployment. This is noteworthy, since the duration of an unemployment spell may have an impact on behaviour at the new job.

The aim of this chapter is to examine the impact of past individual unemployment on work effort in the current job. This micro analysis puts forward two hypotheses regarding the effect of past individual unemployment spells on absence rates after becoming re-employed. According to economic incentives, employees who have been unemployed for a long time are less inclined to report absent in their new job, suggesting the negative effect of individual unemployment duration and sickness absence after taking up a post in a new firm. Selection mechanisms, however, would imply that employees who have been unemployed for a long time might be absence-prone employees. After they re-enter the labour market, they will report absent more often, suggesting a positive relationship between the duration of individual unemployment and sickness absence.

Health obviously has an influence on sickness absence behaviour. Employees with a poor health status often display higher absence rates and longer unemployment spells. We are not necessarily interested in selection due to poor health, but rather in selection due to employees being absence-prone or less achievement-oriented. In order to analyse the relationship between absence-prone employees –not, that is, employees prone to absence through sickness– we include health information to control for employees with poor health and unavoidable absences.

In order to investigate what influence the unemployment spell before being rehired has on the employee's effort in the current job, we use administrative data from 2004 and 2005 on spells of sickness absence during employment in the Netherlands. We can observe previous spells of unemployment from 2002 to 2005. Therefore, when we observe and analyse sickness absence during employment in the years 2004 and 2005 we can detect whether and when employees were (un)employed from 2002 to 2005. We also use information regarding employees' health status before employment, and hence during spells of unemployment, to control for employees with poor health status.

The incentive explanation of the procyclical nature of absence would predict that the incentive effect would also play a role at the micro level. It leads to an expected negative relationship between individual unemployment spells and sickness absence. However, we find a positive relationship, suggesting that the selection effect is the prevailing factor, as it may be the absence-prone employees who have more probably been unemployed for a certain period of time. The results show that, even after controlling for health, individual and firm characteristics, employees who have been unemployed for more than a year before becoming re-employed report 1.3 percentage points more absence than employees who have been unemployed less than a year before becoming re-employed, with an additional 0.9 percentage points increase if they are employed by firms with a high average rate of sickness absence. Therefore, it seems as if the incentive for long-term previously unemployed people to put in more effort when re-entering the labour market will not prevail; apparently, the

disciplining effect of the length of a spell of unemployment on sickness absence in a subsequent new job is not dominant.

The structure of this chapter is as follows. Section 3.2 sets out a theoretical framework on which the hypotheses are based. Section 3.3 describes the Dutch institutional framework. Section 3.4 describes the data, while Section 3.5 gives descriptive statistics. Section 3.6 provides a discussion of the estimates. Section 3.7 concludes.

3.2 Theoretical model and hypotheses

The cyclical nature of absence has been researched extensively and in general a procyclical pattern is found in the literature. In economic upturns, when the labour market is tight, sickness absence rises concurrently.

Typical explanations refer on the one hand to the effect of economic incentives. Varying conditions of the business cycle affect the cost of absence to the employees'. When a labour market is tight, dismissed workers are harder to replace and also have a higher probability of finding a new job. When the economy expands, jobs will be more certain and easier to find, and therefore the consequence of being caught shirking are less rigorous. Therefore, sickness absence is higher in a tight labour market (Leigh, 1985; Arai and Thoursie, 2005; Askildsen et al., 2005; Nordberg and Røed, 2009).

At the same time, there is a sorting or selection mechanism, which refers to the labour composition effect. This means that in economic booms it is the absence-prone workers who are selected to return to the labour market. These absence-prone employees may be less achievement-oriented and more inclined to report high absence

rates. In case of economic downturns, these employees are again the first to become unemployed and selected out of the labour market, demonstrating a selection mechanism (Leigh, 1985).[1] In general, sorting in the labour market amounts to the employment of more skilled and productive employees by more productive firms. In relation to absenteeism, Nordberg and Røed (2009) define the sorting mechanism as what operates to ensure that 'workers with high individual absence propensities are the first to be laid off in a downturn and the last to be hired in an upturn'. Therefore, sorting as such covers not only the selection of different types of employees by accompanying types of firms in line with their respective levels of productivity. It also includes the situation that employees are hired on the basis of their propensity to be absent, with the most absence-prone employees being hired the last.

In this study, we take a micro-perspective and include the duration of individual spells of unemployment before entering a new employment contract. It can be argued that unemployment spells before being employed correlate with sickness absence behaviour. The duration of the previous unemployment spell may affect the cost to an employee of being absent. On the one hand, following the line of 'incentive' reasoning, it can be suggested that employees who have been unemployed for a long time will report absent less often in their new job than they did in their old one (Shapiro and Stiglitz, 1984).

[1] Leigh (1985) included both the unemployment level for the industry and nationally, where the industry level unemployment rate is an index of labour market tightness and hence a proxy for the expected duration of unemployment. Balchin and Wooden (1995) extend this line of analysis and have studied the inclusion of a penalty function consisting of the opportunity cost of being dismissed and the level of the threat of dismissal, concluding that this has a large negative influence on the decision to report absent.

They have an extra incentive to put in a great deal of effort and be constantly present on the work floor, since they have been unemployed for so long. Therefore, the difference in income from wages and unemployment benefits is large. This can be seen as an incentive effect,[2] and would result in a negative relationship between the duration of the unemployment spell prior to becoming employed and sickness absence in the current job. Consequently, the first hypothesis is:

Hypothesis 3.1: The incentive mechanism is dominant in explaining the relationship between previous unemployment spells and current sickness absence behaviour: employees who underwent long spells of unemployment are inclined to report absent less often.

An alternative to the incentive mechanism, however, may also be responsible. Following the selection line of argument, it may be presumed that absence-prone employees, regardless of health, will be unemployed longer and consequently will report absent more often in their new job. Employees at the lower end of the productivity distribution are defined as absence-prone employees. We presume that workers with a high propensity to be absent are more likely to become unemployed and hence selected out of the labour force and equally they are less likely to become re-employed and selected into the working population (Allebeck and Mastekaasa, 2004; Virtanen et al., 2005; Hesselius, 2007; Hultin et al., 2012; Pedersen et al., 2012). In

[2] It can also be the case that, when employees have been unemployed for a long time, the match between the firm or job and the employee is better, since they have had all this time to find a suitable job.

addition, as a consequence of being long-term unemployed, it is likely that their reservation wage will be lower, jobs inferior and their human capital lost. This would result in a positive relationship between the duration of a past unemployment spell and their current absenteeism. Therefore, the second hypothesis is:

Hypothesis 3.2: The selection mechanism is dominant in explaining the relationship between previous unemployment spells and current sickness absence behaviour: employees who underwent long spells of unemployment are inclined to report absent more often.

3.3 Institutional framework

In the Netherlands, involuntarily unemployed people receive unemployment benefits, except if they end their employment contract voluntarily; in this case, they will receive no payments. Unemployment benefits are paid for a maximum 38 months, or three years and two months. Basic unemployment benefits are paid for a period of three months if the unemployed worker before becoming unemployed has been employed for at least 26 weeks out of the past 36 weeks. Prolonged unemployment benefits are paid for a maximum period of three years and two months if the employee has worked for at least four out of the five years before becoming unemployed, depending on his/her work history. During the first two months of unemployment benefits, 75 percent of the previous wage is paid and 70 percent of the former wage is paid subsequently. There may be a fair amount of variation in the duration of spells of unemployment before employees become re-employed or qualify for social welfare.

During the period in which unemployment benefits are received, the employee needs to meet certain obligations. Most importantly, job-searching is required. This means that unemployed people have an obligation to apply for at least four jobs every four weeks. They are also obliged to apply for jobs which are offered by the Employee Insurance Agency (*Uitvoeringsinstituut Werknemersverzekering, UWV*) and to accept and retain a suitable job. Those receiving unemployment benefits must notify the Employee Insurance Agency about holidays and sickness spells.

If employees are sick on the day that a temporary employment contract ends, they can request unemployment benefits as soon as they have recovered and are ready to go back to work. The unemployment benefits cover income during the search for a new job. During periods of sickness, they can request benefits based on the Sickness Benefits Act (*Ziektewet*), which provides income for specific groups of sick workers who have no employer.

If employees report absent due to sickness for a period of 104 weeks, or two years, while under an employment contract, employers must continue to pay their wages. Legislation regulates the continuation of payment of at least 70 percent of the employee's wage and cannot fall below the minimum wage, but in practice during the first year of sickness collective labour agreements often require 100 percent of wages to be paid and 70 percent throughout the second year.

3.4 Data

We use the administrative Dutch National Absence Statistics (*Nationale Verzuimstatistiek, NVS*), documented for 2004 and 2005, as collected by Statistics Netherlands (*Centraal Bureau voor de Statistiek, CBS*), for 5.866.773 employees, which is equal to about 71 and 66 percent respectively of all the employees who reported absent in these two years. Absence statistics are available because firms are required to report them to the Health and Safety Executives (*Arbo-organisaties*).[3] Information on absence comes from the starting date and final date supplied for every spell of sickness. The administrative Social Statistical Dataset on Jobs 2002 to 2005 (*Sociaal Statistisch Bestand, SSB – Banen*) was used to complete the data on employment spells. Furthermore, we matched the data to the administrative information from the Municipal Administration (*Gemeentelijke Basisadministratie, GBA*) so as to include individual characteristics, as well as the administrative information on hospitalization (*Landelijke Medische Registratie, LMR*) to incorporate hospital admissions during unemployment.

We include employees who have been unemployed for some time. As the sickness absence data originate from 2004 and 2005, we include only employees who started their new employment contract in these two years. We can observe the duration of their spells of unemployment from 2002 onwards, since we consider the Social Statistical Dataset on Jobs 2002 to 2005. We exclude employees from the dataset if the information about their employing firm is

[3] The data in the NVS stem from six large Health and Safety Executives (*Arbo-organisaties*), namely, MaetisArbo, ArboDuo, Commit, ArboNed, ArboUnie and AchmeaArbo.

incomplete. We restricted the study to firms consisting of more than 10 employees and to workers of 18-65 years old. We included employees with a part-time factor of more than 0.3, meaning people who work for at least 12 hours per week, and all employees who earn the minimum wage or more. In monitoring sickness absence behaviour after becoming re-employed, we include only employees for whom we have data for at least 200 days from the start of their new employment contract.

In total, we include 18,000 employees, due to the size of the dataset when expanding it and memory restrictions in the statistical software. Of these 18,000 employees, 6,000 workers experienced a short unemployment spell of 1 to 60 days between one job and the next, of whom 3 were admitted to hospital during their spell of unemployment; 6,000 others were unemployed for a medium period of 60 to 365 days of whom 145 were admitted to hospital during their spell of unemployment, and 6,000 more who were unemployed for more than a year before entering a new employment contract, of whom 545 were admitted to hospital during their spell of unemployment. In total, these employees were employed at 7,586 different firms.

3.5 Descriptive statistics

Because we are focusing on 18.000 employees who entered a new employment contract, it is important to get some insight into the transitions from unemployment to employment. Figure 3.1 shows the months in which the employees started their new job after a short unemployment spell (1-60 days), a medium unemployment spell (60-

365 days) and a long unemployment spell (more than 365 days). There is a clear cyclical pattern, indicating that the hiring of new employees follows a quarterly pattern.

Figure 3.1 – Distribution of the starting day of new contracts in 2004 and 2005

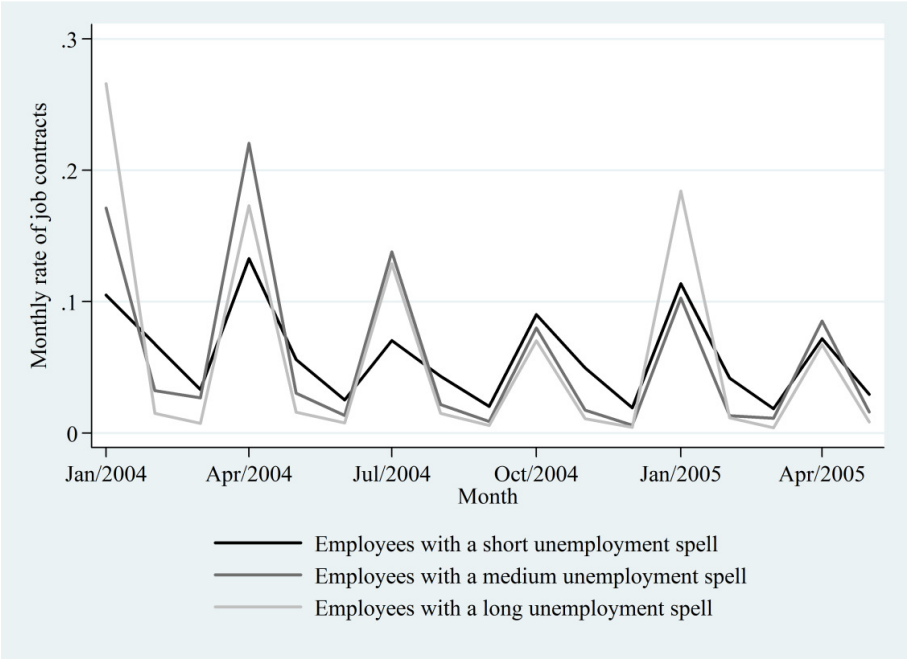
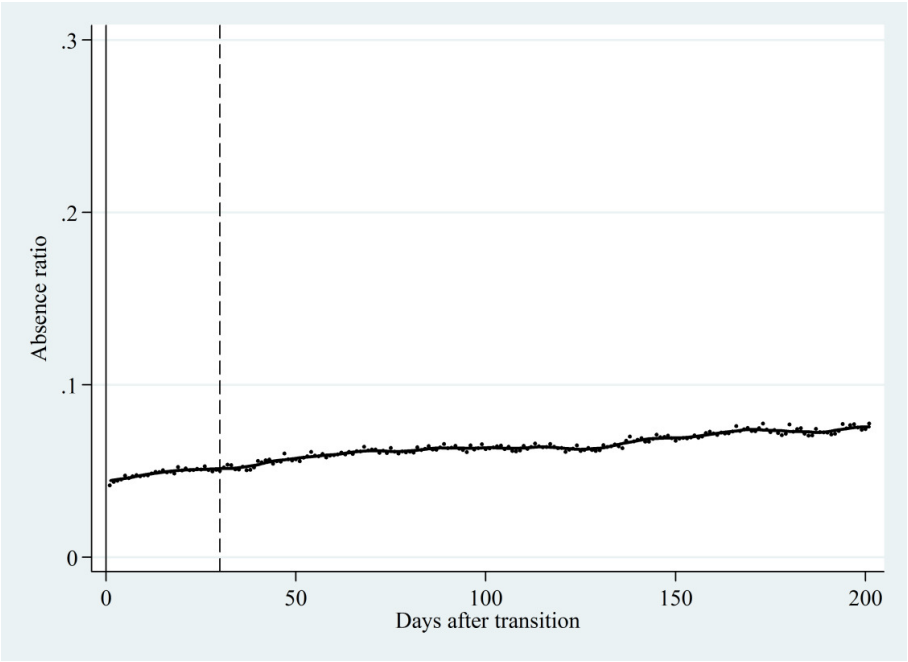


Figure 3.2 shows the absence rate of these 18,000 employees in relation to the start of their employment contract, showing the development of sickness absence after starting a new job. The solid vertical line indicates the first day of the new employment contract, whereas the dashed vertical line indicates thirty days, or one month, after entering the new employment contract, which often is the day that the probationary period ends. It can be seen that the sickness

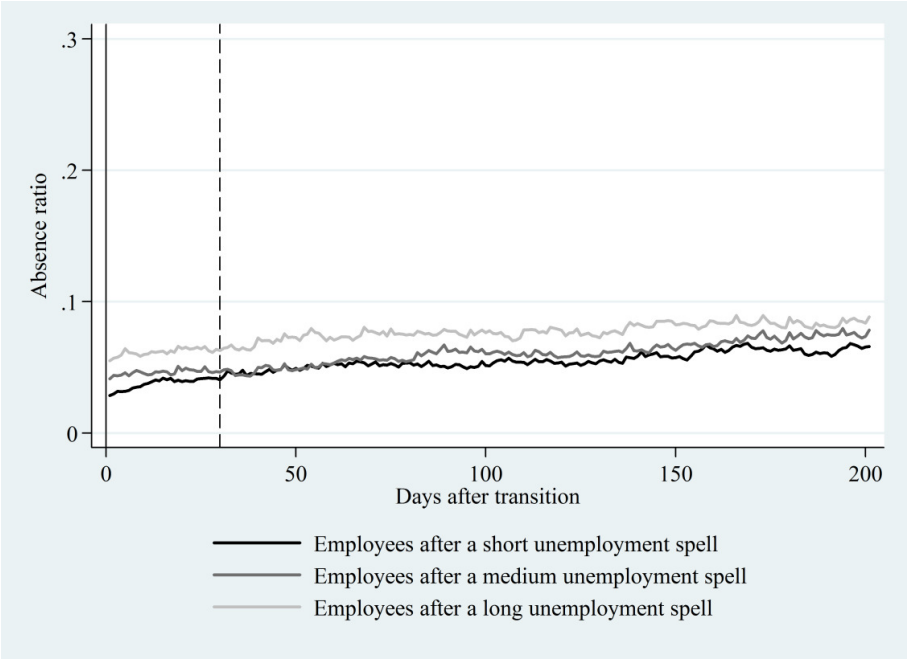
absence rate rises gradually, from about 4 percent at first to about 7.5 percent 200 days after the start of the employment contract.

Figure 3.2 – Development of sickness absence from 1 to 200 days after starting a new employment contract



When making a distinction between these 18.000 employees based on the duration of unemployment, it can be seen that there is a difference in the sickness absence rate in relation to the duration of the previous unemployment. Figure 3.3 shows that for all three groups, the sickness absence rate gradually increases over the course of the new job, but throughout this time, sickness absence is higher for employees who have been unemployed longer.

Figure 3.3 – Development of sickness absence from 1 to 200 days after starting a new employment contract, subdivided for employees with short (1-60 days), medium (60-365 days) and long (more than 365 days) unemployment spells



The dependent variable in our analysis is the individual weekly rate of sickness absence, calculated by the total individual number of sickness days in any specific week divided by the total individual number of contracted working days in the same specific week. We observe the dependent variable for forty weeks when an employee starts a new employment contract after being unemployed. Table 3.1 shows that the average individual weekly rate of absence is 5.9 percent for employees who went through short unemployment spells of 1 to 60 days (with an average of about 11 days), 6.7 percent for employees who were unemployed for a period of 60-365 days (with

an average of about 171 days), and 8.2 percent for employees who were unemployed for more than a year (with an average of 601 days) before entering a new employment contract. Regarding hospital admissions, 0.1 percent of the employees with short unemployment spells were hospitalized during this time, compared to 2.4 percent of the employees with medium unemployment spells and 9.1 percent of the employees with long unemployment spells.[4]

Several variables are reported at the individual and firm level, specifically sickness absence, age, salary and gender. The average sickness absence at a firm, excluding the individual employee under scrutiny, appears to increase with the duration of the spell of unemployment of the workers hired by this firm. The average firm-level sickness absence for employees with short unemployment spells is 5.7 percent, compared to 6.2 and 6.5 percent for employees with medium and long unemployment spells, respectively. Firm size is measured by the number of employees, and is aggregated on the firm –not the plant– level.[5] For employees who have undergone short unemployment spells, the average firm size is 1,752; for employees with medium past unemployment spells it is 1,516, and for employees who were unemployed for more than a year it is 1,960. The average tenure in the firm and average age in the firm are measured in number

[4] Since we can observe sickness absence behaviour during employment spells in 2004 and 2005 only, we go back in time to include unemployment spells from the end of 2003 to the beginning of 2002. Therefore, in order to link the unemployment spells to the employment contracts starting in 2004, more unemployment spells from 2003 than from 2002 are included and hence we observe more hospital admissions during unemployment in 2003 than in 2002.

[5] As firm size is measured at the firm level, not the plant level, it ranges from 10 to about 30,000 employees, with the median at 224 employees.

Table 3.1 – Summary Statistics [a)]

	Short unemployment spell (1-60 days)	Medium unemployment spell (60-365 days)	Long unemployment spell (>365 days)
Employee level			
Absence rate	0.059 (0.210)	0.067 (0.224)	0.082 (0.250)
Unemployment duration	11.326 (15.101)	170.664 (88.779)	601.309 (173.427)
Hospitalization (0-1 indicator)	0.001 (0.022)	0.024 (0.154)	0.091 (0.287)
Firm characteristics			
Average firm absence rate	0.057 (0.024)	0.062 (0.025)	0.065 (0.024)
Number of employees in firm	1,752 (5,011)	1,516 (4,382)	1,960 (4,381)
Average tenure in firm (in years)	3.973 (2.724)	3.836 (2.699)	3.544 (2.691)
Average age in firm	39.204 (4.355)	39.944 (4.511)	40.079 (4.365)
Average salary in firm (in Euros)	27,348 (5,507)	26,820 (5,495)	26,738 (5,350)
Percentage of women working in firm	0.371 (0.248)	0.425 (0.266)	0.452 (0.258)
Construction sector	0.070 (0.255)	0.049 (0.216)	0.041 (0.199)
Mineral extraction sector	0.001 (0.031)	0.001 (0.034)	0.001 (0.024)
Industry sector	0.152 (0.359)	0.112 (0.315)	0.111 (0.315)
Energy production sector	0.004 (0.066)	0.006 (0.074	0.023 (0.150)
Consumer goods production sector	0.144 (0.351)	0.108 (0.310)	0.129 (0.335)
Catering sector	0.013 (0.112)	0.012 (0.111)	0.015 (0.119)
Transport sector	0.081 (0.273)	0.096 (0.294)	0.059 (0.235)
Financial institutions sector	0.037 (0.187)	0.026 (0.159)	0.035 (0.235)
Service sector	0.275 (0.447)	0.232 (0.421)	0.231 (0.422)
Public sector	0.060 (0.238)	0.084 (0.277)	0.110 (0.313)
Education sector	0.041 (0.197)	0.063 (0.244)	0.055 (0.229)
Health care sector	0.090 (0.287)	0.163 (0.369)	0.155 (0.362)

Environmental and remaining services sector	0.032 (0.176)	0.048 (0.214)	0.035 (0.185)
Individual characteristics			
Gender (0=female, 1=male)	0.620 (0.485)	0.574 (0.494)	0.526 (0.499)
Age	35.916 (9.067)	36.904 (9.673)	37.423 (9.641)
Salary in firm (in Euros)	26,802 (11,809)	26,309 (11,209)	28,835 (12,576)
Number of firms	2,779	2,640	2,167
Number of employees	6,000	6,000	6,000

a) Standard deviations in parentheses.

of years, and based on the figures for all the company's workforce. For all employees, irrespective of the length of time that they were unemployed, the average tenure at the firm which has employed them once more is about 4 years and the average age of all employees in the firm is around 40 years. The average salary refers to the gross fiscal annual wage of all employees in the firm and is measured in Euros. The average salary in the firm is about 27,000 Euros for all three groups of employees. The percentage of women working in the firm denotes the proportion of women compared with all employees, and equals 37.1 percent for employees who were briefly unemployed, 42.5 percent for employees who went through medium unemployment spells and 45.2 percent for employees who were unemployed for more than a year. Furthermore, sector dummies are included in Table 3.1, from which it can be seen, for example, that 7 percent of all employees with short unemployment spells works in the construction sector, whereas only 4.1 percent of all employees with long unemployment spells works there. The gender dummies show that 62

percent of the employees in firms where workers with short unemployment spells end up are male, compared to 57.4 percent of workers with medium unemployment spells are male and so are 52.6 percent of workers who have had long spells of unemployment. The average individual age in this sample is 35.9, 37.9 and 37.4 years for employees with short, medium and long unemployment periods, respectively. The average individual salary refers to the gross fiscal annual wage in Euros and equals about 26,800 Euros for employees with both short and long unemployment spells, and 26,300 Euros for workers with medium unemployment periods.[6]

3.6 Empirical results

As we study the effect of previous unemployment spells on current sickness absence behaviour and try to distinguish whether the incentive effect or the selection effect is dominant, we include variables representing the duration of the unemployment spell. We include a hospitalization variable, as we want to control for selection due to the poor health of employees and focus on selection due to absence-proneness. The first specification is

$$Abs_{ijt} = \lambda_1 MU_i + \lambda_2 LU_i + \gamma H_i + \sum_{\tau=1}^{\tau=40} \delta_\tau W_\tau + \sum_{k=1}^{9} \beta_k D_{k,i} + s_j + c_t + \varepsilon_{ijt} \quad (3.1)$$

$i = 1, \dots, N; j = 1, \dots, M; t = 1, \dots, T, \tau \in \{1,2,3, \dots, 40\}.$

[6] The average individual salary is somewhat higher for fulltime working employees, namely, 27,017 Euros for workers with short unemployment spells, 26,462 Euros for employees with medium unemployment spells and 29,393 Euros for workers with long unemployment spells.

In Equation (3.1), the dependent variable Abs is the individual weekly rate of sickness absence. The individual worker is denoted by i, whereas j denotes the firm the employee is employed by. We include two different time indicators, namely, the actual weeks of the years 2004 and 2005, denoted by t, and the relative weeks compared to the moment of starting the new employment contract, τ. MU and LU represent medium-unemployment spells (60-365 days) and long-unemployment spells (more than 365 days), respectively. The employees with the shortest unemployment spells –between 1 and 60 days– are the benchmark group.

Including the duration of unemployment spells to study their effect on sickness absence leads to an empirical problem, since it may be the case that relatively unhealthy people are unemployed longer and display higher sickness absence rates when they re-enter an employment contract. Since health and hospital admissions are highly correlated, a hospital admission seems a valid proxy for health. Therefore, we control for health by including a dummy variable for hospital admissions during unemployment (Hultin et al., 2012). This leads to another problem, since employees who are unemployed for a long period also have more time in which to be admitted to a hospital during their spell of unemployment. Hence, we correct for health by including hospital admissions (0-1 indicator) in relation to the number of unemployed days. Since employees who have been unemployed longer have more time to be admitted to hospital during their unemployment, we correct for this time effect by dividing the hospitalization dummy by the number of unemployed days, which results in a relative hospitalization indicator H.

The summation of week dummies from the moment of entering the new employment contract to forty weeks after starting the new job is represented by W. The set of control variables is represented by D, including firm-level controls (average age in the firm, number of employees, average tenure in the firm, average salary in the firm, percentage of women working in the firm, average sickness absence in the firm (excluding the individual employee) and sector dummies) as well as individual-level controls (age, salary, gender). Sectors are denoted by s, c are the calendar dummies for 24 months in 2004 and 2005 to control for seasonal effects, and ε is an idiosyncratic error term.

Using random-effects, we estimate Equation (3.1) for the whole sample of 18,000 employees, 6,000 of whom were unemployed for 1-60 days, 6,000 of whom were unemployed for 60-365 days and 6,000 of whom were unemployed for more than 365 days.[7] The left-hand column of Table 3.2 reports the estimated coefficients for the random-effects estimates with clustered standard errors. The estimated parameters concerning the duration of the unemployment period show that employees who were unemployed for a period of more than a year have a significantly higher sickness absence rate of 1.7 percentage points than employees with the shortest unemployment durations, even after controlling for health by including the relative hospitalization indicator, together with average firm absence rates, firm size, average tenure in the firm, average age in the firm, average salary in the firm, percentage of women, gender, age, individual salary and sector. Moreover, it can be seen that sickness absence is lowest

[7] Random-effects are used in order to include the dummies concerning the unemployment duration, since these are constant per employee.

immediately after starting a new job, and increases in the weeks thereafter, from 0.8 percentage points in the first week to 2.7 percentage points after 35 weeks.

The estimation of Equation (3.1) shows that sickness absence is higher for employees who have been unemployed for more than a year, even when controlling for health. This would suggest that selection constructs the stronger hypothesis, since employees with long unemployment spells report absent in their new job more often. By checking whether, at the moment of recruitment, employees who have been unemployed for a long time behave differently when hired by firms with high rates of sickness absence, we find that this would seem to indicate even more that selection is responsible.[8] Therefore, we estimate the following equation.

$$\begin{aligned} Abs_{ijt} = {} & \lambda_1 MU_i + \lambda_2 LU_i + \rho_1 \mathrm{MU} \cdot \overline{SA}_{i,j,high} \\ & + \rho_2 \mathrm{LU} \cdot \overline{SA}_{i,j,high} + \gamma H_i \\ & + \sum_{\tau=1}^{\tau=40} \delta_\tau W_\tau + \sum_{k=1}^{9} \lambda_k D_{k,i} + s_j + c_t + \varepsilon_{ijt}. \end{aligned} \tag{3.2}$$

We estimate broadly the same equation as (3.1), but we include interaction terms for MU and LU, representing employees who went through medium and long unemployment spells, with a dummy for firms where there is a high average sickness absence rate, $\overline{SA}_{i,j,high}$, excluding the individual employee being observed. This leads to the inclusion of the terms $\rho_1 MU \cdot \overline{SA}_{i,j,high}$ and $\rho_2 LU \cdot \overline{SA}_{i,j,high}$. In addition, we include H, the relative hospitalization indicator, W, the summation of week dummies, D, the set of control variables, and s

[8] This can be the results of a firm or an employee effect.

and c, representing the sector and calendar dummies. The summation of week dummies refers to a period of forty weeks after starting a new employment contract, but we include twenty biweekly dummies (one for every two weeks) to cover the forty weeks of observation. The estimates on the week dummies show every 5th week.[9]

We estimate Equation (3.2) for the same sample of 18,000 employees. The right-hand column of Table 3.2 reports the random-effects estimates with clustered standard errors. The estimated parameters concerning the duration of unemployment show that employees who were unemployed longer than a year have a significantly higher sickness absence rate of 1.3 percentage points in relation to employees with the shortest duration of unemployment, even after controlling for hospitalization and for the other control variables and calendar dummies. Moreover, employees who have gone through medium unemployment spells of 60-365 days and enter an employment contract with a firm which has high average sickness absence do not increase their own rates of absence rates, although employees who went through long unemployment spells of more than 365 days do increase them. It appears that employees who were unemployed for more than a year and who become employed in a firm with a high average sickness absence rate, denoted by the term $\rho_2 LU \cdot \overline{SA}_{i,j,high}$, increase their own sickness absence rate by 0.9 percentage points. This points to selection, since employees who have been unemployed for more than a year and end up in firms with high sickness absence rates have a significantly higher sickness absence

[9] We include 20 biweekly dummies in Equation (3.2) to cover the forty weeks. Due to page restrictions, we show in Table 3.2 only the estimated coefficients of every 5th week.

rate than employees in the same sort of firm who have been unemployed for less than a year.[10]

Table 3.2 – Estimation results (Equations 3.1 and 3.2)[a)]

	Individual sickness absence [b)] (random-effects)	Individual sickness absence [b)] (random-effects)
Medium-unemployment spells	0.005*** (0.003)	0.004 (0.003)
Long-unemployment spells	0.017* (0.003)	0.013* (0.003)
Relative hospitalization (0-1 indicator corrected for unemployment days)	3.908** (1.780)	3.911** (1.779)
Medium-unemployment spells * high average firm absence rate		0.002 (0.004)
Long-unemployment spells * high average firm absence rate		0.009*** (0.005)
1 week after starting new job	0.008* (0.001)	0.008* (0.001)
5 weeks after starting new job	0.008* (0.002)	0.008* (0.002)
10 weeks after starting new job	0.015* (0.002)	0.015* (0.002)
15 weeks after starting new job	0.016* (0.002)	0.016* (0.002)
20 weeks after starting new job	0.017* (0.003)	0.017* (0.003)
25 weeks after starting new job	0.024* (0.003)	0.024* (0.003)
30 weeks after starting new job	0.022* (0.003)	0.022* (0.003)
35 weeks after starting new job	0.027* (0.003)	0.027* (0.003)
40 weeks after starting new job	0.018*(0.003)	0.018*(0.003)
Average firm absence rate	0.601* (0.058)	0.547* (0.068)
Number of employees in firm/10000	0.004 (0.002)	0.003 (0.002)
Average tenure in firm	0.0003 (0.001)	0.0004 (0.001)
Average age in firm	-0.001*** (0.0004)	-0.001** (0.0003)
Average salary class in firm	-0.005* (0.001)	-0.005* (0.002)
Percentage of women working in firm	-0.009 (0.007)	-0.009 (0.007)
Gender (0=female, 1=male)	-0.018* (0.003)	-0.018* (0.003)
Age	0.002* (0.0001)	0.002* (0.0001)

[10] This does not imply that absence-prone employees select themselves into these low productive firms, as is the case when sorting is related to high (low) productive employees being selected into high (low) productive firms. It implies that íf employees who were unemployed for a long period are given a post in a firm with a high average sickness absence rate, then their sickness absence rate will increase as well.

Salary class	-0.003* (0.001)	-0.003* (0.001)
Sector dummies (12)[c]	13.09	13.11
Observed month dummies (23)[c]	279.85*	278.39*
Total number of employees	18,000	18,000
Number of firms	7,586	7,586
Number of explanatory variables	67	69

Note: We show in the tables the estimated coefficients for every 5th week, whereas dummies for all weeks are included in the regression equations. The coefficients for the other weeks are suppressed, due to page considerations.

a) Clustered standard errors in parentheses.

b) The dependent variable is the weekly individual sickness absence rate for forty weeks after entering a new employment contract.

c) The *F*-statistic is presented. The number of restrictions under the null-hypothesis is mentioned behind the explanatory variable.

* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

These results suggest that a selection mechanism exists. We find a positive relationship between the duration of past unemployment and current sickness absence. Even after including health status, to control for the fact that long-term unemployed employees may have had worse health and more time to visit the hospital during their spell of unemployment, this positive relationship still holds. When the interaction terms of firms with high sickness absence rates and unemployment durations are included, it appears that employees with long unemployment spells before becoming re-employed report absent more often, a trend which is augmented if they enter employment contracts with firms which have high rates of absence.[11]

[11] As a robustness check, we re-estimated Equations (3.1) and (3.2) for a different subsample of 18,000 employees, subdivided into 6,000 employees for each category. The results of this control group support our earlier findings and point towards selection. Employees with long unemployment spells before entering a new employment contract report absent in their new job more often and this effect is

We also re-estimated Equation (3.1) and (3.2), but without correcting for health by excluding the hospitalization variable. When health is excluded as a control variable, the selection effect may be due to taking on employees with poor health or those who are absence-prone. The coefficients are slightly smaller when controlling for health, but in general the results do not change from those in Table 3.2. This may imply that, even though the relative hospitalization coefficient in Table 3.2 is significant, selection due to poor health is not so important in explaining selection since health and the duration of unemployment spells are not correlated.

3.7 Conclusion

Economic research has studied two opposing hypotheses regarding the mechanisms underlying the procyclical nature of absence, namely, economic incentives and selection mechanisms (Leigh, 1985; Arai and Thoursie, 2005; Askildsen et al., 2005; Nordberg and Røed, 2009). From these papers, it appears that the simultaneous negative relationship between unemployment at a macro level and sickness absence at a micro level was related to the effect of economic incentives rather than the effect of selection.

This chapter related unemployment at a micro rather than a macro level to sickness absence. We investigated the effect on sickness absence of past individual unemployment spells before becoming re-employed in one's current job. Two hypotheses were put forward. On the one hand, economic incentives would predict that employees who went through long unemployment spells would report

strengthened when they start working in firms where the average sickness absence is high, even after controlling for health.

absent in their new job less often, suggesting a negative relationship between individual unemployment and sickness absence. On the other hand, selection mechanisms would predict that employees at the lower end of the productivity distribution who enter the labour market after long spells of unemployment would report high absence rates, suggesting a positive relationship between individual unemployment and sickness absence. Since we are interested in selection in relation to absence-prone employees rather than employees with poor health, we controlled for health by including hospitalization before employment. We examined sickness absence spells for Dutch employees in 2004 and 2005, but included unemployment spells from 2002 to 2005.

The results suggest that selection mechanisms seem to be the most important factor in explaining the differences in current sickness absence between employees who went through various spells of unemployment before becoming re-employed, which contradicts what the literature on the procyclical nature of absence would predict. We find a positive relationship between past individual unemployment spells and current sickness absence. Employees who have been unemployed for more than a year before re-entering an employment contract, report absent 1.3 percentage points more often than employees who have been unemployed for less than three months and they report absent an additional 0.9 percentage points more often when they are employed in firms with a high average sickness absence rate, even when controlled for health. The disciplining effect of the duration of an unemployment spell on sickness absence in a subsequent new job is not dominant. The incentive for past long-term

unemployed people to put in more effort when re-entering the labour market is not enough to prevail. Rather, it is put forward that the sorting mechanism applies, encompassing absence-prone workers who re-enter the labour market after a long period of unemployment. As a consequence of this previous experience, it is possible that absence-prone employees' reservation wage will be lower, jobs inferior and human capital lost, all of which are associated with a higher sickness absence rate in the current job.

It appears that employees do not respond strongly to the incentive from the disciplinary effect of the duration of unemployment spells, but this should be seen in proportion to the effect of other incentives. Incentives such as employment protection and the probationary period also play a role when starting a new employment contract. Ichino and Riphahn (2005) show that the number of absence days increases significantly when the probationary period ends. Alternatively, Hassink and Koning (2009) show the effect of positive, bonus-related, incentives on absenteeism. For this reason, the relative importance of incentives may differ and the institutional environment can contribute to the role of incentives. Therefore, a balanced judgement concerning the role of incentives should be sought.

Even though the sum of the individual microeconomic effect does not add up to the outcomes regarding unemployment at a macro level, this study does not deny the conclusions drawn in the analyses regarding labour market tightness. These studies are concerned with the effect at a macro level of the unemployment of others on individual sickness absence, whereas the present microeconomic study is concerned with the effect of one's own previous unemployment on

one's own sickness absence behaviour. Moreover, the analyses concerning unemployment at a macro level consider two alternative explanations for the same phenomenon, whereas this microeconomic examination considers two alternative explanations if either of two possible alternatives ensues.

Firms' ability to manage sickness absence and keep it low is an important spearhead. From these results, it becomes clear that the previous unemployment spells of workers who are hired can be informative. The inflowing of employees may be instructive regarding sorting and their subsequent work effort in the current job. Employees who were unemployed for more than a year run the risk not only of suffering from inferior jobs and lost human capital, but also of frequent sickness absence reports.

There are some limitations to this research. This study shows that employees who were recently unemployed for more than a year report absent in the current job more often, which is augmented when they are employed in firms with a high average sickness absence rate, even when controlling for health. This fits the definition of sorting by Nordberg and Røed (2009), that workers with high individual propensity to absence are the first ones to be laid off in a downturn and the last ones to be hired in an upturn. Sorting covers not only the incidence of employees with the highest absence propensity to be the ones who are hired last, but also covers the hiring of different types of employee by accompanying types of firm based on the employees' level and the firms' level of productivity. Therefore, one of the limitations of this enquiry is that we cannot draw any conclusions about whether the more productive employees are also employed by

more productive firms. We can state only that once they are employed after being unemployed for a long period, they report higher absence rates. Hence, more research remains to be done on whether or not sorting relates also to more skilled and productive employees being employed by more productive firms. In addition, we now include hospitalization to control for health, corrected for the number of days of unemployment. This seems to be a valid proxy, since health and hospital admissions have a clear correlation. It is, however, not perfectly correlated, for not all employees with bad health will be admitted to hospital. Moreover, employees who are admitted to hospital during a long unemployment spell are considered to be healthier than employees who are hospitalized during a short unemployment spell. This does not need to be correct. Therefore, other or possibly better measurements of health should be included. In addition, we are considering sickness absence data documented for 2004 and 2005 only. It would be interesting to integrate a more long-lasting perspective on the consequences of undergoing a long-term spell of unemployment.

PART II

ABSENTEEISM AT TIMES OF HEALTH SHOCKS

Chapter 4

Sickness Absence and the Intensity of the Medical Condition

4.1 Introduction

Despite the quantity of research nowadays on workplace absenteeism, the subject is seldom studied in relation to the intensity of the medical condition. In this chapter we argue that the worker's reason for absence may be an important variable in the analysis of absenteeism. So far, empirical studies of absenteeism have analysed every type of condition simultaneously, but not asked how absence increases as the gravity of the medical or physical condition becomes more intense.

In this chapter we consider the consequences of including the seriousness of the condition in an absence equation. We do this by including the weeks of the condition or illness, in the course of which the intensity is increasing. On the one hand, the intensity of the condition may be independent of the explanatory factors found in the literature, such as gender, age, wages and firm size (Allen, 1981a; Barmby and Stephan, 2000). On the other, the intensity of the condition may be dependent on the explanatory factors. There are two alternative explanations. First, the intensity may weaken the effect of the explanatory factors. Second, the intensity may strengthen the effect of the explanatory factors.

In order to examine the way that absence increases as the physical condition intensifies, and ascertain whether the intensity of

the condition weakens or strengthens the explanatory factors, we focus on pregnancies. From a research point of view, an interesting feature of pregnancy is that it has a more or less equal duration for all women. From the perspective of the employee, the physical burden increases as the pregnancy proceeds and therefore the absence rate will slope upwards. Pregnancy is a relatively endogenous condition for employees, but the group of employees is generally homogeneous. This specific situation gives us the possibility of studying absenteeism among a group of workers who are more homogeneous with respect to the reason for absence than can usually be presumed, since the major studies on sickness absenteeism do not correct for the cause of absence.[1] We exploit the consequences of this specific setting to disentangle whether the intensity of the condition is independent of the explanatory factors. Our estimates for Dutch females indicate the second alternative explanation, since we find that the intensity of the physical condition strengthens the effect of the explanatory factors, which could suggest that the major effects found in the literature are an upper bound of the true effect.

The existing literature uses pregnancies differently from the way in which it is used in the present analysis. It is well known that pregnant workers are more likely than others to report absent and that

[1] Different conditions have dissimilar time spans from the start of the illness to recovery. One can think, for instance, of a fractured leg, which takes about six weeks to recover from, or influenza, which lasts up to about a fortnight. Each condition has a specific pattern or hazard rate of absence over the course of the disease, depending on the duration and intensity of the illness. For most, it will be downward-sloping, meaning the probability of absence decreases over time, when employees experience, say, a fractured leg or the flu. Yet for some conditions, the rate will slope upwards, representing an increasing probability of absence over time, as when employees suffer chronic diseases or become pregnant.

the likelihood of their being absent increases during the pregnancy (Alexanderson et al., 1994; Alexanderson et al., 1996; Fevang et al., 2011). Pregnant employees have a higher health risk because of physical discomforts, such as nausea, backache and pain in the legs and feet. Other papers concerning sickness absence and pregnancies often focus on gender differences around family formation and before and after entering parenthood, for example, Markussen et al. (2011) and Angelov et al. (2013). Rieck and Telle (2013) focus on sickness absence before, during and after pregnancy and show that the level of sickness absence during pregnancies increases over time.

The sickness absence literature gives explanations for differences between employees in the rate of absence (Treble and Barmby, 2011). We make a distinction between classical labour supply factors, employees' career concern, the costs of monitoring and differing job attributes. Remarkably, in many of these explanations, there is no explicit room for the cause of the absence. Ichino and Moretti (2009) consider one specific reason for women, to be precise, the menstrual cycle, but in general the importance and intensity of the health condition is not included.

We focus on Dutch female employees in the period before childbirth, a period of about 40 weeks. The Dutch Working Conditions Act, which is based on European guidelines, states that as the intensity of the condition increases during a pregnancy the employer needs to create a safe and healthy working environment, where psychological as well as physical burdens need to be taken into account. Our empirical analysis is based on a unique set of data of Dutch female employees who gave birth to their first child in 2004

and 2005. We report the following pattern of absenteeism. During the pregnancy, sickness absence increased from about 5 percent 40 weeks before childbirth to about 18 percent 6 weeks before childbirth. Immediately after childbirth, the sickness absence rate decreases to about zero due to maternity leave. The results suggest that the intensity of the pregnancy strengthens the explanatory factors of sickness absence. The greatest increases in sickness absence before childbirth are consistent with the relationships as suggested by the literature; as the intensity of the pregnancy increases, sickness absence increases more for employees with short tenure, low ages, low wages, working in firms with a high average sickness absence, working in firms with a high percentage of women and working in large firms. The differences appear to increase with the intensity of the pregnancy, since there are no significant dissimilarities during the first couple of weeks of pregnancy, whereas thereafter the differences increase with time.

The remainder of this chapter is organized as follows. In Section 4.2, we set out a theoretical framework, on the basis of which we formulate some hypotheses. In Section 4.3, we describe the specific Dutch institutional setting. Section 4.4 consists of an overview of the data. In Section 4.5, we document the patterns of absenteeism around childbirths. Section 4.6 first reports the estimates and then discusses the robustness checks in Section 4.7. In Section 4.8, we conclude and discuss our findings.

4.2 Theoretical framework and hypotheses

4.2.1 Absence equations

Some major economic theories in the area of labour economics seek to explain sickness absence behaviour. However, we first focus on the empirical contributions. An empirical absence equation has the following canonical structure:

$$Abs_{it} = \alpha' X_i + u_{it}, \tag{4.1}$$

where $\alpha \neq 0$ reflects the variables influencing the level of absence.[2] The effects in X cover the labour supply as well as labour demand characteristics, as determined by the literature on sickness absence (Allen, 1981a; Barmby et al., 1991; Coles and Treble, 1993; Coles and Treble, 1996; Barmby and Stephan, 2000; Coles et al., 2007). These effects will be discussed at the end of this section.

Next, we introduce to the equation the intensity of the condition or disease, which is a novel contribution to the existing literature.[3] One may argue that the intensity of the condition is an unobserved effect included in the error term u in Equation (4.1), such that $u_{it} = \beta I_{it} + v_{it}$. If the intensity of the condition is left in the error term, there is a risk of underestimating or overestimating the true effect of the explanatory factors in absolute terms. Broadly speaking,

[2] Since we observe absenteeism for the forty weeks of a pregnancy, time is made relative to the moment of conception. During these weeks, the explanatory variables are constant. Therefore, they do not depend on time and the correlation between the explanatory variables and the intensity of the condition is zero. This is due to the way in which we structured the data. In general the independent variables may vary over time as well, a consequence of which is that the correlation between the explanatory factors and the intensity of the condition is not equal to zero.

[3] Equation (4.1) does not accommodate for differences in intensity. Duration models, such as proportional hazard models, do, however, provide for differences in intensity over time, since the baseline hazard can monotonically increase or decrease over time as well. Our model, however, is not a duration model, as pregnancies have a standard duration of forty weeks.

there are three possibilities, graphically displayed in Figure 4.1. First, one may argue that, as the following equation shows, the intensity (I) is independent of the factor included in X:

$$Abs_{it} = \alpha' X_i + \beta I_{it} + v_{it}. \quad (4.2)$$

A positive β reflects the fact that a higher intensity of the condition leads to more absence.[4] The implication of such an outcome is that the explanatory factors found in the literature are independent of the intensity of the condition. This implies that absence rates are determined by the standard labour supply and demand characteristics X, as well as by the intensity of the condition I. Every condition displays different levels of intensity over its course. Within this pattern, with varying intensities over the course of the condition, differences between employees can still exist, based on the effects in X. Hence, absence rises when the intensity of the condition increases, but it does so independently of the factors included in X. This would mean that, for conditions where the intensity increases over time, there is an upward-sloping sickness absence rate, with constant differences between employees based on the independent factors in X, as displayed in the left-hand panel of Figure 4.1. This is summarized by the following hypothesis:

Hypothesis 4.1: Since the intensity of a condition is independent of the explanatory factors, there will be unvarying sickness absence differences between employees over the course of the condition.

[4] β increases over time when the intensity of the condition increases, as is the case with pregnancies. For other conditions, β may decrease over time, as with fractures.

It follows that the intensity of the condition is possibly not independent of the explanatory variables, since it may weaken or strengthen them. Therefore, we add the interaction terms in intensity and the explanatory factors.

$$Abs_{it} = \alpha' X_i + \beta I_{it} + \gamma' I_{it} X_i + e_{it}. \quad (4.3)$$

If $\gamma \neq 0$, this means that the explanatory factors, as found in the literature, are not independent of the intensity of the condition. Hence, the second possibility is that $\gamma < 0$ in Equation (4.3). In this case, the intensity of the condition may weaken the explanatory factors, such that differences between employees which are captured by X will disappear in the event of a specific health shock or condition. This means that the parameters of the interaction term in intensity I and the explanatory variables X may have the opposite sign as parameters of the direct effect of X, such that $sign(\alpha) = -sign(\gamma)$.[5] When the intensity of the condition is rising over time and the physical burden is getting increasingly severe, the differences that exist as caused by effects in X may diminish. Therefore, the intensity of the condition determines that the physical burden is so high that all differences between employees disappear and all employees will report absent, as displayed in the middle panel of Figure 4.1. This is stated in the next hypothesis:

Hypothesis 4.2: The intensity of a condition weakens the explanatory factors, as a result of which sickness absence differences between

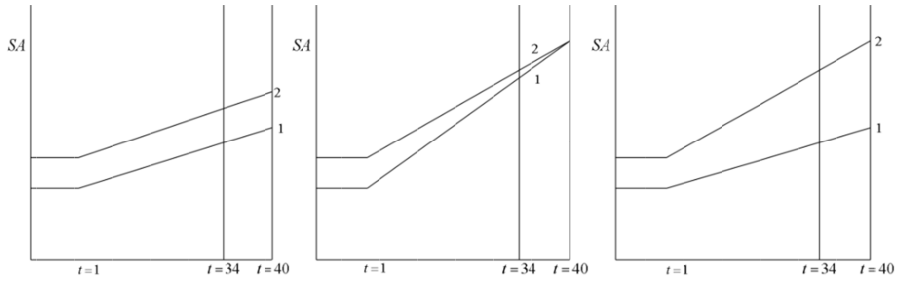
[5] This means that if the intensity of the condition were left out, as in Equation (4.1), there would be an underestimation of the true effect, since $\beta > 0$ and $cov(I, X) < 0$.

employees will be reduced and eventually disappear as sickness absences increase to a similar level.

The third possibility is that $\gamma > 0$ in specification (3). In this case, the intensity of the condition I may strengthen the effect of the explanatory factors X. This implies that the parameters of the interaction term in intensity I and the explanatory variables X may have the same sign as the parameters of the direct effect of X, such that $sign(\alpha) = sign(\gamma)$.[6] In this case, the intensity of the condition amplifies the existing differences, based on the explanatory variables. This is displayed in the right-hand panel of Figure 4.1 and specified in the following hypothesis:

Hypothesis 4.3: The intensity of a condition strengthens the explanatory factors, as a result of which sickness absence differences between employees will be amplified.

Figure 4.1 – Patterns of sickness absence



[6] This means that if the intensity of the condition were left out, as in Equation (4.1), there would be an overestimation of the true effect, since $\beta > 0$ and $cov(I, X) > 0$.

4.2.2 Effects of the explanatory variables

We next discuss some important effects in X on which the hypotheses are built, that we have distinguished so that they boil down to classical labour supply issues, employees' career concern, the costs of monitoring and job attributes influencing sickness absence.

Classical labour supply aspects (see, e.g., Allen, 1981a), are based on utility maximizing employees and they are subject to budget and time constraints. Differences in absence behaviour can be explained by dissimilarities in household characteristics and disutilities of work, such as gender and age. In addition, socioeconomic status can also be used as a supply-side explanation for differences in absence rates between employees. Employees with a higher socioeconomic status as a result of education, income or occupation, deal with health problems and sickness in a different way, since they have better financial means to take care of themselves. Furthermore, another supply side explanation for differences in absence rates is the employees' 'career concern'. Employees with a career concern have a tendency to work hard and rarely be absent. Holmström (1982) argues that employees have an incentive to put in more effort if their ability is unobservable and if individual output is used by supervisors to monitor ability. Therefore, the sickness absence of workers may increase with tenure or age. However, sickness absence among workers may also decline with tenure related to a 'career concern', since the selection of motivated employees causes employees with long tenure to report absent less frequently (Barmby and Stephan, 2000; Hassink and Koning, 2009).

The labour demand side also offers clarifications for important effects in X. Several factors are related to the costs of monitoring, such as firm size, peer effects and sick-pay schemes and therefore the level of absence control. Large firms experience smaller unit costs of absence and less strict regimes of monitoring, for monitoring is more costly and therefore sickness absence is higher in large firms (Barmby and Stephan, 2000). Peer effects, such as colleagues' behaviour, may influence average sickness absence at the firm, affecting the costs of monitoring. Higher costs of monitoring are associated with higher sickness absence rates (Vistnes, 1997; Mas and Moretti, 2009). The distribution of females working in the firm may influence the costs of monitoring and sickness absence. Ichino and Moretti (2009) show that if there is more noise in the signalling device of absence on earnings, related to the female menstrual cycle, monitoring is less. An alternative explanation from the labour demand side for differences in absence rates is employees' job attributes, since there are differences in job complexities and differences in the pressure to return. Not all jobs are equally complex. Jobs can be homogeneous and consist of one task only (Kremer, 1993; Mortensen and Pissarides, 1994), or they can be heterogeneous and involve multiple tasks (Kremer, 1993; Lazear, 1995). When job complexity is high, a job consists of multiple tasks, possibly ranging from physical to more analytical ones. The Kremer (1993) model shows that a positive relationship exists between the number of tasks or the technology used in a job and the worker's skill or effort, implying higher absence rates for employees with a lower number of tasks or for employees using inferior technologies to do their job. Moreover, another job attribute is related

to the pressure that employees experience from their employers to return to work. Employees with highly complex jobs may perceive more pressure from their employers to return to work than low-wage employees perceive, a result of which can be a difference in sickness absence levels (Post et al., 2005; Brouwer et al., 2009).

4.3 Institutional setting

In the Netherlands, female employees are entitled to 16 weeks of paid pregnancy and maternity leave, which is based on the Work and Care Act (*WAZO*). Leave is usually subdivided into 6 weeks of pregnancy leave before childbirth and 10 weeks of maternity leave after it. During pregnancy leave and maternity leave, the employee will receive pregnancy benefits on the basis of the Work and Care Act, which is paid for by the Social Benefit Administration (*Uitvoeringsinstituut Werknemersverzekering, UWV*). If employees report absent due to pregnancy before pregnancy leave starts, they will receive benefits according to the Sickness Benefits Act (*Ziektewet*).[7] If employees report absences unrelated to the pregnancy before pregnancy leave starts, however, employers will continue to pay their salaries.

The Dutch Working Conditions Act is based on the European guidelines (89/391/EEG). The European Council directive 92/85/EEC specifically regulates the measures to improve safety at work during and after pregnancy. It states that, after the employer has been notified

[7] During sickness, employees generally continue to receive wages from their employers. There are some high-risk groups of employees, however, who are financed by the government during sickness, such as organ donors, flex workers and pregnant women who are sick due to pregnancy. These employees are called 'safety-netters' (*vangnetters*).

of the pregnancy, the employer must create a safe and healthy working environment for the female employee and the unborn child. The employer should take into account the on-the-job risks of the pregnant employee, for example physical burdens, such as the need for bending, squatting, standing and kneeling, as well as psychological or emotional burdens, such as pressure of work and stress. Other factors should be considered as well, such as possible exposure of the pregnant employee to vibrations or shocks, radiation, extreme noise, uncomfortable climatic conditions and hazardous substances, as well as bacteria, funguses and viruses. Specific rules about lifting are also included in the Working Conditions Act, with different norms for different weeks. During the whole course of the pregnancy and three months after giving birth, the maximum weight that may be carried in a single lift is ten kilograms. After 20 weeks, the pregnant employee may carry only five kilograms ten times a day, while after 30 weeks this number is reduced to five times a day. Within two weeks after notification of the pregnancy, the employer needs to inform the employee about the possible consequences of being exposed to work-specific risks. Therefore, task adjustment needs to take place if necessary and possible (Saurel-Cubizolles and Kaminski, 1987; Van Beukering, 2006).

Finally, the Working Hours Act regulates that the pregnant employee has the right to have extra hours of rest, up to one eighth of working time. Moreover, she cannot be forced to work overtime or on nightshifts. A pregnant employee, in addition, may not be dismissed during pregnancy or during the first six weeks after maternity leave, with some exceptions. Legally, employees are obliged to notify the

employer of pregnancy no later than three weeks before the pregnancy leave is due to start, but in practice employees tend to inform their employers after about ten weeks of pregnancy.

4.4 Data

We use administrative information on 5.866.773 employees, for which we take the Dutch National Absence Statistics (*Nationale Verzuimstatistiek, NVS*), as collected by Statistics Netherlands (*Centraal Bureau voor de Statistiek, CBS*), documented for 2004 and 2005; this covers about 71 and 66 percent of all employees who reported absent in these two years, respectively. Absence statistics are included because firms are required to deliver this to the Health and Safety Executives (*Arbo-organisaties*). With respect to absence, there is information on the starting date and final date of spells of sickness. The administrative Social Statistical Dataset on Jobs 2002 to 2005 (*Sociaal Statistisch Bestand, SSB – Banen*) has been used to complete employment spells. Furthermore, we matched the data to administrative information from the Municipal Administration (*Gemeentelijke Basisadministratie, GBA*) to include individual characteristics and childbirths.

We focus on female employees[8] with first-born children in 2004 and 2005.[9] In total 393.821 children were born in 2004 and

[8] In the analyses, we include only female employees during pregnancy. We did not find clear patterns for men during the forty weeks of their partner's pregnancy and therefore they are excluded. They are included in the analysis of Angelov et al. (2013), for example, but a longer time span is considered.

[9] We focus on women who had their first baby in order to bring together a homogeneous group of employees. Women who had their second baby and were still employed in the labour market are often more highly educated than other women, who tend to exit the labour market after the birth of their first child.

2005, out of which 216.127 had working parents, whose employment data we obtained. 210.266 children were single births, while 5.861 children were multiple births.[10] Regarding these 210.266 births, we obtained information about 100.563 mothers and 109.703 fathers. We focus on mothers with a first-born single child. We exclude from the dataset employees with missing firm information. We also eliminate pregnant employees who fell ill due to the pregnancy, called 'safety-netters', who account for only about 6 percent of the observations. We restrict the study to firms employing more than 10 workers and to employees between 18 and 45 years. We include only employees whose childbirth takes place within their employment contract. Furthermore, we include only women whose delivery took place at least 300 days after the start of their employment contract, in order to monitor their sickness absence behaviour during the course of the pregnancy. We excluded sickness absence at the moment of delivery, since this should be seen as pregnancy leave. As a result, we use information on 15.446 employees working in 6.353 different firms, equal to almost 5 percent of all the childbirths that took place in this period.

With this focus, it is vital to get some insight into the months before birth, in order to clarify any cyclical pattern that may exist. Therefore, Figure 4.2 shows the evolution of the childbirths that are included in our sample, demonstrating a slight seasonal pattern. It should be noted that, in this graph, child-births over the whole course of two years can be observed, whereas the regression estimations consists only of births which took place from September 2004

[10] Multiple births can be twins, triplets, or quadruplets.

onwards in order to be able to include the sickness absence of female employees before the birth of the child.

Figure 4.2 – Evolution of birth rates between 2004 and 2005

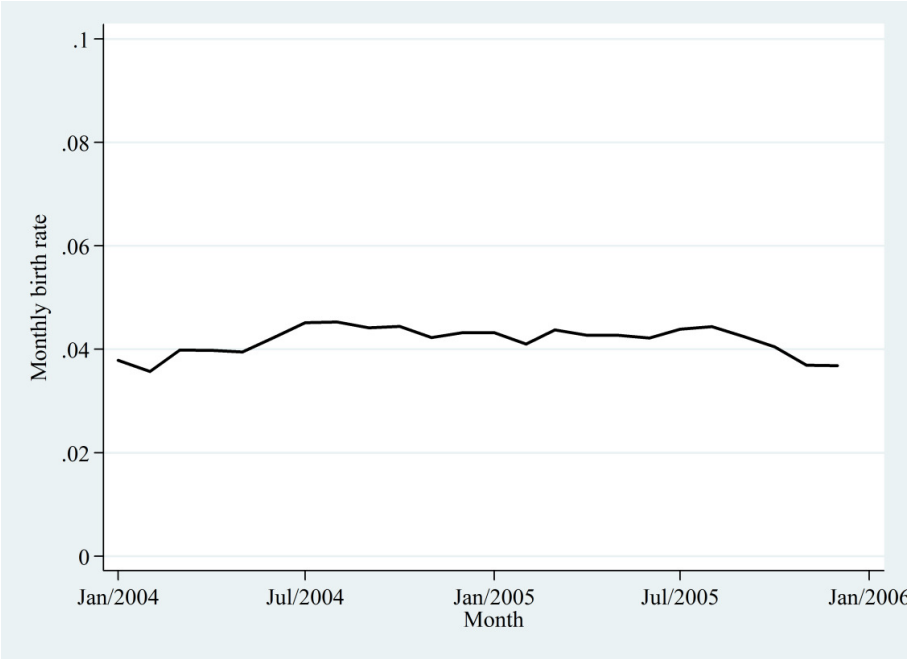
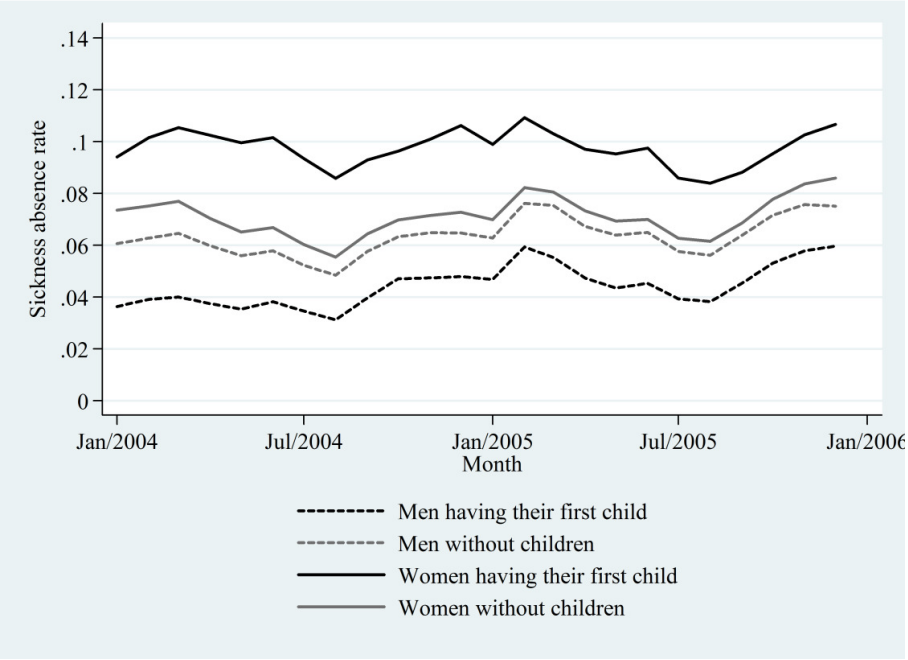


Figure 4.3 shows the rate of absence of male and female employees without and with experience of family formation in different months in 2004 and 2005. It shows that the average monthly rate of absenteeism fluctuates between 4 and 10 percent and is evidently higher in the winter months and lower in the summer months. Men and women with no children have an average sickness absence rate of 6 and 8 percent, respectively, whereas the gender difference increases after the birth of the first child. Women increase their sickness absence to about 10 percent, whereas for men this declines to about 4 percent.

Figure 4.3 – Sickness absence rate over 24 months for men and women without and with family formation in 2004 and 2005



The dependent variable in this chapter is the individual weekly rate of sickness absence, equal to the total individual number of sickness days in a specific week divided by the total individual number of contracted working days in the same week. From Table 4.1 it becomes clear that the average individual weekly rate of absence in this sample is about 3.7 and 10.7 percent for male and female employees with a child, respectively. Salary refers to the gross fiscal annual wage and is measured in Euros. Table 4.1 shows the average salary to be 32,913 and 24,209 Euros, respectively, for male and female workers having their first child. In addition, we define the firm-level sickness absence rate as the total number of absence days in

Table 4.1 – Summary Statistics [a)]

	Employees without family formation		Employees with family formation [b)]	
	Men	Women	Men	Women
Employee level				
Absence rate	0.063	0.071	0.037	0.107
	(0.204)	(0.218)	(0.172)	(0.291)
Firm characteristics				
Salary	26,037	18,444	32,913	24,209
	(18,864)	(14,199)	(15,426)	(12,290)
Average firm sickness absence	0.055	0.055	0.057	0.060
	(0.030)	(0.028)	(0.025)	(0.024)
Percentage of females	0.330	0.574	0.286	0.600
	(0.216)	(0.235)	(0.212)	(0.251)
Firm size	2,902	3,141	1,590	1,978
	(6,646)	(6,874)	(4,607)	(5,220)
Construction sector	0.074	0.010	0.106	0.013
	(0.262)	(0.097)	(0.307)	(0.113)
Mineral extraction sector	0.002	0.001	0.003	0.001
	(0.042)	(0.025)	(0.050)	(0.020)
Industry sector	0.175	0.069	0.201	0.076
	(0.380)	(0.254)	(0.401)	(0.265)
Energy production sector	0.005	0.002	0.004	0.002
	(0.073)	(0.050)	(0.064)	(0.047)
Consumer goods production sector	0.121	0.119	0.171	0.148
	(0.326)	(0.324)	(0.376)	(0.336)
Catering sector	0.021	0.032	0.015	0.019
	(0.144)	(0.177)	(0.123)	(0.135)
Transport sector	0.092	0.043	0.086	0.046
	(0.289)	(0.203)	(0.280)	(0.210)
Financial institutions sector	0.013	0.016	0.018	0.024
	(0.114)	(0.124)	(0.133)	(0.153)
Service sector	0.287	0.281	0.210	0.163
	(0.452)	(0.449)	(0.407)	(0.369)
Public sector	0.084	0.085	0.088	0.103
	(0.277)	(0.280)	(0.284)	(0.304)
Education sector	0.051	0.082	0.030	0.093
	(0.219)	(0.275)	(0.170)	(0.291)
Health care sector	0.043	0.217	0.037	0.269
	(0.203)	(0.412)	(0.190)	(0.444)

Environmental and	0.032	0.043	0.031	0.043
remaining services sector	(0.177)	(0.202)	(0.173)	(0.202)
Individual characteristics				
Tenure	4.871	3.688	4.034	3.240
	(6.361)	(4.854)	(3.421)	(2.651)
Age	40.708	38.096	33.798	30.910
	(12.511)	(12.584)	(5.120)	(4.121)
Unmarried (0-1 indicator)	0.576	0.606	0.527	0.571
	(0.494)	(0.489)	(0.499)	(0.495)
Married (0-1 indicator)	0.317	0.288	0.424	0.404
	(0.465)	(0.453)	(0.494)	(0.491)
Divorced (0-1 indicator)	0.100	0.094	0.048	0.023
	(0.301)	(0.292)	(0.214)	(0.153)
Widowed (0-1 indicator)	0.006	0.012	0.001	0.001
	(0.079)	(0.110)	(0.022)	(0.025)
Number of firms	20,255	15,339	7,515	6,353
Number of employees	73,976	61,461	14,566	15,446
Number of childbirths	0	0	14,566	15,446

a) Averages are reported, standard deviations in parentheses.
b) Employees without family formation are employees without children who did not have any children in 2004 and 2005. Employees with family formation are employees without children who had their first child in 2004 or 2005.

the firm divided by the total number of contracted working days in the firm. For men, this appears to be around 5.7 percent, whereas for women it equals 6 percent. In addition, we include the percentage of women working in the firm, which is defined as the total number of females working in the company divided by the total number of employees working in the firm. It appears that the pregnant women from our sample work in firms which employ relatively more females, that is, 60 percent as opposed to 28.6 percent in the male sample. Additionally, firm size is measured in the number of employees and is

aggregated at the firm –not plant– level.[11] Table 4.1 shows the average firm size to be 1,590 and 1,978, respectively, for male and female employees who had a first child. Furthermore, sector dummies are included in Table 4.1, from which it can be seen for example that the percentage of employees working in the construction sector is equal to about 10.6 percent for males and 1.3 percent for females. Tenure is measured in number of years and Table 4.1 shows it to be 4 and 3.2 years for men and women who are having their first child. The average age in this sample equals 33.8 and 30.9 years respectively for male and female employees having their first child. Regarding marital status, about 55 and 41 percent, respectively, of the employees having their first child are unmarried and married, the others being divorced or widowed.

These characteristics of employees who had their first child can be put in perspective by including employees who did not have any children up to and including 2004 and 2005. We show the information on 73,976 males and 61,461 females, working in 2004 and 2005 in 20,255 and 15,339 different firms, respectively. The average individual monthly rate of sickness absence equals 6.3 percent for men and 7.1 percent for women. The gross average annual wage is lower than for employees who were having their first child and equal to about 26,037 Euros for men and 18,444 Euros for women. Firm-level sickness absence is 5.5 percent for males and females, whereas the percentage of women working in the firm equals 33 and 57.4 percent, respectively, for the male and female sample. The average firm size for male and female employees who were not forming a

[11] As firm size is measured at the firm level, not the plant level, it ranges from 10 to about 30,000 employees, with the median at 297 employees.

family is about 3,000 employees. The average tenure is equal to 4.9 and 3.7 years while the average age is 40.7 and 38.1 years for men and women, respectively. Regarding marital status, about 60 percent of the sample without family formation is unmarried, whereas about 30 percent is married.

4.5 Patterns of absenteeism

This section discusses absenteeism for the sub-selection of employees entering family formation, i.e., men and women having their first child. For all employees, absence is reported relative to the day of childbirth. We define the day of childbirth as $\delta = 1$. Absence is registered as an indicator variable at the daily level. We considered absence for 300 working days (weekends included) during pregnancy and before delivery. Figure 4.4 depicts the average daily absence rates for mothers around the births of the first, second and third child.

Figure 4.4 represents the average daily absence rates of women[12] before the birth of their first, second and third child. The solid vertical line registers the moment of delivery at $\delta = 1$, whereas the dashed vertical lines indicate 42 and 280 working days before giving birth, which represent 6 and 40 weeks, respectively. As noted above, pregnancies usually last 40 weeks and pregnant women generally start their pregnancy leave 6 weeks before the due date.

In Figure 4.4 there are two adverse developments of absence around childbirths. Before the delivery, female absenteeism increases from approximately 6 percent to a peak of about 18 percent at $\delta = -42$, or six weeks before the due date. Thereafter, there is a rapid

[12] Full-time and part-time employees are both included.

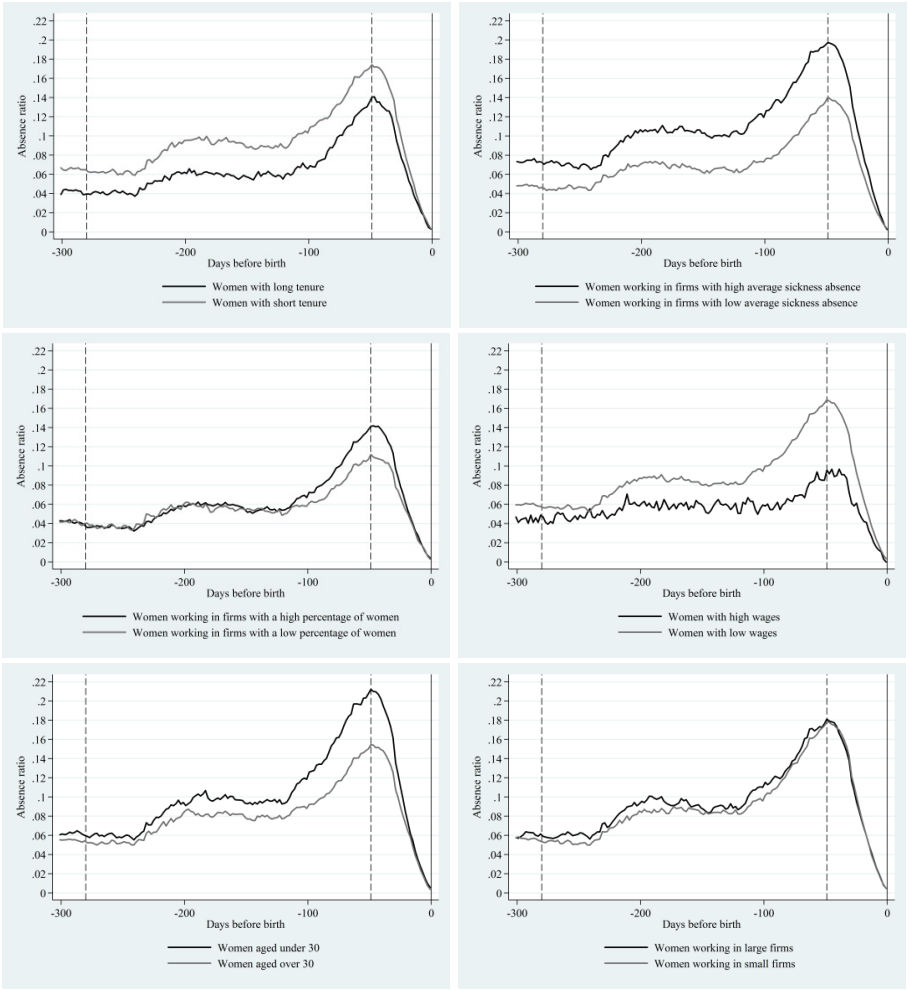
decline in absences, which can be due to the fact that employees usually start their pregnancy leave 6 to 4 weeks before the due date. The figure shows a new finding: after conception, there is an increased rate of absence. In addition, assuming that the pregnancy was officially notified at around 10 weeks after conception, some differences seem to emerge.

Figure 4.4 – Absence ratio of females around the births of the first, second and third child

From Figure 4.5 it can be seen that sickness absence is higher for employees with short tenure, working in firms with a higher average rate of sickness absence, a higher average percentages of sickness absence among women, lower salaries, lower age and in larger firms. It is remarkable that the peak is different for different

groups of employees and that sickness absence is higher for the groups of those from whom this may be expected, the so-called risk-groups.

Figure 4.5 – Absence ratio of females around the birth of the first child for different categorical variables



The figure is also informative about the costs to the firm of pregnancy in terms of absence. On average, the sickness absence rate

for women without children is 7.1 percent. The average rate of individual sickness absence for pregnant women before childbirth is 10.69 percent. Therefore, until the moment of pregnancy leave, the expected costs of pregnancy for the employer in terms days of absence amount to more than two weeks' extra absence.[13]

4.6 Empirical analyses

4.6.1 Empirical strategy

We consider the pattern of absenteeism during a pregnancy, after correcting for weeks during the pregnancy, calendar month, observable characteristics of firms and individuals and unobserved effects of the employee. The regression equation is specified as a fixed-effects specification, for which the dependent variable is the weekly rate of absenteeism.

The equation is as follows:[14]

$$Abs_{ijt} = \sum_{\tau=1}^{40} W_\tau + \sum_{s=2}^{40} W_s T_{ij} + \sum_{s=2}^{40} W_s A_i + \sum_{s=2}^{40} W_s I_{ij} + \sum_{s=2}^{40} W_s SA_{ij} + \sum_{s=2}^{40} W_s PF_{ij} + \sum_{s=2}^{40} W_s FS_{ij} + c_t + \alpha_i + \varepsilon_{ijt}, \quad (4.4)$$

$i = 1, \dots, N; j = 1, \dots, M; t = 1, \dots, T, \tau \in \{1,2,3, \dots ,40\}\, s \in \{2,4,6, \dots ,40\},$

[13] The average sickness absence for the firm is 7.1 percent, while it increases to an average of 10.69 percent for women during pregnancy. The difference, 3.59 percentage points, should be multiplied with one percentage of the course of the pregnancy, which is one percentage of 280 days, 2.8. Thus, the increase in days is 3.59*2.8=10.05 working days, or more than two weeks of absence.

[14] We include interaction effects without the main effects. All the main effects are constant over the course of the pregnancy and therefore would drop out since we use fixed-effects. Differences in slope can therefore be observed from the interaction terms.

where the dependent variable Abs is the weekly rate of sickness absence for forty weeks of pregnancy. Subscripts i and j denote the employee and firm, respectively. Subscript t represents the actual week of the year in 2004 and 2005. Indicator τ ($\tau = 1,2,3,\dots,40$), registers the number of weeks reached in the pregnancy and W_τ refers to the forty weeks of pregnancy. The main effects are constant for employees over the course of the pregnancy and are therefore included in the fixed-effect. The week-dummies are interacted biweekly ($s = 2,4,6,\dots,40$) with the employee characteristics tenure T_{ij} and age A_i and with employer characteristics of salary I_{ij}, firm-level sickness absence rate SA_{ij}, percentage of women working in the firm PF_{ij} and firm size FS_{ij}, leading to twenty biweekly interaction terms (one for every two weeks) with the specific employee and employer characteristics.

The employee and employer characteristics are all subdivided into two categories. Tenure of employees is subcategorized into short, under four years, and long, over four years of employment, while for age, the cut-off lies at the age of 30. Salary is subdivided into employees earning less or more than 40,000 Euros per year. The firm-level sickness absence rate is split into firms with a low average sickness absence rate, under 6.5 percent, and a high average sickness absence rate, over 6.5 percent, whereas for the percentage of women working in the firm, the cut-off lies at 50 percent. Finally, regarding size, firms are separated into small, with fewer than 500 employees, and large firms, with more than 500. In the estimates, we include the interaction terms regarding long tenure, high age, high salary, high firm-level sickness absence rate, high percentage of women working

in the firm and large firms. c_t are 24 dummy variables that capture calendar month effects for the years 2004 and 2005. The worker-specific effect is denoted by α_i and ε_{ijt} is an idiosyncratic error term.

We estimate two baseline specifications, for which the unobserved worker effect is estimated both as a fixed-effects and as a random-effects specification in Table 4.2 and Table 4.3, respectively. Furthermore, the baseline specification is estimated for all females who had their first child in 2004 and 2005, on which Figure 4.4 is based. In Table 4.2 we report the estimated coefficients for the fixed-effects estimates. These show that absenteeism increases before pregnancy leave starts; the estimated parameters on $\sum_{\tau=1}^{40} W_\tau$ are significantly increasingly positive with respect to the first week of pregnancy. When correcting for observable characteristics, the estimated parameters in the second column for pregnant employees on $\sum_{\tau=1}^{40} W_\tau$ range from 1.3 to 13.6 percentage points in week 10 and week 36, respectively. On average, during their first pregnancy women's sickness absence increases by 5.29 percentage points with respect to the first week of pregnancy, ceteris paribus. Compared to the average sickness absence rate of 7.1 percent among women who were not having a baby, this is fairly sizeable.

Table 4.2 – Estimation results (Equation 4.4, fixed-effects) for females having their first child

	Individual sickness absence [a, b, c]	
	Column A [d]	Column B [d]
Pregnancy week 2	-0.002*** (0.001)	-0.002** (0.001)
Pregnancy week 4	-0.001 (0.001)	-0.003 (0.003)
Pregnancy week 6	-0.002 (0.002)	-0.006*** (0.004)
Pregnancy week 8	0.002 (0.002)	0.001 (0.004)
Pregnancy week 10	0.013* (0.002)	0.013* (0.005)
Pregnancy week12	0.023* (0.002)	0.021* (0.005)
Pregnancy week 14	0.029* (0.002)	0.023* (0.005)
Pregnancy week 16	0.027* (0.002)	0.021* (0.006)
Pregnancy week 18	0.030* (0.002)	0.021* (0.006)
Pregnancy week 20	0.027* (0.002)	0.021* (0.006)
Pregnancy week 22	0.031* (0.002)	0.025* (0.006)
Pregnancy week 24	0.033* (0.003)	0.026* (0.006)
Pregnancy week 26	0.048* (0.003)	0.037* (0.007)
Pregnancy week 28	0.063* (0.003)	0.054* (0.007)
Pregnancy week 30	0.085* (0.003)	0.074* (0.008)
Pregnancy week 32	0.117* (0.003)	0.103* (0.008)
Pregnancy week 34	0.146* (0.003)	0.129* (0.009)
Pregnancy week 36	0.157* (0.003)	0.136* (0.009)
Pregnancy week 38	0.130* (0.003)	0.113* (0.009)
Pregnancy week 40	0.113* (0.003)	0.091* (0.008)
Joint significance: Monthly dummies (23) [e]		2.77*
Total number of employees	15,446	15,446
Number of children	15,446	15,446
Number of firms	6.353	6.353
Number of explanatory variables	39	175

a) We included 40 week dummies for the week of the pregnancy in the regression and in the tables we show only the coefficients for every other week due to page considerations. For each of the variables, we included 20 biweekly interaction terms in the regressions and these are all included in the tables.

b) The dependent variable is the weekly individual rate of sickness absence during pregnancy.

c) Clustered standard errors in parentheses.

d) Column A represents the estimates of the baseline only, whereas column B represents the estimates of the baseline and the interaction terms (continued on the next page).

e) The *F*-statistic is presented (number of restrictions under the null-hypothesis)

* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

	Column B –continued–					
Week	Long tenure	High age	High salary	High sickness absence	High female share	Large firm size
3-4	0.002 (0.002)	-0.003 (0.002)	0.005 (0.004)	-0.001 (0.002)	0.001 (0.002)	0.003 (0.002)
5-6	0.003 (0.003)	-0.0001 (0.003)	0.003 (0.005)	-0.005*** (0.003)	0.002 (0.003)	0.006** (0.003)
7-8	0.001 (0.003)	0.0001 (0.003)	0.005 (0.005)	-0.007** (0.003)	0.001 (0.003)	0.003 (0.003)
9-10	-0.001 (0.003)	-0.001 (0.004)	-0.008 (0.006)	-0.001 (0.004)	-0.002 (0.004)	0.002 (0.004)
11-12	-0.006 (0.004)	-0.004 (0.004)	-0.006 (0.007)	0.005 (0.004)	-0.002 (0.004)	0.008*** (0.004)
13-14	-0.010** (0.004)	0.003 (0.005)	-0.017** (0.007)	0.008*** (0.005)	-0.001 (0.005)	0.007 (0.004)
15-16	-0.010** (0.004)	-0.004 (0.005)	-0.013*** (0.007)	0.011** (0.005)	0.004 (0.004)	0.008*** (0.005)
17-18	-0.012** (0.005)	0.0001 (0.005)	-0.011 (0.008)	0.014* (0.005)	0.005 (0.005)	0.005 (0.005)
19-20	-0.011** (0.005)	-0.001 (0.005)	-0.011 (0.008)	0.017* (0.005)	0.0004 (0.005)	0.001 (0.005)
21-22	-0.008*** (0.005)	-0.004 (0.005)	-0.012 (0.008)	0.013** (0.005)	0.001 (0.005)	0.003 (0.005)
23-24	-0.010** (0.005)	-0.007 (0.005)	-0.008 (0.008)	0.018* (0.005)	0.005 (0.005)	0.003 (0.005)
25-26	-0.013** (0.005)	-0.011** (0.005)	-0.012 (0.009)	0.024* (0.005)	0.008 (0.005)	0.008 (0.005)
27-28	-0.019* (0.005)	-0.023* (0.006)	-0.022** (0.009)	0.032* (0.006)	0.012** (0.006)	0.013** (0.006)
29-30	-0.018* (0.006)	-0.033* (0.006)	-0.032* (0.009)	0.039* (0.006)	0.017* (0.006)	0.011*** (0.006)
31-32	-0.017* (0.006)	-0.042* (0.006)	-0.043* (0.010)	0.048* (0.006)	0.025* (0.006)	0.015** (0.006)
33-34	-0.020* (0.007)	-0.046* (0.007)	-0.052* (0.011)	0.057* (0.007)	0.028* (0.007)	0.012*** (0.007)
35-36	-0.020* (0.007)	-0.046* (0.007)	-0.057* (0.011)	0.057* (0.007)	0.033* (0.007)	0.011 (0.007)
37-38	-0.011 (0.007)	-0.034* (0.007)	-0.047* (0.011)	0.049* (0.007)	0.020* (0.007)	0.011*** (0.007)
39-40	0.001 (0.007)	-0.018* (0.007)	-0.009 (0.012)	0.045* (0.007)	0.0001 (0.007)	0.023* (0.007)

The employee characteristics differ according to the week of pregnancy that the employee is in. The estimated parameters on the tenure effect over the different weeks of pregnancy, denoted by the terms $\sum_{s=2}^{40} W_s T_{ij}$, show that employees with long tenure have lower absence rates than employees with short tenure, implying the selection of motivated employees related to their career concern, because sickness absence declines rather than increases with tenure. The estimated parameters range from 1 percentage points in weeks 13-14 to 2 percentage points in weeks 35-36. They also show that during the first 12 weeks of pregnancy, there is no difference in absence rates between women with short and with long tenure, whereas after 12 weeks this difference becomes visible. The estimated parameters on age over the different weeks of pregnancy, represented by the terms $\sum_{s=2}^{40} W_s A_i$, demonstrate that relatively older employees have lower absence rates than younger employees do, ranging from 1.1 percentage points in weeks 25-26 to 4.6 percentage points in weeks 33-34. These parameters also show that, during the first 24 weeks of pregnancy, there is no difference in absence rates between women of different ages, whereas after 24 weeks the difference is apparent.

The effects of the firm characteristics also change with the weeks of pregnancy. The estimated parameters on salary over the course of the pregnancy, symbolized by the terms $\sum_{s=2}^{40} W_s I_{ij}$, range from 2.2 percentage points in weeks 27-28 to 5.7 percentage points in weeks 35-36, indicating an increasing absence rate for employees who are in relatively poorly paid jobs. The parameters on the effect of the average sickness absence rate in the firm, denoted by the terms $\sum_{s=2}^{40} W_s SA_{ij}$, show that this influences sickness absence, which rises

from 0.8 percentage points in weeks 13-14 of the pregnancy to 5.7 percentage points in weeks 33-34 of it, where firms with higher average rates of firm absenteeism have higher absence rates. The estimated parameters on the percentage of women working in the firm, represented by the terms $\sum_{s=2}^{40} W_s PF_{ij}$, indicate that the effect ranges from 1.2 percentage point in weeks 27-28 to 3.3 percentage points in weeks 35-36 in favour of employees working in firms with relatively more women. Again, before week 27, no significant differences are observed. Finally, the parameters on firm size, symbolised by the terms $\sum_{s=2}^{40} W_s FS_{ij}$, show that employees working in large firms have a 1.3 percentage points higher rate of sickness absence in weeks 27-28 and that this rises to a 2.3 percentage points higher rate of absence in weeks 39-40. We included 23 month dummies, which appear to have a significant effect with an F-value of 2.77.

In Table 4.3, we also report the estimated coefficients for the random-effects estimates. The same pattern is shown as in the fixed-effects estimates; absenteeism increases over the course of the pregnancy and similar significant differences are to be observed for employees regarding tenure, age, salary, average sickness absence rate in the firm, percentage of women working in the firm and firm size. Again, it shows that the differences appear to be conclusive after about 3, 21, 9, 3, 27 and 25 weeks for these different categorical variables. This is comparable to the fixed-effects estimates.

Table 4.3 – Estimation results (Equation 4.4, random-effects) for females having their first child

	Individual sickness absence [a, b, c]	
	Column A [d]	Column B [d]
Pregnancy week 2	-0.002*** (0.001)	-0.002 (0.001)
Pregnancy week 4	-0.001 (0.001)	-0.002 (0.003)
Pregnancy week 6	-0.002 (0.002)	-0.004 (0.003)
Pregnancy week 8	0.002 (0.002)	0.002 (0.004)
Pregnancy week 10	0.013* (0.002)	0.015* (0.004)
Pregnancy week12	0.023* (0.002)	0.024* (0.004)
Pregnancy week 14	0.029* (0.002)	0.026* (0.005)
Pregnancy week 16	0.027* (0.002)	0.024* (0.005)
Pregnancy week 18	0.030* (0.002)	0.025* (0.005)
Pregnancy week 20	0.027* (0.002)	0.024* (0.005)
Pregnancy week 22	0.031* (0.002)	0.029* (0.005)
Pregnancy week 24	0.033* (0.003)	0.029* (0.006)
Pregnancy week 26	0.048* (0.003)	0.041* (0.006)
Pregnancy week 28	0.063* (0.003)	0.058* (0.006)
Pregnancy week 30	0.085* (0.003)	0.079* (0.007)
Pregnancy week 32	0.117* (0.003)	0.107* (0.007)
Pregnancy week 34	0.146* (0.003)	0.134* (0.008)
Pregnancy week 36	0.157* (0.003)	0.141* (0.008)
Pregnancy week 38	0.130* (0.003)	0.118* (0.008)
Pregnancy week 40	0.113* (0.003)	0.096* (0.008)
Joint significance: Monthly dummies (23) [e]		60.77*
Total number of employees	15,446	15,446
Number of children	15,446	15,446
Number of firms	6.353	6.353
Number of explanatory variables	40	177

a) We included 40 week dummies for the week of the pregnancy in the regression and in the tables we show only the coefficients for every other week due to page considerations. For each of the variables, we included 20 biweekly interaction terms in the regressions and these are all included in the tables.

b) The dependent variable is the weekly individual rate of sickness absence during pregnancy.

c) Clustered standard errors in parentheses.

d) Column A represents the estimates of the baseline only, whereas column B represents the estimates of the baseline and the interaction terms (continued on the next page).

e) The *F*-statistic is presented (number of restrictions under the null-hypothesis)

* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

	Column B –continued–					
Week	Long tenure	High age	High salary	High sickness absence	High female share	Large firm size
3-4	-0.010* (0.002)	-0.006** (0.002)	-0.001 (0.004)	0.014* (0.002)	-0.002 (0.003)	0.004*** (0.002)
5-6	-0.008* (0.003)	-0.003 (0.003)	-0.002 (0.005)	0.010* (0.003)	-0.001 (0.004)	0.008* (0.003)
7-8	-0.010* (0.003)	-0.003 (0.003)	-0.0001 (0.005)	0.008* (0.003)	-0.002 (0.004)	0.004 (0.003)
9-10	-0.012* (0.003)	-0.004 (0.003)	-0.013** (0.005)	0.013* (0.003)	-0.005 (0.004)	0.004 (0.003)
11-12	-0.017* (0.003)	-0.007** (0.004)	-0.012** (0.006)	0.020* (0.004)	-0.005 (0.004)	0.009** (0.004)
13-14	-0.022* (0.004)	-0.008 (0.004)	-0.022* (0.006)	0.023* (0.004)	-0.004 (0.004)	0.008** (0.004)
15-16	-0.022* (0.004)	-0.007*** (0.004)	-0.018* (0.006)	0.025* (0.004)	0.001 (0.004)	0.009** (0.004)
17-18	-0.023* (0.004)	-0.003 (0.004)	-0.017** (0.007)	0.029* (0.004)	0.002 (0.004)	0.006 (0.004)
19-20	-0.022* (0.004)	-0.004 (0.004)	-0.016** (0.007)	0.032* (0.004)	-0.003 (0.004)	0.003 (0.004)
21-22	-0.019* (0.004)	-0.007*** (0.004)	-0.017** (0.007)	0.027* (0.004)	-0.002 (0.004)	0.004 (0.004)
23-24	-0.021* (0.004)	-0.010** (0.004)	-0.014*** (0.007)	0.033* (0.004)	0.002 (0.004)	0.005 (0.004)
25-26	-0.025* (0.004)	-0.014** (0.005)	-0.018** (0.007)	0.039* (0.005)	0.005 (0.005)	0.010** (0.005)
27-28	-0.030* (0.005)	-0.027* (0.005)	-0.028* (0.008)	0.047* (0.005)	0.009*** (0.005)	0.015* (0.005)
29-30	-0.030* (0.005)	-0.036* (0.005)	-0.037* (0.008)	0.054* (0.005)	0.014* (0.005)	0.012** (0.005)
31-32	-0.029* (0.006)	-0.046* (0.006)	-0.048* (0.009)	0.063* (0.006)	0.022* (0.006)	0.017* (0.006)
33-34	-0.032* (0.006)	-0.050* (0.006)	-0.058* (0.010)	0.071* (0.006)	0.025* (0.006)	0.014** (0.006)
35-36	-0.031* (0.006)	-0.049* (0.007)	-0.063* (0.010)	0.072* (0.006)	0.030* (0.006)	0.012*** (0.006)
37-38	-0.022* (0.006)	-0.037* (0.006)	-0.052* (0.010)	0.064* (0.006)	0.017* (0.006)	0.013** (0.006)
39-40	-0.010***(0.006)	-0.021* (0.006)	-0.015 (0.011)	0.060* (0.006)	-0.003 (0.006)	0.024* (0.006)

4.6.2 Implications

The fixed-effects estimates show that during the first thirteen weeks of pregnancy, there are hardly any differences between the two groups. This is about equal to the period before the notification of pregnancy to the outside world and the employer. After approximately thirteen weeks, we start to observe differences in absence behaviour regarding tenure, age, salary, average sickness absence rate in the firm, percentage of women working in the firm and firm size. This shows that the increase or decrease, as compared to the baseline absence rate during pregnancy, is not constant. Absence seems to increase more for groups at risk, i.e., the deviations with respect to the pattern of increasing sickness absence before childbirth are consistent with the relationship as suggested in the literature, although these deviations are not constant over time. Thus, it is well established that an increase in the rate of absence takes place during pregnancy, although the differences between groups are not the same throughout the pregnancy. We do not find reduced differences between employees during pregnancies. Rather, we find support for the third hypothesis regarding amplified dissimilarities between employees at such a time.

The explanatory variables which we discussed in Section 4.2 and tested in Section 4.6.1 deal with classical labour supply issues, employees' career concern, the costs of monitoring and job attributes. The results show that the differences between employees regarding all of these explanatory factors are amplified when the intensity of the condition increases. The classical labour supply literature distinguishes employees with low and high disutilities of work, such as those for gender and age. When the intensity of the condition

intensifies, it may become even harder to attend work for employees with higher disutilities of work. We observe that female employees who are categorized as 'high age', meaning that they are over 30, report absent less often over the course of a pregnancy than younger employees do. This may be related to education. In general, older employees will have higher disutilities of work and therefore a higher sickness absence rate. In this case, we focus on pregnant women, those in the category of 'old' when they are over 30 when having their first baby. The relatively 'young' pregnant employees are most likely to be those with less education, who will have higher disutilities of work. As the relatively 'old' women are most likely to be the higher educated ones, this explains their negative relation with the sickness absence rate. Related to this, employees of differing socioeconomic status, depending on education and income, for example, may respond differently to an increase in the intensity of the condition and deal with it differently. High-wage earners have more and better means of taking care of themselves and therefore may pursue an even healthier lifestyle, should their condition intensity, than low-wage employees. From the regressions, it appears that the employees who are low-wage earners do indeed display an increasingly higher rate of absence over the course of the pregnancy.

Regarding employees' career concern, it may be that when the intensity of the condition increases, employees without a career concern are likely to increase their sickness absence rate more than do employees with a career concern, since the former have lower costs of absence and are less worried about the signal it may give. The regression in Table 4.2 shows that tenure is increasingly negatively

related to sickness absence, meaning that employees who are employed at a firm for more than four years report absent less often. It appears that the effect of the selection of motivated employees and the consequent negative relationship between tenure and sickness absence (Barmby and Stephan, 2000; Hassink and Koning, 2009) outweighs the Holmström (1982) hypothesis regarding the incentive of short-tenured employees to put in more effort if their ability is unobservable and the consequent positive relationship between tenure and sickness absence.

Concerning the costs of monitoring, related to firm size and peer effects, it may be that when the severity of the condition intensifies, sickness absence increases more for the groups which are more costly to monitor. It appears that employees report absent more often in large firms, which is a consistent finding with such firms having the higher cost of monitoring. The same holds for firms with a high average rate of sickness absence and firms with a high proportion of female employees, because individuals working in firms of this kind also display higher individual rates of sickness absence.

To conclude, on the topic of job attributes, it may be that when the intensity of the condition increases, it is easier when job complexity is high and a job consists of many different tasks for an employer to reshuffle and reallocate duties. Therefore, when the severity of the condition intensifies, sickness absence can increase more for employees with relatively straightforward jobs than for employees with highly complex jobs (Strand et al., 1997; Wergeland and Strand, 1997; Coles et al., 2007; Lanfranchi and Treble, 2010). Low-wage employees with health problems and absence may also

experience less pressure to return to work than high-wage employees do (Post et al., 2005; Brouwer et al., 2009). The results show that individuals with higher wages, who are often engaged in complex jobs involving multiple tasks and a higher pressure to return, report absent less often than employees with lower wages.

4.7 Robustness checks

Table 4.4 represents the estimates of Equation (4.4) for a sample of 11,514 females who had their second child in 2004 and 2005. This is a differently composed group, since women having a second baby who are still on the labour market are often higher educated than women who have left the labour market after their first child. We report the coefficients for the fixed-effects estimates. These show that absenteeism before pregnancy leave starts increases for females pregnant with their second child; the estimated parameters on $\sum_{\tau=1}^{40} W_\tau$ are also significantly increasingly positive with respect to the first week of pregnancy. On average, during a first pregnancy sickness absence increases by 6.04 percentage points with respect to the first week of pregnancy.

When looking at the estimated parameters on the observable employee and firm characteristics, it appears that the same pattern exists for women having their second child as for women having their first child, but the moment where the differences start to augment differs. Regarding tenure, the estimates show that employees with high tenure have lower absence rates than employees with short tenure, ranging from 1 to 3.5 percentage points, where the differences start to be significant in weeks 9-10 of the pregnancy. Regarding age,

Table 4.4 – Estimation results (Equation 4.4, fixed-effects) for females having their second child

	Individual sickness absence [a, b, c]	
	Column A [d]	Column B [d]
Pregnancy week 2	-0.001 (0.001)	-0.002 (0.001)
Pregnancy week 4	-0.003*** (0.002)	-0.004 (0.004)
Pregnancy week 6	-0.002 (0.002)	-0.005 (0.005)
Pregnancy week 8	0.001 (0.002)	0.004 (0.005)
Pregnancy week 10	0.015* (0.002)	0.023* (0.006)
Pregnancy week12	0.028* (0.003)	0.035* (0.007)
Pregnancy week 14	0.039* (0.003)	0.044* (0.008)
Pregnancy week 16	0.035* (0.003)	0.035* (0.008)
Pregnancy week 18	0.039* (0.003)	0.040* (0.008)
Pregnancy week 20	0.035* (0.003)	0.041* (0.008)
Pregnancy week 22	0.040* (0.003)	0.047* (0.009)
Pregnancy week 24	0.048* (0.003)	0.054* (0.009)
Pregnancy week 26	0.058* (0.003)	0.064* (0.009)
Pregnancy week 28	0.077* (0.003)	0.078* (0.010)
Pregnancy week 30	0.100* (0.003)	0.096* (0.011)
Pregnancy week 32	0.133* (0.004)	0.134* (0.011)
Pregnancy week 34	0.160* (0.004)	0.152* (0.012)
Pregnancy week 36	0.170* (0.004)	0.179* (0.012)
Pregnancy week 38	0.141* (0.004)	0.133* (0.012)
Pregnancy week 40	0.125* (0.004)	0.113* (0.012)
Joint significance: Monthly dummies (23) [e]		3.19*
Total number of employees	11,514	11,514
Number of children	11,514	11,514
Number of firms	5,126	5,126
Number of explanatory variables	39	175

a) We included 40 week dummies for the week of the pregnancy in the regression and in the tables we show only the coefficients for every other week due to page considerations. For each of the variables, we included 20 biweekly interaction terms in the regressions and these are all included in the tables.

b) The dependent variable is the weekly individual rate of sickness absence during pregnancy.

c) Clustered standard errors in parentheses.

d) Column A represents the estimates of the baseline only, whereas column B represents the estimates of the baseline and the interaction terms (continued on the next page).

e) The *F*-statistic is presented (number of restrictions under the null-hypothesis)

* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

	Column B –continued–					
Week	Long tenure	High age	High salary	High sickness absence	High female share	Large firm size
3-4	0.001 (0.002)	0.002 (0.003)	-0.004 (0.003)	0.001 (0.003)	-0.001 (0.003)	-0.001 (0.003)
5-6	0.002 (0.003)	0.002 (0.004)	-0.004 (0.004)	0.004 (0.003)	0.001 (0.003)	-0.006*** (0.003)
7-8	-0.003 (0.003)	-0.002 (0.004)	-0.004 (0.004)	0.004 (0.004)	-0.002 (0.004)	-0.008*** (0.004)
9-10	-0.010* (0.004)	-0.005 (0.005)	-0.003 (0.005)	0.001 (0.004)	-0.003 (0.004)	-0.003 (0.004)
11-12	-0.010** (0.004)	-0.005 (0.006)	-0.006 (0.006)	0.010** (0.005)	-0.010 (0.005)	-0.001*** (0.005)
13-14	-0.015* (0.005)	-0.007 (0.006)	-0.009 (0.006)	0.017* (0.005)	-0.005 (0.005)	-0.001 (0.005)
15-16	-0.015* (0.005)	-0.004 (0.006)	-0.015** (0.006)	0.019* (0.005)	-0.0003 (0.005)	0.004 (0.005)
17-18	-0.014* (0.005)	0.008 (0.007)	-0.011 (0.007)	0.020* (0.005)	0.002 (0.005)	0.003 (0.005)
19-20	-0.015* (0.005)	-0.013*** (0.007)	-0.013** (0.007)	0.018* (0.006)	0.002 (0.006)	-0.002 (0.005)
21-22	-0.017* (0.005)	-0.017** (0.007)	-0.016* (0.007)	0.019* (0.006)	0.006 (0.006)	0.001 (0.006)
23-24	-0.021* (0.005)	-0.020* (0.007)	-0.018* (0.007)	0.024* (0.006)	0.009 (0.006)	0.001 (0.006)
25-26	-0.017* (0.006)	-0.028* (0.007)	-0.024* (0.007)	0.031* (0.006)	0.010 (0.006)	0.009 (0.006)
27-28	-0.022* (0.006)	-0.029* (0.008)	-0.027* (0.007)	0.046* (0.006)	0.011*** (0.006)	0.010 (0.006)
29-30	-0.026* (0.006)	-0.031* (0.008)	-0.032* (0.008)	0.055* (0.007)	0.018* (0.007)	0.005 (0.007)
31-32	-0.033* (0.007)	-0.039* (0.009)	-0.042* (0.009)	0.060* (0.007)	0.026* (0.007)	0.006 (0.007)
33-34	-0.033* (0.007)	-0.033* (0.010)	-0.047* (0.009)	0.065* (0.008)	0.029* (0.008)	0.005 (0.008)
35-36	-0.035* (0.008)	-0.043* (0.010)	-0.051* (0.009)	0.067* (0.008)	0.016** (0.008)	0.007 (0.008)
37-38	-0.022* (0.007)	-0.019** (0.009)	-0.045* (0.009)	0.062* (0.008)	0.010 (0.008)	0.015** (0.008)
39-40	-0.007 (0.007)	-0.008 (0.009)	-0.027* (0.009)	0.053* (0.008)	-0.006 (0.008)	0.025* (0.008)

it appears that older females have lower absence rates, appearing in the sickness absence figures after weeks 19-20, ranging from 1.3 to 4.3 percentage points.

The firm characteristics appear to show the same results. Employees with high wages have lower absence rates starting from weeks 15-16 onwards, leading to a 1.5 to 5.1 percentage point lower rate of absence for this group. The firm-average rate of sickness absence in the firm has a positive influence on the individual rate of sickness absence during second pregnancies, where a 1 to 6.7 percentage point increase materializes, starting in weeks 11-12. The estimated parameters on the percentage of women working in the firm indicate that the effect ranges from 1.1 to 2.9 percentage points in favour of employees working in firms with relatively more women, starting in weeks 27-28. Finally, employees working in large firms appear to display a higher rate of sickness absence in the last couple of weeks, ranging from a 1.5 percentage point increase in weeks 37-38 to a 2.5 percentage point increase in weeks 39-40. We again included 23 month dummies, which appear to have a significant effect with an F-value of 3.19.

From these robustness checks[15] it appears that the same implications can be drawn, meaning that the characteristics regarding tenure, age, salary, average firm sickness absence, percentage of females and firm size show that classical labour supply issues, employees' career concern, the costs of monitoring and job attributes are explanations for these augmenting differences.

[15] We also did a robustness check by excluding some employees with wages below the minimum wage and the results did not change.

4.8 Conclusion

Absenteeism is rarely studied in relation to the intensity of the condition that employees are suffering from. In this chapter, we include in our analysis of absenteeism the intensity of the condition as an explanatory variable and we investigate how absence develops as the intensity of the condition augments. Hitherto, empirical studies concerning absenteeism have not corrected for the gravity of the health condition, but have analysed every type of condition concurrently (Allen, 1981a; Barmby et al., 1991; Coles and Treble, 1993; Coles and Treble, 1996; Barmby and Stephan, 2000; Coles et al., 2007). Duration models do allow differences in intensity over time, as the baseline hazard can monotonically increase or decrease over time. Pregnancies cannot be captured in a duration model, since they have a standard duration of forty weeks.

Although a pregnancy is a non-causal health shock, its intensity increases over time and the patterns that we find are undisputed. Throughout a pregnancy, the sickness absence rate increases. We find that the intensity of the pregnancy strengthens, rather than diminishes, the effect of the explanatory factors. During the first couple of weeks, there are hardly any differences between different groups of employees. After about thirteen weeks of pregnancy, however, differences in absence behaviour are amplified in relation to tenure, age, salary, average sickness absence in the firm, the percentage of women working in the firm and firm size.

There are multiple explanations to account for these amplified differences between employees, but we cannot distinguish which feature is dominant. We made a distinction between classical labour

supply factors, employees' career concern, the cost of monitoring and differing job attributes. Labour supply factors and differing disutilities of work can cause an increasing difference between employees, because low-wage and less educated employees have higher disutilities of work and less means of taking care of themselves (Allen, 1981a). In addition, employees without a career concern are likely to increase their sickness absence rate more than are employees with a career concern, since the former are less worried about the signal it may give, which can cause an increasing difference between the two groups (Barmby and Stephan, 2000; Hassink and Koning, 2009).

Furthermore, employees who are being monitored at different costs, related to firm size and peer effects, can display differing sickness absence rates when the intensity of their condition increases (Vistnes, 1997; Barmby and Stephan, 2000; Mas and Moretti, 2009). To conclude, dissimilarities on the level of job attributes may also provide a reason for diverging differences in sickness absence. In cases of health shock, such as a pregnancy, sickness absence will increase. For employees with highly complex jobs, consisting of multiple tasks, there are more opportunities for an employer to reshuffle and reallocate duties in the event of a pregnancy and the chances are higher that these employees can still perform some tasks (Kremer, 1993; Lazear, 1995). In addition, they may also experience higher pressure from their employers to return to work (Post et al., 2005; Brouwer et al., 2009). Consequently, the sickness absence of employees with less complex jobs will increase more than of

employees with highly complex jobs and the result may be to amplify the differences between these groups.

Including the intensity of absenteeism as an explanatory variable shows that the intensity of the condition is not independent of the explanatory factors. Rather, the intensity of the condition strengthens the effect of the explanatory variables. One implication for employers may be that firms are more resistant against shocks when the firms employ more workers with lower disutilities of work and higher career concerns. In addition, firms with lower monitoring costs and with more complex jobs are more shock resistant. Future research should demonstrate whether the intensity of the condition also strengthens the explanatory variables for other conditions, such as conditions whose severity declines over time.

Chapter 5

The Social Gradient in Sickness Absenteeism

5.1 Introduction

For the triangle of effects formed by sickness absence, social status and health, it has been demonstrated that health is intertwine with the other two phenomena. It is hard to disentangle these three phenomena because of health-related methodological issues. More specifically, there is strong evidence of a so-called "social gradient" in health, whereas health in its turn has an impact on social status and – obviously– on sickness absence. We study whether there is a social gradient in sickness absence even after excluding the influence of employees' health status.

The social gradient in health implies that high-salaried workers have a lower risk of poor health, high morbidity and increased mortality (Marmot et al., 1991; McDonough et al., 1999; Snyder and Evans, 2006; Balia and Jones, 2008). In addition, health has an influence on the social gradient, since the level of health influences employee's social status and wage rate. Healthy employees may work longer hours, which may lead to higher earnings (Smith, 1999).

In addition to the positive correlation between social status and health, there are two additional partial relationships in the triangle to consider. Health has an obvious influence on sickness absence, for diseases and illnesses are apparent reasons to report absent from work. Most theoretical, as well as empirical, models of labour economics, however, do not include employees' health (unlike Allen, 1981a;

Paringer, 1983; Leigh, 1991, for example). At the same time, employees' salary has an impact on sickness absence, since employees with higher wages and accordingly superior social status report absent less often (see, for example, Allen, 1981a; Drago and Wooden, 1992; Brown and Sessions, 1996; Barmby and Stephan, 2000). The economic studies relating wages to sickness absence deal with the problem of health as it intertwines with sickness absence, and also with the wage level. Unobserved differences in the workers' health position may explain the effect of wages on sickness absenteeism in the workplace.[1] Therefore, this literature cannot state anything about the mere social gradient in sickness absence, since we define the social gradient in sickness absence to be the influence of wages on absenteeism after controlling for health.

This brings us to a major unresolved question: is there any social gradient of sickness absence after ruling out the confounding influence of the worker's physical health condition? To address this question, this chapter exploits the presence of an unexpected health shock by conditioning on it. We analyse the development of sickness absenteeism in the first weeks after a fracture, which may lead to sickness absenteeism for the same specific medical reason.[2] A fracture is considered an exogenous health shock, since it is irrespective of social status. All the workers with a fracture whom we consider were

[1] The literature on workplace absenteeism has not paid attention to this phenomenon, because of the endogeneity of health in empirical models of absenteeism. Only Ichino and Moretti (2009) specifically look at differences in sickness absence due to a specific condition, namely, the menstrual cycle.

[2] The first weeks after a fracture offer the clearest and least distorted period for which to analyse differences, because the medical circumstances are similar for all employees. During the first weeks after the fracture, all employees are in a cast. After about six weeks, the first employees will have their cast removed.

treated in hospital. In the Netherlands, generally there are no differences in the quality of medical treatment in different hospitals regardless of the patient's social background and patients can choose their hospital freely. All fracture patients receive similar treatments, casts and care. Therefore, the quality of hospital treatment is similar.

This setting of the conditioning on health leads to different hypotheses and opposite answers to the major question of this chapter. One may argue that sickness absenteeism after treatment would be independent of social status. A fracture would cause all workers to go to hospital and stop them from working, irrespective of salary.

Alternative theories, however, would predict an inverse effect of social status on sickness absenteeism. First, high-salaried workers may be more inclined to return to work early, because absence may have graver implications for their future career (Holmström, 1982). Second, the attributes of the worker's job position may also be important; for high-salaried workers the diversity of tasks is great, so that they can carry out some of the non-physical tasks on their return to work. Employees who have jobs consisting of only a few, often physical, tasks will have a higher rate of sickness absence during the first weeks after the fracture, because it is impossible for them to exclude all but the nonphysical tasks during these weeks (Sattinger, 1975; Kremer, 1993). Moreover, an attribute of the workers' job position may be pressure from the employer to return to work soon. Employees with complex jobs or high wages may report absent less often and be prone to return to work quickly because they experience this kind of pressure from their employers (Brouwer et al., 2009).

Our empirical examination is based on a unique set of administrative data on workplace absenteeism among Dutch employees in 2004 and 2005. After matching these data with a dataset of hospital admissions –including hospital visits for the treatment of fractures– we obtained a dataset of sickness absenteeism which is the result of a homogeneous and unexpected medical condition. Indeed, we observed an immediate increase in the sickness absence rate of 71.3 percentage points on average. However, even in this case there is strong evidence of a social gradient in sickness absenteeism. The difference-in-differences estimates imply that high-salaried workers have a stronger decline in absenteeism, which starts as early as the first weeks of absence.

The structure of this chapter is as follows. In Section 5.2, we set out a theoretical framework and two hypotheses. Section 5.3 describes the data used. Section 5.4 provides the patterns of absenteeism around fractures. Section 5.5 offers the empirical specification, followed by the estimates in Section 5.6 and the robustness checks in Section 5.7. Section 5.8 concludes.

5.2 Theoretical framework and hypotheses

5.2.1 Social status, health and sickness absence

We consider the triangle of effects formed by health, social status and sickness absence from the perspective of sickness absence. In what follows, we consider studies of all of the three partial relationships of Equation (5.1). Simply put, it amounts to a theoretical equation in which both the worker's health and his/her social status have a negative effect on sickness absenteeism, whereas the correlation

between health and social status is positive. Thus, when for the moment abstracting from the other explanatory factors found in the literature,

$$absence = f(health, social\ status).$$
$$- \quad - \qquad (5.1)$$
$$corr(health, social\ status) > 0$$

With respect to the relationship between health and social status shown in Equation (5.1), the literature has found a positive correlation between health and social status, using different indicators of health and social status. Ever since the Whitehall study of British public servants, socioeconomic inequalities in health or morbidity have been established in an extensive strand of the literature. A negative relationship between social class and morbidity has been found, meaning that the prevalence of different types of illness and disease are more common amongst people with lower grades of employment (Marmot et al., 1991). In addition, an inverse relation between social status and mortality has been identified, representing relations such as higher mortality rates among employees with manual compared to non-manual occupations (Culyer and Wagstaff, 1993; Mackenbach et al., 1997; McDonough et al., 1999; Snyder and Evans, 2006; Jones, 2012). Socioeconomic circumstances in the early years influence health and mortality in adulthood (Van den Berg et al., 2006) and employees with superior socioeconomic status, including income and wealth, are more healthy (Smith, 1998; Smith, 1999). Moreover, part of the literature on the socioeconomic gradient focuses on the heterogeneity in recovery and survival frequencies from medical disorders, such as cancers and heart diseases (Schrijvers and

Mackenbach, 1994; Smith et al., 1998; Peltonen et al., 2000; Lundborg et al., 2011).[3] In addition the effect of socioeconomic status on health, the causality also runs the other way round, because health impacts on the social gradient and thus wages. Healthy employees may work longer hours, which may result in higher income (Smith, 1999).

We next discuss the effect of health on sickness absence shown in Equation (5.1). Apparently, there is a negative effect, because diseases or illnesses are an evident reason for reporting absence due to sickness. However, health is not usually included in the theoretical and empirical models of sickness absence. For studies which have included health as an explanatory variable (for example, Allen, 1981a), endogeneity issues as a result of reversed causality arise. There are strong indications that absenteeism contains more than a medical component alone,[4] such as the influence of an employee's general practitioner (Bollag et al., 2007; Markussen et al., 2011) and economic theories of workplace absenteeism are often formulated for the workers' absence in general rather than for sickness absence in particular (Brown and Sessions, 1996). [5]

Finally, Equation (5.1) shows a negative relationship between social status and sickness absence, since employees with higher wages report absent less often (Allen, 1981a; Drago and Wooden, 1992;

[3] The socioeconomic gradient has usually been shown to broaden during working life and to narrow as people get older (Van Kippersluis et al., 2009; Lundborg et al., 2011). We observe the gradient only directly after a health shock and we control for age.

[4] There is also evidence that in the United States, many sick workers continue to go to work because they are not entitled to paid sick leave (Heyman et al., 2010).

[5] A broader definition of workplace absence includes illness or injury, funeral leave, personal leave, military service, maternity leave and family and medical leave.

Brown and Sessions, 1996). The economic studies which relate wages to sickness absence deal with the difficulty of health as interwoven with social status as well as with sickness absence. If health is left out of the absence equation, as it is in most studies relating wages to sickness absence, endogeneity issues arise because of an omitted variable bias. It may be unobserved differences in the workers' health position that explain the effect of social status or wages on absenteeism. Consequently, this literature cannot claim anything about the true social gradient in sickness absence.

5.2.2 Research design

In order to investigate the prevalence of the social gradient in sickness absence, we need to control for the employees' health status, as suggested in Equation (5.1). This is a challenging issue because of the endogeneity of health in the absence equation. In order to tackle this problem, we focus on employees going through an unforeseen health shock. In the event of a shock, health will instantly deteriorate and the sickness absence rate jumps to a higher level. Subsequently, the sickness absence rate is downward-sloping over time, meaning that the probability of absence declines over time as health improves. In order to test whether the social gradient of sickness absence persists after keeping physical health constant, we condition on fractures.[6]

The medical conditions of fractures are ruptures related to arms and legs. It is an unexpected change of a physical condition,

[6] We do not control for mental, as opposed to physical, health. Mental problems can influence the probability of a fracture as well as differences in sickness absence after suffering a fracture. This effect, however, is somewhat weakened since we include only employees who work for 20 hours a week or more, assuming that workers with serious mental health problems do not work more than 20 hours a week.

often the result of an accident. By conditioning on fractures, we keep the physical health status constant for all employees bearing this physical burden. We analyse the development of sickness absenteeism in the weeks after an employee fractures one of his/her arms or legs. The interval before a rupture recovers depends on what bone is fractured, the type of fracture and the age and health status of the patient. Fractures can be either open or closed, depending on whether a wound is present. Small fractures, such as a fractured hand or wrist, can mend after about six weeks. Larger fractures, such as broken legs or arms, usually heal in six to twelve weeks.

5.2.3 Hypotheses

Figure 5.1 depicts two different theoretical patterns that may emerge after a health shock, with the left-hand panel showing the initial disappearance of the social gradient when conditioning on fractures, whereas the right-hand panel shows the persistence of the social gradient when conditioning on fractures.[7]

On the one hand, when keeping the physical health status constant by conditioning on fractures, one may claim that sickness absence is independent of social status and there will be no more evidence of a social gradient in Equation (5.1), and also none directly

[7] In the Netherlands, employees can report sickness without an immediate doctor's certificate. When employees suspect that they will be absent for a long period, they should consult a doctor. Employers continue to pay wages when employees report absent due to sickness for a period of 104 weeks, or two years. Legislation regulates that the continuation of payment should equal at least 70 percent of the wage and never less than the minimum wage, whereas in practice the collective labour agreements often stipulate that 100 percent of wages shall be paid during the first year of sickness.

after the fracture. A fracture would mean that all workers needed to report absent as a result of hospitalization, irrespective of social status. The traditional socioeconomic explanation, based on employees with superior social status having more and better means to take care of themselves, will not explain differences in sickness absence in the first six weeks after a fracture, because it is an exogenous, physical impediment. The cost of monitoring, which differs according to firm size and peer effects, for example, will also not cause differences in absenteeism amongst employees for the first couple of weeks, due to the seriousness of the condition (Barmby and Stephan, 2000; Ichino and Moretti, 2009; Mas and Moretti, 2009). Therefore, since the condition such employees are in is an evident physical disablement, the sickness absence of all employees suffering a fracture jumps to a high level and all differences between employees disappear. In this case, all dissimilarities vanish and there is no longer a social gradient in sickness absence. This is represented by the left-hand panel of Figure 5.1, where sickness absence jumps to a similar level for all employees, regardless of existing differences before the health shock, before gradually returning to the pre-shock level. This is summarized by the following hypothesis:

Hypothesis 5.1: When conditioning on fractures, sickness absence will increase to an equal level and the social gradient will disappear, irrespective of existing differences before the health shock.

Alternatively, we could argue that the social gradient and sickness absence are not independent and there is a persistent effect of

social status on sickness absence in Equation (5.1), even after conditioning on physical health status, and also directly after the fracture. In the case of fractures, there can still be differences in sickness absence related to employees' social status as a consequence of their career concern or job attributes.

From a labour supply perspective, employees earning high salaries may be more prone to return to work immediately after suffering a health shock. In the event of a fracture, employees without any career concern may display a higher rate of sickness absence than employees with a career concern (Holmström, 1982; Coles and Treble, 1996; Ichino and Riphahn, 2005). The former group of workers may be less worried about the signal that absenteeism may give and therefore a social gradient in sickness absence may emerge as a result.[8]

Additionally, from a labour demand perspective, job attributes may also explain a social gradient in sickness absence. On the one hand, high-wage employees often have jobs which involve multiple tasks, ranging from physical to analytical ones. For a high-wage employee with a physical health shock, there are more opportunities to switch from physical tasks to nonphysical tasks (Strand et al., 1997; Wergeland and Strand, 1997; Coles et al., 2007; Lanfranchi and Treble, 2010).[9]

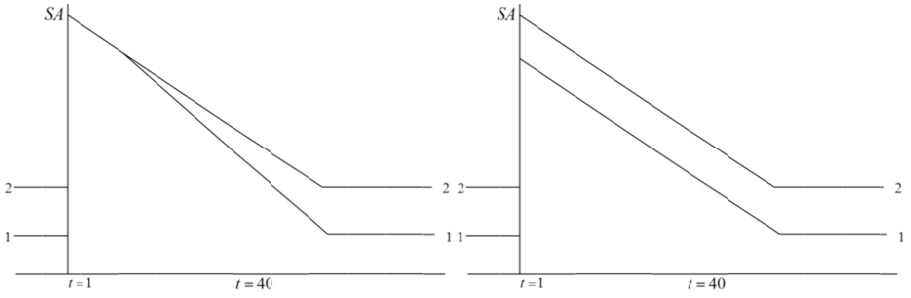
[8] There is no clear effect of tenure on sickness absence. On the one hand, it can be hypothesized that employees with short tenure will report absent less frequently, because of this career perspective. On the other, it can be proposed that employees with long tenure will be absent less often, because of a selection effect (Barmby and Stephan, 2000; Hassink and Koning, 2009).

[9] This is in accordance with Rosen (1982), as complementarity implies increased production when ability and effort are higher.

On the other hand, for less complex jobs the restrictions of the job attributes are more stringent, so that it is it is harder to reshuffle and reallocate duties in the event of a health shock. Therefore, it is easier to temporarily rearrange job tasks for high-salaried workers than for other employees. Consequently, sickness absence will be higher among low-salaried workers. Moreover, high-wage employees may perceive pressure from their employers to return to work soon, a result of which can be an immediate difference in sickness absence levels related to the social gradient (Brouwer et al., 2009). This brings us to the following hypothesis:

Hypothesis 5.2: When conditioning on fractures, immediate differences in sickness absence in the first weeks after the health shock will persistently display a social gradient.

Figure 5.1 – Patterns of sickness absence after fractures



5.3 Data

We use administrative information on 5,866,773 employees, for which we take the Dutch National Absence Statistics (*Nationale*

Verzuimstatistiek, NVS), as collected by Statistics Netherlands (*Centraal Bureau voor de Statistiek, CBS*), documented for 2004 and 2005, which is equal to about 71 and 66 percent of all employees who reported absent in these two years respectively. Absence statistics are included because firms are required to deliver them to the Health and Safety Executives (*Arbo-organisaties*). With respect to absence, there is information on the starting date and final date of a sickness spell. The administrative Social Statistical Dataset on Jobs 2002 to 2005 (*Sociaal Statistisch Bestand, SSB – Banen*) was used to complete the spells of employment. Furthermore, we matched the data to administrative information of the Municipal Administration (*Gemeentelijke Basisadministratie, GBA*) to include individual characteristics.

This dataset is merged with the National Medical Registration (*Landelijke Medische Registratie, LMR*), provided by the foundation for Dutch Hospital Data (*DHD*), including data about the clinical hospitalization of patients. We accessed data from 2004 and 2005, from which we could identify the conditions and disorders that are treated in a hospital. With this dataset, we isolated employees with fractures of the upper leg, lower leg, knee, ankle, upper arm, lower arm and hand. The fractures which are included in this dataset are the relatively severe cases, since all patients who are clinically hospitalized are included. In total, 8,206 fractures of the kind that we selected took place in 2004 and 2005. Of these, 5,253 occurred when the worker was employed, thus during the employment contract. We excluded from the dataset employees with missing firm information. We restricted the study to firms with more than 10 employees and to

workers of between 18 and 65 years. We excluded employees with a part-time factor of less than 0.5, meaning that only employees with jobs of 20 hours or more were included. We included these specific employees because characteristics, such as health status, type of employment contracts and incentives, may differ substantially with respect to firm size, age, hours of work and type of employment contract. In addition, we included only employees who were employed at least 100 days before the fracture took place and 200 days after the fracture took place, in order to be able to monitor their sickness absence behaviour before and after the fracture.[10] As a result, 2,295 fractures in total are included, subdivided into 276 upper leg fractures, 427 lower leg fractures, 56 knee fractures, 655 ankle fractures, 180 upper arm fractures, 377 lower arm fractures and 324 hand fractures.[11,12] As a control group, we took a random sample of employees. These employees were working in the same firms and under the same working time conditions as the employees who suffered a fracture and were subject to the same restrictions. In total, there were 591,090 employees without any fractures working in the same firms under the same working conditions, of which we took a

[10] In the selection of employees, we imposed the criterion that employees had to be employed 100 days before the fracture and 200 days after the fracture. In the regression analyses, we observe them for a maximum of 40 weeks (280 days) before and after the fracture if they were employed during this time span. Therefore, an unbalanced panel is created, where employees are observed for a minimum of 100 days before and 200 days after the fracture and for a maximum of 280 days before and after the fracture.

[11] Of the 2,295 fractures, 747 took place from September to February (winter months) and 1,548 took place from March to August (summer months). In both seasons, high-wage employees take up 16 percent of the fractures.

[12] It appears that leg-related fractures are related to low-wage employees, while arm-related fractures are unrelated to wages. The results in Table 5.4 show separated regressions for leg-related and arm-related fractures and the results regarding the existence of the social gradient in sickness absence are the same.

random sample of 10,000 employees.[13] The random sample consists of 1.7 percent of this total group of employees. In total, these 12,295 employees worked in 1,741 different firms.

As we focus on 2,295 employees with a fracture and 10,000 employees without a fracture in 2004 and 2005, it is important to learn more about the months of the fracture, in order to observe whether a cyclical pattern exists. Figure 5.2 presents the evolution of fractures that are included in our sample, showing that there is no explicable seasonal pattern. Because the sickness absence data stem from 2004 and 2005 and the presence-absence decisions should be observed for at least 100 days before the fracture and 200 days after the fracture, the fractures that are included in our sample range from April 2004 up to and including June 2005.

Figure 5.3 shows the rate of absence of the sample of employees with and without a fracture over the months April 2004 to June 2005. The figure shows that sickness absence is higher for the group of employees suffering a fracture, with an average of 25.6 percent. The 10,000 employees without a fracture have an average sickness absence rate of 7.7 percent and the sickness absence rate is higher in the winter months and lower in the summer months.

The dependent variable in our analysis is the individual rate of sickness absence at the worker level, defined as the number of sickness days in a specific week divided by the number of contracted working days in the same week. We observe the dependent variable at

[13] As a robustness check, we also used a different control group in the regressions, consisting of 10,000 other employees from the same firms and under the same working time conditions as the treatment group. The results from the analyses do not differ substantially.

Figure 5.2 – Evolution of fractures between 2004 and 2005

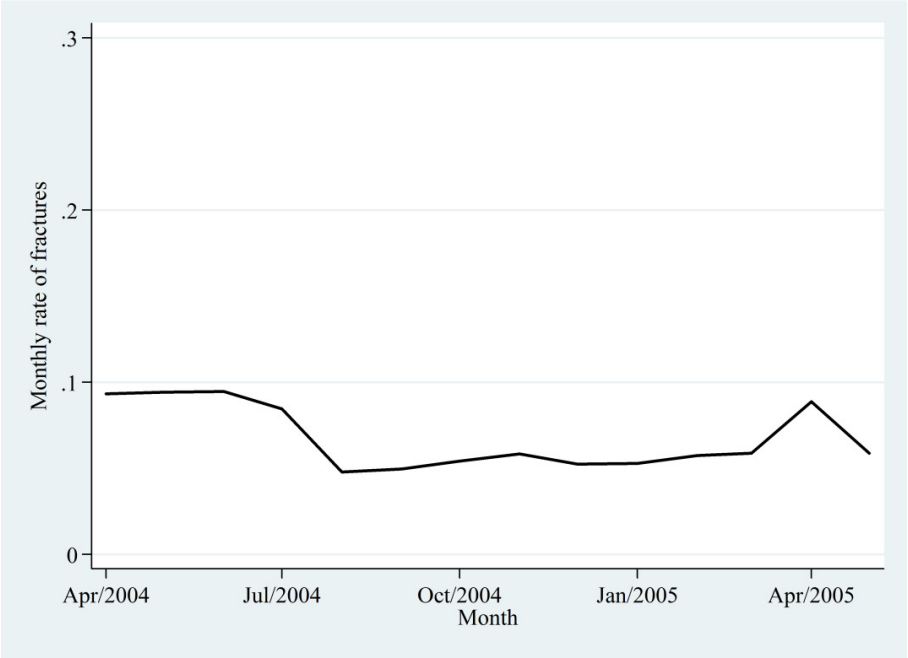
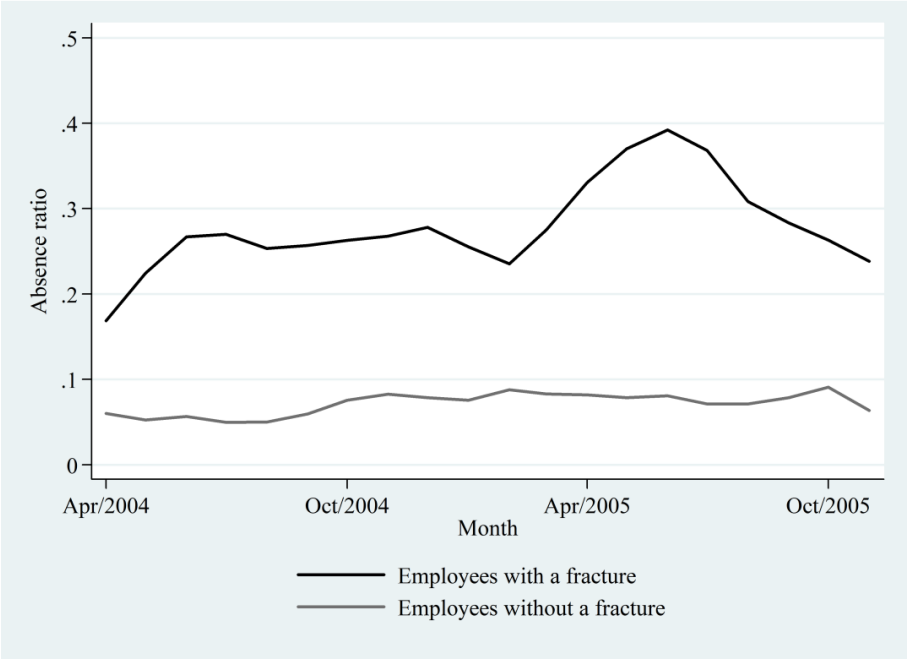


Figure 5.3 – Sickness absence rate over months in 2004 and 2005



the weekly level for 40 weeks before and 40 weeks after the moment of fracture for the employees who experienced one. Table 5.1 shows that the average individual rate of absence at the weekly level in this sample is about 6 percent before and 40.4 percent after the fracture for employees with a fracture and 7.7 percent on average for employees without a fracture. Average sickness absence in the firms where they are employed (excluding the individual employee) equals 6.7 percent for employees with a fracture and 7 percent for employees without a fracture. The averages are also informative about the cost to the company of fractures, in terms of absence. On average, the sickness absence rate before the fracture is 6 percent, whereas after the fracture it increases to an average of 40.4 percent in forty weeks. Therefore, the expected cost of fractures in terms of days of absence amounts to almost fourteen weeks of extra absence.[14]

Salary is included to measure the social gradient in sickness absence; it refers to the gross fiscal annual wage and is measured in Euros. Table 5.1 shows the average salary to be 28,888 and 27,865 Euros for employees with and without a fracture, respectively. From our sample it appears that there is no significant difference between low-wage and high-wage employees in the probability of experiencing a fracture. Moreover, standard control variables from the labour supply and labour demand side are included. Firm size is measured in

[14] Average sickness absence for employees before the fracture is 6.0 percent, whereas it increases to an average of 40.4 percent for employees after the fracture. The difference, 34.4 percentage points, should be multiplied by one percent of the course of the forty weeks that we observe, that is, one percent of 280 days, 2.8. Thus, the increase in days is 34.4*2.8=96.32 working days, or almost 14 weeks of absence.

Table 5.1 – Summary Statistics [a)]

	Fracture	No fracture
Employee level		
Absence rate	0.256 (0.009)	0.077 (0.003)
Before fracture	0.060 (0.005)	
After fracture	0.404 (0.010)	
Firm level		
Absence rate	0.067 (0.001)	0.070 (0.0003)
Firm characteristics		
Salary in firm (in Euros)	28,888 (350.519)	27,865 (166.53)
Number of employees in firm	1,989 (119.671)	5,083 (81.52)
Tenure (in years)	5.459 (0.117)	5.290 (0.064)
Construction sector	0.092 (0.006)	0.039 (0.002)
Mineral extraction sector	0.001 (0.001)	0.001 (0.0001)
Industry sector	0.206 (0.008)	0.168 (0.004)
Energy production sector	0.004 (0.001)	0.004 (0.001)
Consumer goods production sector	0.133 (0.007)	0.081 (0.003)
Catering sector	0.020 (0.003)	0.016 (0.001)
Transport sector	0.082 (0.006)	0.107 (0.003)
Financial institutions sector	0.009 (0.002)	0.011 (0.001)
Service sector	0.122 (0.007)	0.124 (0.003)
Public sector	0.089 (0.006)	0.200 (0.004)
Education sector	0.070 (0.005)	0.056 (0.002)
Health care sector	0.134 (0.007)	0.166 (0.003)
Environmental and remaining services sector	0.038 (0.004)	0.027 (0.002)
Individual characteristics		
Gender (0=female, 1=male)	0.670 (0.010)	0.554 (0.005)
Age	42.990 (0.237)	42.333 (0.107)
Number of children	1.023 (0.023)	1.050 (0.011)
Unmarried (0-1 indicator)	0.367 (0.010)	0.344 (0.005)
Married (0-1 indicator)	0.528 (0.010)	0.553 (0.005)
Divorced (0-1 indicator)	0.095 (0.006)	0.094 (0.003)
Widowed (0-1 indicator)	0.010 (0.002)	0.009 (0.001)
Number of firms	943	798
Number of employees	2,295	10,000

a) Standard deviation of the mean in parentheses.

the number of employees and is aggregated on the firm –not plant– level.[15] Table 5.1 shows the average firm size to be 1,989 and 5,083 for employees with and without a fracture, respectively. Tenure is measured in number of years; Table 5.1 shows it to be 5.5 and 5.3 years for employees with and without a fracture. Furthermore, sector dummies are included in Table 5.1, from which it can be seen, for example, that of all the employees with a fracture in our sample, 9.2 percent works in the construction sector, whereas only 3.9 percent of the control group without a fracture works in the construction sector. The gender dummies show that 67 percent of all employees with a fracture are male, whereas this percentage equals 55.4 in the control group.[16] The average age in this sample equals 43 and 42.3 years for employees with and without a fracture, respectively. Regarding marital status, about 52.8 and 36.7 percent of the employees experiencing a fracture are married and unmarried, respectively, whereas 9.5 and 1 percent of the employees are divorced and widowed. This is comparable to the control group.

In the regression analyses, we subcategorize the independent variables into two categories, creating dummy variables. The 0-1 indicator variables are for wage (1 is 40,000 Euros or more annually), firm size (1 is more than 500 employees), average firm-level absence rate (excluding information on the individual employee (1 is above 6.5 percent)), tenure (1 is above four years of employment), age (1 is above 40 years), proportion of women in the firm (1 is above 50

[15] As firm size is measured on the firm level, not the plant level, it ranges from 10 to about 30,000 employees, with the median at 1,127 employees.

[16] We check whether the regression results show similar or dissimilar results in the section concerning the empirical analyses.

percent). 16 percent of all employees suffering a fracture are high-wage earners. Regarding the other variables, 33 percent work in large firms, 50 percent work in firms with a high average sickness absence and 46 percent have long tenure. Furthermore, 67 percent are males, 61 percent are considered to be of high age and 31 percent are working in firms with a large proportion of women.

5.4 Patterns of absenteeism around fractures

We report the patterns of absence at the daily level over a period of 300 days, ranging from 100 days before the fracture until 200 days after the fracture. We normalize these spells by setting the day (δ) of fracture at $\delta = 1$, so that $\delta = -100$ ($\delta = 200$) corresponds to 100 days before (200 days after) the fracture. Figure 5.4 displays the average rate of daily absence among all employees who suffered a fracture. The solid vertical line refers to $\delta = 1$, whereas the dashed vertical line indicates six weeks after the fracture, about the time when the cast is usually removed. The rate of sickness absence rises to about 80 percent immediately after the bone was broken. It then steadily decreases, but does not reach the old level within 200 days.

In Figure 5.5 the employees are categorized with respect to seven types of fracture, distinguishing between the upper leg, lower leg, knee, ankle, upper arm, lower arm and hand. The figures show no difference in pattern for all the types of fracture, but the increase in absence at the day of fracture, $\delta = 1$, ranges from 78 percent (lower arm) to 86 percent (knee).

Figure 5.4 – Absence ratio of employees with a fracture

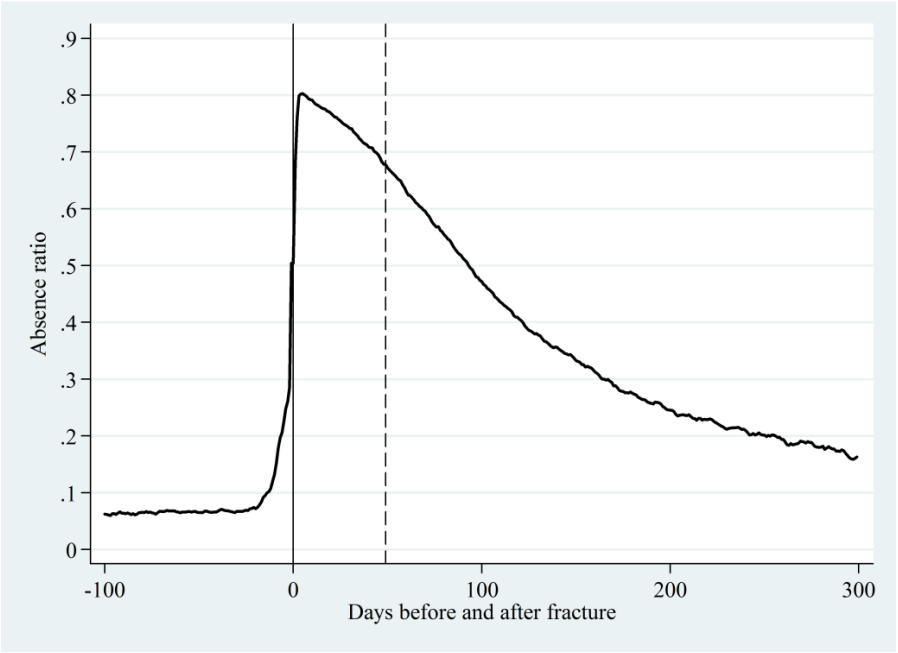


Figure 5.5 – Absence ratio of employees with different types of fractures

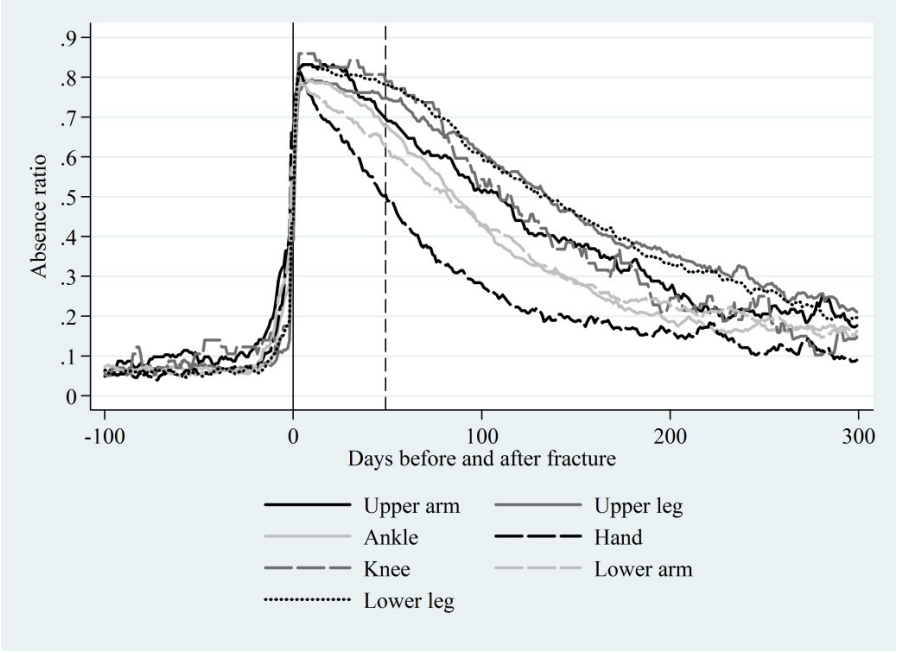
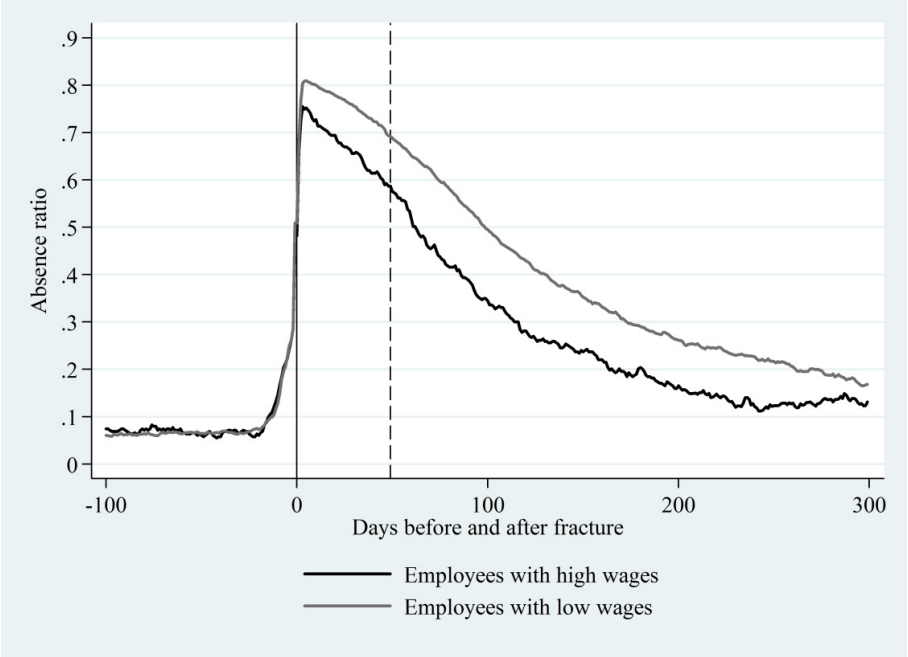


Figure 5.6 is based on a categorization of high-wage and other employees, for which the threshold lies at an annual salary of 40,000 Euros. It displays striking differences in the pattern of absence after the fracture. High-wage employees already had a lower sickness absence rate before the fracture occurred. Immediately after the fracture, both groups of employees have a relatively high absence rate, but the smallest increase is for the high-wage employees.

Figure 5.6 – Absence ratio of employees with a fracture earning high and low wages



5.5 Empirical specification

We classify the employees into those who had an unforeseen fracture during the entire period of observation and all the other workers. We refer to these

groups as the treated and the non-treated, respectively.

With respect to the empirical specification, there are two issues that require specific attention. First, the week of treatment is different for different workers, because the fracture took place unexpectedly during the period of observation. As a result, we introduce an indicator that becomes one for the week in which the fracture took place and this indicator is independent of the error term of the equation. Second, the difference in absence behaviour between the treated and non-treated workers may decline over the first weeks after the fracture, so that multiple interaction terms are needed to identify this pattern.

The first specification is a variant of the classical difference-in-difference specification, for which the main difference is that the shock to the treated occurred randomly at any time in the two years. The interaction terms in treatment and week after the shock allows for any differences in absence between the non-treated and the treated in each of the 40 weeks after the fracture took place:

$$Abs_{ijt} = \alpha_i + \sum_{\tau=1}^{\tau=40} \beta_\tau F_i W_\tau + c_t + \varepsilon_{ijt}, \qquad (5.2)$$

$i = 1, \dots, N; j = 1, \dots, M; t = 1, \dots, T, \tau \in \{1,2,3, \dots, 40\}$,

where the dependent variable Abs is the weekly rate of sickness absence. Subscripts i and j denote the employee and firm, respectively. Subscript t represents the actual week of the year 2004 or 2005. Indicator τ ($\tau = 1, \dots, 40$), registers the number of weeks relative to the week of fracture at $\tau = 1$. The indicator F is one for the workers who suffered a fracture and zero otherwise. The variable W_τ is a 0-1 indicator for week τ. Furthermore, α_i is a worker-specific

effect for the i-th worker; c_t are calendar month dummies. ε is an idiosyncratic error term.

The second specification includes interaction terms of the weeks after the fracture with worker-specific categories. We include interaction terms in treatment, week after the shock and high and low wages to investigate whether the social gradient holds in sickness absence. Additionally, interaction terms in the standard control variables from the labour supply and labour demand side are included.

$$Abs_{ijt} = \alpha_i + \sum_{\tau=1}^{\tau=40} \beta_\tau F_i W_\tau + \sum_{\tau=1}^{\tau=40} \sum_{k=1}^{7} \lambda_{\tau,k} F_i W_\tau D_{k,i} + c_t + \varepsilon_{ijt}, \quad (5.3)$$

$$i = 1, \dots, N; j = 1, \dots, M; t = 1, \dots, T, \tau \in \{1,2,3, \dots,40\},$$

$$k \in \{1,2,3, \dots,7\}.$$

Subscript k refers to one of the seven D dummy categories[17] (wages, firm size, gender, average sickness absence in the firm (excluding the individual employee), tenure, age and percentage of women working in the firm). We estimate this using fixed-effects and random-effects with clustered standard errors.

5.6 Estimates

The estimates of every 10th week of Equation (5.2) are presented in Table 5.2.[18] The estimated parameters with fixed-effects on the

[17] For wages, both the interaction terms for high and low wages are included. If only one of these categories were included, the benchmark case would be the opposite of all the variables included, which would make it hard to interpret. Therefore, the interaction terms of both the high and low wage employees are incorporated.

[18] We include 40 week dummies in Equation (5.2) and 40 week dummies and 40 interaction terms per dummy category in Equation (5.3). Therefore, due to page restrictions, we show in the tables only the estimated coefficients of every 10th week, whereas dummies and interaction terms for all weeks are included in the regression equations.

interaction terms between the week of fracture and treatment show that they are significantly decreasingly positive, i.e., sickness absence increases with 71.3 percentage points in the first week after the fracture. Forty weeks after the fracture took place, the difference between the treated and the non-treated has reduced to 5 percentage points.

Table 5.2 – Difference-in-difference estimation results (Equation 5.2) for employees with and without a fracture [a)]

	Individual sickness absence [b)] (fixed-effects)
1 week after fracture*fracture	0.713* (0.009)
10 weeks after fracture*fracture	0.544* (0.011)
20 weeks after fracture*fracture	0.284* (0.010)
30 weeks after fracture*fracture	0.148* (0.009)
40 weeks after fracture*fracture	0.050* (0.009)
Calendar dummies (23) [c)]	18.46*
Total number of employees	12,295
Number of fractures	2,295
Number of firms	1,741
Number of explanatory variables	43

Note: We show estimated the coefficients of every 10th week in the tables, whereas dummies for all weeks are included in the regression equations. The coefficients on the other weeks are suppressed, due to page considerations.

a) Clustered standard errors in parentheses.

b) The dependent variable is the weekly individual sickness absence rate before and after the fracture.

c) The *F*-statistic is presented. The number of restrictions under the null-hypothesis is mentioned behind the explanatory variable.

* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

Next, we discuss the fixed-effects estimates of Equation (5.3). The estimated coefficients for the fixed-effects and the random-effects estimates of Equation (5.3) are presented in Table 5.3. The estimated parameters on the interaction terms in treatment and week after the fracture are jointly statistically significant.[19] Across the forty weeks, absenteeism for workers with a fracture declines. For the interaction terms in treatment, week of fracture and high wage, the results show that the increase in sickness absence is significantly lower for high-wage employees than for the other employees. We focus on the first weeks after the fracture, since this is the period in which there are fewest distortions since the medical circumstances are comparable for all employees. More specifically, for high-wage employees absenteeism increases with 66 percentage points in the first week after the fracture, even when including the standard control variables. In contrast, for the low-wage employees the increase is 75.2 percentage points.[20] The results suggest that there is a social gradient in sickness absence, seeing that the increase in the first week is significantly lower for employees with high wages after conditioning on health.[21]

[19] Each of the group of interaction terms regarding salary, firm size, average firm absence (excluding the individual employee) and age is jointly significant. Each of the group of interaction terms concerning gender, tenure and the percentage of women working in the firm is jointly insignificant.

[20] We test whether the coefficients representing the increase in sickness absence in the first week after the fracture are lower for high-wage employees by means of a Wald test, where the H0 hypothesis is $\lambda_{1,lw} = \lambda_{1,hw} = \lambda_{1,lw} - \lambda_{1,hw} = 0$. The p-values corresponding to this Wald test equal 0.0009.

[21] The random-effects estimates of Equation (5.3) show similar results.

Table 5.3 – Difference-in-difference estimation results (Equation 5.3) for employees with and without a fracture [a)]

	Individual sickness absence [b)] (fixed-effects)	Individual sickness absence[b)] (random-effects)
1 week after fracture*fracture*high salary	0.660* (0.035)	0.663* (0.034)
10 weeks after fracture*fracture*high salary	0.324* (0.038)	0.326* (0.038)
20 weeks after fracture*fracture*high salary	0.038 (0.035)	0.041 (0.035)
30 weeks after fracture*fracture*high salary	0.006 (0.031)	0.009 (0.031)
40 weeks after fracture*fracture*high salary	-0.061** (0.028)	-0.058** (0.028)
1 week after fracture*fracture*low salary	0.752* (0.027)	0.753* (0.027)
10 weeks after fracture*fracture*low salary	0.497* (0.031)	0.497* (0.031)
20 weeks after fracture*fracture*low salary	0.185* (0.029)	0.186* (0.028)
30 weeks after fracture*fracture*low salary	0.115* (0.025)	0.116* (0.025)
40 weeks after fracture*fracture*low salary	-0.002 (0.023)	-0.001 (0.023)
1 week after fracture*fracture*small firm	0.103* (0.020)	0.101* (0.020)
10 weeks after fracture*fracture*small firm	0.090* (0.023)	0.089* (0.022)
20 weeks after fracture*fracture*small firm	0.075* (0.022)	0.074* (0.021)
30 weeks after fracture*fracture*small firm	0.020 (0.020)	0.019 (0.019)
40 weeks after fracture*fracture*small firm	0.043** (0.018)	0.042** (0.018)
1 week after fracture*fracture*females	-0.089* (0.024)	-0.089* (0.024)
10 weeks after fracture*fracture*females	-0.033 (0.027)	-0.033 (0.027)
20 weeks after fracture*fracture*females	0.009(0.026)	0.009 (0.025)
30 weeks after fracture*fracture*females	-0.007 (0.023)	-0.007 (0.023)
40 weeks after fracture*fracture*females	-0.020 (0.021)	-0.021 (0.021)
1 week after fracture*fracture*high firm absence	-0.028 (0.018)	-0.027 (0.018)
10 weeks after fracture*fracture*high firm absence	0.024 (0.021)	0.024 (0.021)
20 weeks after fracture*fracture*high firm absence	0.072* (0.021)	0.073* (0.020)
30 weeks after fracture*fracture*high firm absence	0.059* (0.019)	0.060* (0.018)
40 weeks after fracture*fracture*high firm absence	0.047* (0.018)	0.048* (0.017)
1 week after fracture*fracture*short tenure	-0.037*** (0.018)	-0.036** (0.018)
10 weeks after fracture*fracture*short tenure	-0.033 (0.021)	-0.032 (0.021)
20 weeks after fracture*fracture*short tenure	-0.020 (0.021)	-0.019 (0.020)
30 weeks after fracture*fracture*short tenure	-0.033*** (0.018)	-0.032*** (0.018)
40 weeks after fracture*fracture*short tenure	-0.017 (0.017)	-0.015 (0.017)
1 week after fracture*fracture*high age	-0.061* (0.019)	-0.062* (0.018)

10 weeks after fracture*fracture*high age	0.063* (0.022)	0.061* (0.022)
20 weeks after fracture*fracture*high age	0.090* (0.022)	0.088* (0.021)
30 weeks after fracture*fracture*high age	0.054* (0.019)	0.053* (0.019)
40 weeks after fracture*fracture*high age	0.041** (0.018)	0.040** (0.017)
1 week after fracture*fracture*high percentage of women	0.021 (0.024)	0.022 (0.023)
10 weeks after fracture*fracture*high percentage of women	-0.021 (0.027)	-0.021 (0.027)
20 weeks after fracture*fracture*high percentage of women	-0.034 (0.026)	-0.034 (0.025)
30 weeks after fracture*fracture*high percentage of women	-0.021 (0.023)	-0.021 (0.023)
40 weeks after fracture*fracture*high percentage of women	-0.001 (0.021)	-0.001 (0.021)
Salary		-0.002** (0.001)
Firm size/10000		0.004** (0.002)
Gender (1=male)		-0.016* (0.003)
Firm absence		0.723* (0.057)
Tenure		-0.001* (0.0002)
Age		0.001* (0.0001)
Percentage of women in firm		-0.013** (0.006)
Observed month dummies (23)[c]	18.25*	418.99*
Total number of employees	12,295	12,295
Number of fractures	2,295	2,295
Number of firms	1,741	1,741
Number of explanatory variables	183	190

Note: We show the estimated coefficients of every 10^{th} week in the tables, whereas dummies and interaction terms for all weeks are included in the regression equations. The coefficients on the other weeks are suppressed, due to page considerations.

a) Clustered standard errors in parentheses.

b) The dependent variable is the weekly individual sickness absence rate before and after the fracture.

c) The *F*-statistic is presented. The number of restrictions under the null-hypothesis is mentioned behind the explanatory variable.

* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

5.7 Robustness Checks

As a sensitivity analysis,[22] we estimate Equation (5.3) separately for employees with a leg-related fracture or with an arm-related fracture, as there can be differences in the severity and level of inconvenience for employees suffering these different types of fracture. Figure 5.5 shows that the patterns for different fractures are similar, but the level can differ slightly. Therefore, we separate the case of upper leg, lower leg, knee and ankle from that of upper arm, lower arm and hand. Table 5.4 shows that in both cases, sickness absence increases less for high-wage employees. For employees with a leg-related fracture, sickness absence rises with 67.5 percentage points for high-wage earners and with 75.4 percentage points for low-wage employees. For those with an arm-related rupture, the increase equals 63.9 percentage points for high-wage employees and with 74.8 percentage points for low-wage earners.[23]

In Table 5.5, we estimate Equation (5.3) for employees with low and high wages, but with a different cut-off point, which lies at 30,000 rather than 40,000 euros.[24] The results show smaller

[22] The summary statistics show the remarkable difference that 66.9 percent of all employees with a fracture are male, whereas this percentage equals 55.5 in the control group. As a robustness check, we also estimated Equation (5.3) for males and females separately. The results show that the social gradient exists in sickness absence from the second week onwards for females and from the first week onwards for males when split on the basis of gender.

[23] The p-value for the Wald test of the coefficient for leg-related fractures equals 0.0290 and the one for arm-related fractures equals 0.0134.

[24] We chose 40,000 Euro initially to display the social gradient for those in the top social class. However, we also checked it for a cut-off point of 30,000 Euros, 35,000 Euros and 45,000 Euros, the results of which are significant as well. Of the 2,295 employees with a fracture, 363 were high-wage earners. When the cut-off point lays at 30,000 Euros rather than 40,000 Euros (robustness checks), there were 932 high-wage earners.

Table 5.4 – Difference-in-difference estimation results (Equation 5.3) for employees with leg-related and arm-related fractures [a)]

	Individual sickness absence[b)] (fixed-effects) Leg related fractures	Individual sickness absence[b)] (fixed-effects) Arm related fractures
1 week after fracture*fracture*high salary	0.675* (0.043)	0.639* (0.056)
10 weeks after fracture*fracture*high salary	0.329* (0.046)	0.318* (0.063)
20 weeks after fracture*fracture*high salary	0.036 (0.045)	0.048 (0.055)
30 weeks after fracture*fracture*high salary	-0.001 (0.040)	0.028 (0.051)
40 weeks after fracture*fracture*high salary	-0.069*** (0.038)	-0.042 (0.042)
1 week after fracture*fracture*low salary	0.754* (0.034)	0.748* (0.043)
10 weeks after fracture*fracture*low salary	0.536* (0.038)	0.427* (0.050)
20 weeks after fracture*fracture*low salary	0.231* (0.037)	0.122* (0.043)
30 weeks after fracture*fracture*low salary	0.139* (0.032)	0.084** (0.040)
40 weeks after fracture*fracture*low salary	0.006 (0.030)	-0.015 (0.037)
1 week after fracture*fracture*small firm	0.117* (0.026)	0.079** (0.033)
10 weeks after fracture*fracture*small firm	0.131* (0.028)	0.018 (0.036)
20 weeks after fracture*fracture*small firm	0.083* (0.028)	0.055 (0.033)
30 weeks after fracture*fracture*small firm	0.013 (0.025)	0.026 (0.031)
40 weeks after fracture*fracture*small firm	0.052** (0.024)	0.025 (0.028)
1 week after fracture*fracture*females	-0.103* (0.031)	-0.066*** (0.038)
10 weeks after fracture*fracture*females	-0.068*** (0.034)	0.033 (0.043)
20 weeks after fracture*fracture*females	-0.016 (0.033)	0.053 (0.040)
30 weeks after fracture*fracture*females	-0.040 (0.029)	0.044 (0.039)
40 weeks after fracture*fracture*females	-0.049*** (0.027)	0.025 (0.034)
1 week after fracture*fracture*high firm absence	-0.069* (0.023)	0.042 (0.030)
10 weeks after fracture*fracture*high firm absence	0.005 (0.026)	0.081** (0.034)
20 weeks after fracture*fracture*high firm absence	0.089* (0.027)	0.055 (0.031)
30 weeks after fracture*fracture*high firm absence	0.073* (0.024)	0.043 (0.029)
40 weeks after fracture*fracture*high firm absence	0.055** (0.023)	0.039 (0.026)
1 week after fracture*fracture*short tenure	-0.015 (0.023)	-0.074** (0.030)
10 weeks after fracture*fracture*short tenure	-0.010 (0.026)	-0.073** (0.034)
20 weeks after fracture*fracture*short tenure	-0.007 (0.027)	-0.047 (0.032)
30 weeks after fracture*fracture*short tenure	-0.033 (0.024)	-0.042 (0.029)

40 weeks after fracture*fracture*short tenure	-0.008 (0.022)	-0.034 (0.026)
1 week after fracture*fracture*high age	-0.049** (0.023)	-0.083* (0.031)
10 weeks after fracture*fracture*high age	0.071* (0.027)	0.049 (0.037)
20 weeks after fracture*fracture*high age	0.071** (0.028)	0.119* (0.033)
30 weeks after fracture*fracture*high age	0.058** (0.024)	0.045 (0.031)
40 weeks after fracture*fracture*high age	0.037 (0.023)	0.047*** (0.027)
1 week after fracture*fracture*high percentage of women	0.040 (0.030)	-0.011 (0.039)
10 weeks after fracture*fracture*high percentage of women	-0.007 (0.033)	-0.048 (0.044)
20 weeks after fracture*fracture*high percentage of women	-0.011 (0.033)	-0.072*** (0.040)
30 weeks after fracture*fracture*high percentage of women	0.014 (0.028)	-0.076** (0.039)
40 weeks after fracture*fracture*high percentage of women	0.028 (0.027)	-0.047 (0.034)
Observed month dummies (23)[c]	18.84*	19.00*
Total number of employees	11,412	10,883
Number of fractures	1,412	883
Number of firms	1,375	1,155
Number of explanatory variables	183	183

Note: We show the estimated coefficients of every 10th week in the tables, whereas dummies and interaction terms for all weeks are included in the regression equations. The coefficients on the other weeks are suppressed, due to page considerations.

a) Clustered standard errors in parentheses.

b) The dependent variable is the weekly individual sickness absence rate before and after the fracture.

c) The *F*-statistic is presented. The number of restrictions under the null-hypothesis is mentioned behind the explanatory variable.

* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

Table 5.5 – Difference-in-difference estimation results (Equation 5.3) for employees with and without a fracture for a different salary cut-off point (30,000 euros) [a)]

	Individual sickness absence [b)] (fixed-effects)
1 week after fracture*fracture*high salary	0.713* (0.028)
10 weeks after fracture*fracture*high salary	0.423* (0.032)
20 weeks after fracture*fracture*high salary	0.104* (0.030)
30 weeks after fracture*fracture*high salary	0.056** (0.027)
40 weeks after fracture*fracture*high salary	-0.033 (0.025)
1 week after fracture*fracture*low salary	0.755* (0.029)
10 weeks after fracture*fracture*low salary	0.501* (0.033)
20 weeks after fracture*fracture*low salary	0.207* (0.030)
30 weeks after fracture*fracture*low salary	0.131* (0.027)
40 weeks after fracture*fracture*low salary	0.004 (0.024)
1 week after fracture*fracture*small firm	0.103* (0.020)
10 weeks after fracture*fracture*small firm	0.091* (0.023)
20 weeks after fracture*fracture*small firm	0.075* (0.022)
30 weeks after fracture*fracture*small firm	0.020 (0.020)
40 weeks after fracture*fracture*small firm	0.043** (0.018)
1 week after fracture*fracture*females	-0.091* (0.025)
10 weeks after fracture*fracture*females	-0.036 (0.028)
20 weeks after fracture*fracture*females	-0.005 (0.026)
30 weeks after fracture*fracture*females	-0.017 (0.024)
40 weeks after fracture*fracture*females	-0.025 (0.022)
1 week after fracture*fracture*high firm absence	-0.022 (0.018)
10 weeks after fracture*fracture*high firm absence	0.034*** (0.021)
20 weeks after fracture*fracture*high firm absence	0.079* (0.021)
30 weeks after fracture*fracture*high firm absence	0.065* (0.019)
40 weeks after fracture*fracture*high firm absence	0.051* (0.017)
1 week after fracture*fracture*short tenure	-0.038** (0.019)
10 weeks after fracture*fracture*short tenure	-0.036 (0.021)
20 weeks after fracture*fracture*short tenure	-0.025 (0.021)
30 weeks after fracture*fracture*short tenure	-0.037** (0.018)
40 weeks after fracture*fracture*short tenure	-0.018 (0.017)
1 week after fracture*fracture*high age	-0.066* (0.019)
10 weeks after fracture*fracture*high age	0.053** (0.022)
20 weeks after fracture*fracture*high age	0.088* (0.022)
30 weeks after fracture*fracture*high age	0.053* (0.019)

40 weeks after fracture*fracture*high age	0.040** (0.018)
1 week after fracture*fracture*high percentage of women	0.024 (0.024)
10 weeks after fracture*fracture*high percentage of women	-0.016 (0.027)
20 weeks after fracture*fracture*high percentage of women	-0.031 (0.026)
30 weeks after fracture*fracture*high percentage of women	-0.019 (0.023)
40 weeks after fracture*fracture*high percentage of women	0.001 (0.021)
Observed month dummies (23)[c]	18.39*
Total number of employees	12,295
Number of fractures	2,295
Number of firms	1,741
Number of explanatory variables	183

Note: We show the estimated coefficients of every 10th week in the tables, whereas dummies and interaction terms for all weeks are included in the regression equations. The coefficients on the other weeks are suppressed, due to page considerations.

a) Clustered standard errors in parentheses.

b) The dependent variable is the weekly individual sickness absence rate before and after the fracture.

c) The *F*-statistic is presented. The number of restrictions under the null-hypothesis is mentioned behind the explanatory variable.

* Statistically significant at the 1-percent level; ** at the 5-percent level; *** at the 10-percent level

differences between the groups,[25] but confirm the persistence of the social gradient when conditioning on fractures. The results are similar; the increase for low-wage employees is 75.5 percentage points and still significantly higher than the 71.3 percentage point increase for high-wage workers. This suggests that the effect of the social gradient

[25] The p-values for the Wald test of the coefficient with a cut-off point at 30,000 equals 0.0393, the p-value with a cut-off point at 35.000 equals 0.0470 and the p-value with a cut-off point at 45,000 equals 0.0027.

is stronger when the income limit for high-wage employees is set higher.[26]

5.8 Conclusion

This chapter investigated whether there is any social gradient of sickness absence after correcting for the confounding influence of a worker's physical health condition. We did so by examining the development of sickness absence by using a quasi-experimental setup when conditioning on fractures. A fracture is an exogenous health shock, being irrespective of social status. We focus on the period before and after a fracture and report the specific pattern of an immediate increase of 71.3 percentage points in sickness absence directly after a fracture. The conclusions are twofold.

First, the results suggest that the social gradient holds for sickness absence. The increase in sickness absence is smaller for the high-salaried employees than for the other employees (66 versus 75.2 percentage points immediately after the fracture). During the first six weeks after a fracture, the traditional socioeconomic explanation for differences between workers, based on employees with a superior social status having more and better means of taking care of themselves, does not hold, because a fracture is an exogenous, physical impediment.

Second, we conclude that the social gradient in absenteeism may have different theoretical explanations, for which we distinguish

[26] When excluding some employees with wages below the minimum wage, the conclusions do not change and the differences are still significant, with p-values of 0.0041 (for a cut-off point of 45,000), 0.0014 (for a cut-off point of 40,000), 0.0778 (for a cut-off point of 35,000) and 0.085 (for a cut-off point of 30,000).

differences in career considerations versus differences in job attributes. Employees with higher wages may be more concerned about their career and about the signal sent by absence. Because they anticipate the implications for their future careers they may be inclined to return to work early, which could explain the existence of the social gradient in case of fractures (Holmström, 1982; Coles and Treble, 1996).

Alternatively, different job complexities may explain these differences between employees (Sattinger, 1975; Kremer, 1993). High-wage employees with high wages and many tasks can have their duties easily separated and reallocated such that they can reject the physical ones and still carry out the nonphysical ones. For low-wage employees who generally have jobs of lower complexity, it is harder to reallocate and to reshuffle tasks in the event of a health shock, so that they will have a higher sickness absence rate. In addition, employees with complex jobs or high wages may report absent less often and be prone to return to work quickly because they experience or perceive pressure from their employers (Brouwer et al., 2009).

Overall, both classes of theory give a new view on absenteeism and they may set the research agenda for more investigation on the social gradient in absenteeism. First, there are two alternative explanations for the persistence of the social gradient in sickness absence when controlling for health, one stemming from the labour supply side and one from the labour demand side, namely, differences in career considerations and differences in job attributes. A deeper examination is needed in order to elucidate this occurrence. Second, further attention should be paid to the role of health on sickness

absence behaviour. From this study it appears that, as our intuition would suggest, health is an important determinant of reporting absent and future research should try to incorporate this into a coherent framework. Furthermore, we have sickness absence data documented for 2004 and 2005 only. If would be interesting to incorporate a more long-term perspective on the consequences of suffering a health shock. There are many unresolved issues regarding the long-term consequences of longstanding sickness absence on subsequent employment, unemployment and wage developments.

Chapter 6

Conclusion

This dissertation has examined sickness absence in cases of job transition and health shock. Sickness absence is related to illnesses ranging from everyday colds to serious physical and mental diseases. However, the absence rate includes more than absence which is merely due to sickness; it also appears to be related to social class and firm characteristics. Consequently, though sickness absence involves more than absence resulting from sickness, it cannot be reduced to a question of effort either. This is why there is some potential for influencing the level of sickness absence at the margins.

Part I focused on sickness absence in the period around job transitions on the labour market by concentrating on the sickness absence profiles of job-to-job moves and of newly hired workers after a period of unemployment. Part II examined two specific health shocks which influence sickness absence, namely, pregnancies and fractures and examined the way in which health and absenteeism are interrelated. In Section 6.1 we offer our main findings, stating our limitations and suggestions for future research in Section 6.2.

6.1 Main findings

Part I of the dissertation investigates sickness absence in the period before and after a job transition in the labour market. Chapters 2 and 3 give different perspectives on the same phenomenon. The common theme of both chapters is that there is an increase of sickness absence

in the period around transitions in the labour market. We find that there is a positive effect on sickness absence both for a job-to-job move (Chapter 2) and for a move from unemployment to a job (Chapter 3).

In Chapter 2, we investigate the sickness absence of employees who make a job-to-job transition. Sickness absence appears to be procyclical, implying there is a higher rate of absenteeism in a tight labour market. In the literature on the procyclical nature of absence, two explanations are given. On the one hand, economic incentives can be effective and they may cause a higher rate of sickness absence in a tight labour market, since the costs of being absent are lower for the employee. On the other hand, a selection mechanism may be effective, for absence-prone employees are more likely to be selected into the labour market when demand is high. Our research indicates an additional explanation for the procyclical nature of sickness absence. Around job moves, absence increases in the period before a job-to-job transition, whereas it declines in the first months with the new employer. The estimates indicate that the increase in sickness absence before the job-to-job transition outweighs the decline in sickness absence after the job-to-job move. The net increase equals 0.62 percentage points. In addition to sickness absence being procyclical, job-to-job transitions also follow a cyclical pattern. In economic booms, the probability of finding a new job is higher and employees will make more job-to-job transitions. An important conclusion from Chapter 2 is, therefore, that the procyclical character of sickness absence is strengthened by the net increase in sickness absence in the period surrounding job-to-job transitions.

In Chapter 3, we investigate the relationship between sickness absence and unemployment at a micro level, by focusing on the effect of past unemployment duration on sickness absence behaviour after hiring. Two propositions, which stem from the incentive-selection trade-off, are formulated. On the one hand, economic incentives could imply that employees who went through long unemployment spells report absent less often in their new job, predicting a negative relationship between individual unemployment duration and sickness absence. On the other hand, selection mechanisms could imply that employees at the lower end of the productivity distribution who enter the labour market after a long period of unemployment are likely to report high absence rates, suggesting a positive relationship between individual unemployment and sickness absence. As we are more interested in selection associated with absence-prone employees than in poor health, we control for health by including hospitalization information during unemployment. The results imply that the selection mechanism dominates the incentive effect. The estimates indicate that employees who have been unemployed for more than a year before entering a new employment contract have a sickness absence rate 1.3 percentage points higher than employees who have been unemployed for less than three months. Moreover, if employees who have been unemployed for more than a year are employed in firms with a high average sickness absence rate, they report absent an additional 0.9 percentage points more often. Apparently, the unemployment spell hardly ever serves as an incentive to lower the sickness absence rate when becoming re-employed.

Part II of the dissertation examines the relation between sickness absence and health. Two health shocks that some employees can undergo, pregnancies and fractures, are isolated in order to study the way in which health shocks influence sickness absence behaviour. Given the impact of health on the sickness absence rate, as established in Chapter 4, it should be included in the absence equations. Not only is there a direct effect of health or the intensity of the condition on sickness absence, but it appears that there also is an indirect effect, because the intensity of the condition strengthens the effect of the explanatory factors. In Chapter 5 we make use of a stricter test by focusing on fractures as an exogenous health shock and determine whether there is an effect of wage or social status on sickness absence when excluding health as a confounding factor.

Chapter 4 studies the consequences of excluding the seriousness of the physical condition in the absence equation. We include the intensity of the physical condition of pregnancy as an explanatory variable and we investigate the way in which the rate of absence increases as the physical condition intensifies. Studying sickness absence in relation to pregnancies is of interest, since the intensity of the medical condition is usually not included in the absence equation. We focus on the development of sickness absence for a homogeneous group of female employees during the forty weeks of pregnancy. We put forward the view that the seriousness of the physical condition may be either independent of or dependent on the explanatory factors found in the literature. If independent, the intensity of the condition would not change the effect of the explanatory variables over time. If dependent, the seriousness of the

physical condition could either weaken or strengthen the explanatory factors over the course of the condition. We find that the intensity of the pregnancy strengthens the effect of the explanatory variables found so far in the literature. Existing differences between employees, related to tenure, age, wages, firm-level sickness absence rate, percentage of women working in the firm and firm size are amplified over the course of forty weeks. This means that sickness absence increases more for women with short tenure, low age, low wage, work in firms with a high firm-level sickness absence rate, work in firms with a large share of females and work in large firms. There are multiple explanations to account for the amplified differences that we find. They may be related to labour supply factors and employees' career concern, as well as to aspects of labour demand such as the cost of monitoring and job attributes.

Chapter 5 studies whether there is any social gradient in sickness absence after correcting for the confounding influence of the employees' state of physical health. Health, social status and sickness absence are three phenomena which are highly interrelated. Not only is there a social gradient in health, but health for its part influences social status and sickness absence. We analyse whether there is a social gradient in sickness absence after controlling for the influence of employees' health status. We use a quasi-experimental structure and apply a difference-in-difference estimator by conditioning on an exogenous health shock which is independent of social status: fractures. We find that the social gradient prevails in sickness absence when conditioning on fractures. The increase in sickness absence directly after a fracture is significantly higher for employees with low

wages than for employees with high wages, namely, 75.2 versus 66 percentage points. During the first six weeks after the fracture, the treatment and burden are similar for all employees and the traditional socioeconomic explanations, such as education, for differences between workers do not hold. There are some factors which may explain the pattern that we observe. From the labour supply side, employees with higher wages may be more concerned about their career and the signal sent by absence, as a result of which they may be inclined to return to work soon. In addition, stemming from the labour demand side, employees with high wages may have more complex jobs, so that in case of a health shock they can reject the physical tasks but still carry out the nonphysical ones. Moreover, their employers may pressure them to return to work soon.

Chapter 5 confirms the results that we found in Chapter 4. The results in Chapter 4 suggest that there is more to sickness absence than the mere intensity of the physical condition, since the effects of the explanatory variables are strengthened with the intensity of a pregnancy. In Chapter 5, we operate a more severe method by examining an exogenous physical condition, fracture. The results show that when the intensity of the condition is highest, directly after the occurrence of the fracture, there is a social gradient, related to wages, in sickness absence.

6.2 Limitations and suggestions for future research

This dissertation has analysed several aspects of sickness absence in the period around job transitions and health shocks. From this research, it appears that there are several difficulties in the current

research as well as possibilities for future research. They are related to methodological concerns, theoretical issues or policy implications.

On a general note, the literature could develop towards examining the degree to which firms can influence sickness absence behaviour. Future research should focus on the cost to firms of sickness absence. The extent to which firms suffer from sickness absence depends not only on the wages that they continue to pay, but also on the organization of the production process. The cost to firms of absence depends on the degree of complementarity between inputs in the production function. Teamwork, just-in-time deliveries and complementarity between labour and capital, such as inventories, are not robust to absence (Lanfranchi and Treble, 2010). We did not incorporate into this research the degree of complementarity between production factors. However, we did use the complexity of jobs, related to the organization of the production process, as a possible explanation for the patterns that we found in Chapters 4 and 5.

Methodologically, a recurring issue in the empirical literature is that of causation versus correlation. Most economic research faces selectivity in one way or another and this applies also to the present dissertation. Both Chapters 2 and 3 may deal with employees transitioning on the labour market as a consequence of self-selection. In Chapter 4, the analysis of pregnancies may be impacted by forward-looking behaviour, but the importance of this should not be overrated. Chapter 5, however, uses an exogenous health shock, for which this concern does not hold. The literature is still engaged in improving upon this issue.

Another important issue which economists often have to deal with is the relation between supply and demand and the degree to which a specific phenomenon can be attributed to either the employee or the firm side. In addition to observable characteristics, unobservable heterogeneity can be linked to both the employee and the firm. A classic example from the economic literature is the problem of distinguishing between quits and layoffs. In Chapter 2 and Chapter 5, we cannot make a distinction between employee and employer influences. In Chapter 2, we can differentiate between employees with uninterrupted and interrupted employment contracts, but we are not able to distinguish between workers who made an employee-initiated transition and those who made a firm-initiated one. It would be interesting to investigate the differences between employees making a voluntary and those making an involuntary move because the incentives they have from the old employment contract and during the probationary period at the new firm may differ.

In Chapter 5 we cannot distinguish between employee and employer influences, either. We find that the social gradient prevails in sickness absence when conditioning on fractures. This chapter shows that two alternative explanations remain for the persistence of the social gradient in sickness absence when conditioning on health. One originates from the labour supply side and one stems from the labour demand side, focusing on career considerations and job attributes, respectively. A deeper investigation is needed to determine whether it originates from the side of the employee or of the employer.

On a theoretical note, an important issue related to this dissertation is the inclusion of health in the analyses. Theoretical models in the labour economic literature on absenteeism regularly fail to include the individual's health. Often, theories are framed for absence in general rather than for sickness absence in particular. Absence is obviously a function of illnesses or specific conditions, so it is remarkable that it is so often excluded from theoretical and empirical models. An explanation for this may be that the reason for absence and the type of illness are often not registered. We address this issue by conditioning on specific conditions in Chapter 4 and 5, namely, pregnancies and fractures. More attempts should be made to include individuals' health in the absence equation. Related to this is the topic of controlling for employees with poor health. In order to identify employees with poor health in Chapter 3, we checked whether they had been admitted to a hospital during their spell of unemployment. Hospital admissions, although highly correlated with poor health, are not a perfect measurement, for there can be employees with poor health who have not been admitted to a hospital. Therefore, more and improved measurements of health should be used.

In addition, sorting is a broad topic in the economic literature, to which we also contributed with this dissertation. Part of the sorting literature deals with the issue of assortative matching on the labour market. This has not so far been profoundly researched in relation to sickness absence. We touch upon this issue in Chapter 3. This chapter examines sorting, as defined by Nordberg and Røed (2009), namely, that workers with high individual propensities to absence are the first ones to be laid off in a downturn and the last ones to be hired in an

upturn. A different definition of sorting could cover different types of employee being selected into accompanying types of firms, on the basis of the employees' and the firms' respective levels of productivity. We cannot draw any conclusions about whether this occurs and whether more (less) productive employees are selected into more (less) productive firms; future research should try to incorporate this into the analyses.

Related to policy considerations, Chapters 2 and 3 showed that sickness absence increases in the period around transitions on the labour market. In a labour market which is becoming increasingly mobile, in which permanent contracts are the exception rather than the rule and spells of unemployment between two jobs are not uncommon, these mechanisms are important to investigate. If these mechanisms are taken for granted, it may imply that the 'equilibrium' level of sickness absence may change as a consequence of an increasingly mobile labour market.

In addition, Chapters 4 and 5 showed that the intensity of the physical condition is an important factor when reporting absent; future research should attempt to integrate this into a consistent framework. Chapter 4 provides evidence that the intensity of the medical condition is an important omitted variable. Even when the physical condition intensifies and sickness absence increases, there are differences between different groups of employees. As these differences seem to amplify, rather than weaken, this implies that there is considerable potential for employers to influence sickness absence behaviour. Even if we operate a more severe method by examining an exogenous physical condition, such as that in Chapter 5, there are differences

between employees. It suggests there still is a great deal to be gained for human-resource management, since actual sickness absence behaviour is apparently influenced by more than an employee's physical condition.

References

Abowd, J. and F. Kramarz (1999). The analysis of labor markets using matched employer-employee data. Chapter 40 in Ashenfelter, Orley and Card eds. *Handbook of Labor Economics*, Vol. 3, Elsevier Science, Holland, 2630-2672.

Alexanderson, K., G. Hensing, M. Leijon, I. Åkerlind, H. Rydh, J. Carstensen, and P. Bjurulf (1994). Pregnancy related sickness absence in a Swedish county, 1985-87. *Journal of Epidemiology and Community Health*, 48(5):464-470.

Alexanderson, K., A. Sydsjö, G. Hensing, G. Sydsjö, and J. Carstensen (1996). Impact of pregnancy on gender differences in sickness absence. *Scandinavian Journal of Public Health*, 24(3):169-176.

Allebeck, P. and A. Mastekaasa (2004). Chapter 3. Causes of sickness absence: Research approaches and explanatory models. *Scandinavian Journal of Public Health*, 32(63):36-43.

Allen, S.G. (1981a). An empirical model of workers attendance. *The Review of Economics and Statistics*, 63(1):77-87.

Allen, S.G. (1981b). Compensation, safety, and absenteeism: Evidence from the paper industry. *Industrial and Labor Relations Review*, 34(2):207-218.

Allen, S.G. (1984). Trade unions, absenteeism, and exit-voice. *Industrial and Labor Relations Review*, 37(3):331-345.

Angelov, N., P. Johansson, and E. Lindahl (2013). Gender differences in sickness absence and the gender division of family responsibilities. *Institute for the Study of Labor (IZA), Discussion Paper*, No. 7379.

Arai, M. and P.S. Thoursie (2005). Incentives and selection in cyclical absenteeism. *Labour Economics*, 12(2):269-280.

Ashenfelter, O. and G.E. Johnson (1969). Bargaining theory, trade unions, and industrial strike activity. *The American Economic Review*, 59(1):35-49.

Askildsen, J.E., E. Bratberg, and Ø.A. Nilsen (2005). Unemployment, labor force composition and sickness absence: A panel data study. *Health Economics*, 14(11):1087-1101.

Balchin, J. and M. Wooden (1995). Absence penalties and work attendance. *Australian Economic Review*, 28(4):43-58.

Balia, S. and A.M. Jones (2008). Mortality, lifestyle and socio-economic status. *Journal of Health Economics*, 27(1):1-26.

Barmby, T.A. (2002). Worker absenteeism: A discrete hazard model with bivariate heterogeneity. *Labour Economics*, 9(4):469-476.

Barmby, T.A., M.G. Ercolani, and J.G. Treble (2002). Sickness absence: An international comparison. *The Economic Journal*, 112(480):F315-F331.

Barmby, T.A. and M. Larguem (2009). Coughs and sneezes spread diseases: An empirical study of absenteeism and infectious illness. *Journal of Health Economics*, 28(5):1012-1017.

Barmby, T.A., C.D. Orme, and J.G. Treble (1991). Worker absenteeism: An analysis using microdata. *The Economic Journal*, 101(405):214-229.

Barmby, T.A., J. Sessions, and J. Treble (1994). Absenteeism, efficiency wages and shirking. *The Scandinavian Journal of Economics*, 96(4):561-566.

Barmby, T.A. and G. Stephan (2000). Worker absenteeism: Why firm size may matter. *Manchester School*, 68(5):568-577.

Blanchard, O.J. and P. Diamond (1990). The cyclical behaviour of the gross flows of U.S. workers. *Brookings Papers on Economic Activity*, 1990(2):85-155.

Bollag, U., A. Rajeswaran, C. Ruffieux, and B. Burnand (2007). Sickness certification in primary care – the physician's role. *Swiss Medical Weekly*, 137(23):341-346.

Borjas, G.J. (1979). Job satisfaction, wages and unions. *The Journal of Human Resources*, 14(1):21-40.

Brouwer, W.B.F., N.J.A. Van Exel, M.A. Koopmanschap, and F.F.H. Rutten (2002). Productivity costs before and after absence from work: As important as common? *Health Policy*, 61(2):173-187.

Brouwer, W.B.F., M.A. Koopmanschap, and F.F.H. Rutten (1999). Productivity losses without absence: Measurement validation and empirical evidence. *Health Policy*, 48(1):13-27.

Brouwer, S., B. Krol, M.F. Reneman, T. Bültmann, R.L. Franche, J.J.L. Van der Klink, and J.W. Groothoff (2009). Behavioral determinants as predictors of return to work after long-term sickness absence: An application of the theory of planned behavior. *Journal of Occupational Rehabilitation*, 19(2):166-174.

Brown, S., F. Fakhfakh, and J.S. Sessions (1999). Absenteeism and employee sharing: An empirical analysis based on French panel data, 1981-1991. *Industrial and Labor Relation Review*, 52(2):234-251.

Brown, S. and J.G. Sessions (1996). The economics of absence: Theory and evidence. *Journal of Economic Surveys*, 10(1):23-53.

Buzzard, R.B. and W.J. Shaw (1952). An analysis of absence under a scheme of paid sick leave. *British Journal of Industrial Medicine*, 9(4):282-295.

Chatterji, M. and C.J. Tilley (2002). Sickness, absenteeism, presenteeism, and sick pay. *Oxford Economic Papers*, 54(4):669-687.

Chaudhury, M. and I. Ng (1992). Absenteeism predictors: Least squares, rank regression, and model selection results. *The Canadian Journal of Economics*, 25(3):615-634.

Coles, M., J. Lanfranchi, A. Skalli, and J. Treble (2007). Pay, technology, and the cost of worker absence. *Economic Inquiry*, 45(2):268-285.

Coles, M.G. and J.G. Treble (1993). The price of worker reliability. *Economic Letters*, 41(2):149-155.

Coles, M.G. and J.G. Treble (1996). Calculating the price of worker reliability. *Labour Economics*, 3(2):169-188.

Culyer, A.J. and A. Wagstaff (1993). Equity and equality in health and health care. *Journal of Health Economics*, 12(4):431-457.

De Jong, P. (2012). Recent changes in Dutch disability policy. *APE Report (**A**arts de Jong Wilms Goudriaan **P**ublic **E**conomics).*

De Jong, P. and M. Lindeboom (2004). Privatisation of sickness insurance: Evidence from the Netherlands. *Swedish Economic Policy Review*, 11(1):121-143.

Deardorff, A.V. and F.P. Stafford (1976). Compensation of cooperating factors. *Econometrica*, 44(4):671-684.

Douglas, P.H. (1919). Absenteeism in labor. *Political Science Quarterly*, 34(4):591-608.

Drago, R. and M. Wooden (1992). The determinants of labor absence: Economic factors and workgroup norms across countries. *Industrial and Labor Relations Review*, 45(4):764-778.

Dunn, L.F. and S.A. Youngblood (1986). Absenteeism as a mechanism for approaching an optimal labor market equilibrium: An empirical study. *The Review of Economics and Statistics*, 68(4):668-674.

Ehrenberg, R.G. (1970). Absenteeism and the overtime decision. *The American Economic Review*, 60(3):352-357.

Eysink, P.E.D., H.H. Hamberg-Van Reenen, C.H. Van Gool, N. Hoeymans, and A. Burdorf (2010). Meten van verloren arbeidsjaren door ziekte: Disease-adjusted working years (DAWY). Verkenning van een nieuwe maat. *RIVM rapport*, 270244001.

Fevang, E., S. Markussen, and K. Røed (2011). The sick pay trap. *Institute for the Study of Labor (IZA), Discussion Paper*, No. 5655.

Flanagan, F.J., G. Strauss, and L. Ulman (1974). Worker discontent and work place behavior. *Industrial Relations*, 13(2):101-123.

Freeman, R.B. (1978). Job satisfaction as an economic variable. *The American Economic Review*, 68(2):135-141.

Hart, R. (2004). *The Economics of Overtime Working*. Cambridge: Cambridge University Press.

Hassink, W.H.J. (2011). Ziek is toch ziek? Over inspanning en verzuim op de werkvloer. *TPEdigitaal*, 5(4):109-124.

Hassink, W.H.J. and P.W.C. Koning (2009). Do financial bonuses reduce employee absenteeism? Evidence from a lottery. *Industrial and Labor Relations Review*, 62(3):325-340.

Hesselius, P. (2007). Does sickness absence increase the risk of unemployment? *The Journal of Socio-Economics*, 36(2):288-310.

Heymann, J., H.J. Rho, J. Schmitt, and A. Earle (2010). Ensuring a healthy and productive workforce: Comparing the generosity of paid sick day and sick leave policies in 22 countries. *International Journal of Health Services*, 40(1):1-22.

Heywood, J.S. and U. Jirjahn (2004). Teams, teamwork and absence. *Scandinavian Journal of Economics*, 106(4):765-782.

Heywood, J.S., U. Jirjahn, and X. Wei (2008). Teamwork, monitoring and absence. *Journal of Economic Behavior and Organization*, 68(3-4):676-690.

Holmström, B. (1982). Managerial incentive problems – A dynamic perspective. In *Essays in Economics and Management in Honor of Lars Wahlbeck*, Swedish School of Economics, Helsinki [reprinted in *Review of Economic Studies*, 66(1):169-183].

Hultin, H., C. Lindholm, M. Malfert, and J. Möller (2012). Short-term sick leave and future risk of sickness absence and unemployment – The impact of health status. *BMC Public Health*, 12(1):861-869.

Ichino, A. and E. Moretti (2009). Biological gender differences, absenteeism and the earning gap. *American Economic Journal: Applied Economics*, 1(1):183-218.

Ichino, A. and R.T. Riphahn (2004). Absenteeism and employment protection: Three case studies. *Swedish Economic Policy Review*, 11(1):95-114.

Ichino, A. and R.T. Riphahn (2005). The effect of employment protection on worker effort: A comparison of absenteeism during and after probation. *Journal of the European Economic Association*, 3(1):120-143.

Johansson, P. and M. Palme (1996). Do economic incentives affect work absence? Empirical evidence using Swedish micro data. *Journal of Public Economics*, 59(2):195-218.

Jones, A.M. (ed.) (2012). *The Elgar Companion to Health Economics Second Edition*. Aldershot: Edward Elgar.

Kaivanto, K. (1997). An alternative model of pro-cyclical absenteeism. *Economic Letters*, 54, 29-34.

Koopmanschap, M.A., F.F.H. Rutten, B.M. Van Ineveld, and L. Van Roijen (1995). The friction cost method for measuring indirect costs of disease. *Journal of Health Economics*, 14(2):171-189.

Kremer, M. (1993). The O-ring theory of economic development. *Quarterly Journal of Economics*, 108(3):551-575.

Lanfranchi, J. and J.G. Treble (2010). Just-in-time production, work organization and absence control. *The Manchester School*, 78(5):460-483.

Layard, P.R.G., S.J. Nickell, and R. Jackson (1991). *Unemployment: Macroeconomic Performance and the Labour Market*. Oxford and New York: Oxford University Press.

Lazear, E.P. (1995). A jobs-based analysis of labor markets. *The American Economic Review*, 85(2):260-265.

Leigh, J.P. (1985). The effects of unemployment and the business cycle on absenteeism. *Journal of Economics and Business*, 37(2):159-170.

Leigh, J.P. (1991). Employee and job attributes as predictors of absenteeism in a national sample of workers: The importance of health and dangerous working conditions. *Social Science and Medicine*, 33(2):127-137.

Livanos, I. and A. Zangelidis (2013). Unemployment, labour market flexibility and absenteeism: A pan-European study. *Industrial Relations: A Journal of Economy and Society*, 52(2):492-515.

Lundborg, P., M. Nilsson, and J. Vikström (2011). Socioeconomic heterogeneity in the effect of health shocks on earnings: Evidence from population-wide data on Swedish workers. *Institute for the Study of Labor (IZA), Working Paper*, No. 6121.

Lusinyan, L. and L. Bonato (2007). Work absence in Europe. *IMF Staff Papers*, 54(3):475-538.

Mackenbach, J.P, A.E. Kunst, A.E.J.M. Cavelaars, F. Groenhof, and J.J.M. Geurts (1997). Socioeconomic inequalities in morbidity and mortality in western Europe. *Lancet* (North American Edition), 349(9066):1655-1659.

Markussen, S., K. Røed, O.J. Røgeberg, and S. Gaure (2011). The anatomy of absenteeism. *Journal of Health Economics*, 30(2):277-292.

Marmot, M.G., G.D., Smith, S. Stansfeld, Ch. Patel, F. North, J. Head, I. White, E. Brunner, and A. Feeny (1991). Health inequalities among British civil servants: The Whitehall II study. *Lancet* (North American Edition), 337(8754):1387-193.

Mas, A. and E. Moretti (2009). Peers at work. *American Economic Review*, 99(1):112-145.

Mattke, S., A. Balakrishnan, G. Bergamo, and S.J. Newberry (2007). A review of methods to measure health-related productivity loss. *The American Journal of Managed Care*, 13(4):211-217.

McDonough, P., D.R. Williams, J.S. House, and G.J. Duncan (1999). Gender and the socioeconomic gradient in mortality. *Journal of Health and Social Behavior*, 40(1):17-31.

Meerding, W.J., W. IJzelenberg, M.A. Koopmanschap, J.L. Stevens, and A. Burdorf (2005). Health problems lead to considerable productivity loss at work among workers with high physical load jobs. *Journal of Clinical Epidemiology*, 58(5):517-523.

Molenaar-Cox, P.G.M. and T.J. Veerman (2006). *Effecten van de Wet Verlenging Loondoorbetaling Bij Ziekte op Private Verzuimverzekeringen*. Leiden: Bureau Astri.

Mortensen, D.T. (1994). The cyclical behaviour of job and worker flows. *Journal of Economic Dynamics and Control*, 18(6):1121-1142.

Mortensen, D.T. and C.A. Pissarides (1994). Job creation and job destruction in the theory of unemployment. *Review of Economic Studies*, 61(3):397-415.

Nordberg, M. and K. Røed (2009). Economic incentives, business cycles, and long-term sickness absence. *Industrial Relations*, 48(2):203-230.

Ose, S.O. (2005). Working conditions, compensation and absenteeism. *Journal of Health Economics*, 24(1):161-188.

Paringer, L. (1983). Women and absenteeism: Health or economics? *The American Economic Review*, 73(2):123-127.

Pedersen, J., J.B. Bjorner, H. Burr, and K.B.Christensen (2012). Transitions between sickness absence, work, unemployment, and disability in Denmark 2004–2008. *Scandinavian Journal of Work, Environment and Health*, 38(6):516-526.

Peltonen, M., M. Rosen, V. Lundberg, and K. Asplund (2000). Social patterning of myocardial infarction and stroke in Sweden: Incidence and survival. *American Journal of Epidemiology*, 151(3):283-292.

Post, M., B. Krol, and J.W. Groothoff (2005). Work-related determinants of return to work of employees on long-term sickness absence. *Disability and Rehabilitation*, 27(9):481-488.

Pouliakas, K. and N. Theodoropoulos (2012). The effect of variable pay schemes on workplace absenteeism. *Research in Labor Economics*, 36, 109-157.

Pouliakas, K. and I. Theodossiou (2013). The economics of health and safety at work: An interdisciplinary review of the theory and policy. *Journal of Economic Surveys*, 27(1):167-208.

Reza, A.M. (1975). Labour supply and demand, absenteeism, and union behaviour. *The Review of Economic Studies*, 42(2):237-247.

Rieck, K.M.E. and K. Telle (2013). Sick leave before, during and after pregnancy. *Acta Sociologica*, 56(2):117-137.

Røed, K. and E. Fevang (2007). Organizational change, absenteeism, and welfare dependency. *Journal of Human Resources*, 42(1):156-193.

Rosen, S. (1982). Authority, control, and the distribution of earnings. *The Bell Journal of Economics*, 13(2):311-323.

Ruhm, C.J. (2000). Are recessions good for your health? *The Quarterly Journal of Economics*, 115(2):617-650.

Sattinger, M. (1975). Comparative advantage and the distributions of earnings and abilities. *Econometrica*, 43(3):455-468.

Saurel-Cubizolles, M.J. and M. Kaminski (1987). Pregnant women's working conditions and their changes during pregnancy: A national study in France. *British Journal of Industrial Medicine*, 44(4):236-243.

Schaufeli, W.B., A.B. Bakker, and W. Van Rhenen (2009). How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. *Journal of Organizational Behavior*, 30(7):893-917.

Schrijvers, C.T. and J.P. Mackenbach (1994). Cancer patient survival by socioeconomic status in seven countries: A review for six common cancer sites [corrected]. *Journal of Epidemiology and Community Health*, 48(5):441-446.

Shapiro, C. and J. Stiglitz (1984). Equilibrium unemployment as a worker discipline device. *The American Economic Review*, 74(3):433-444.

Smith, J.P. (1998). Socioeconomic status and health. *The American Economic Review*, 88(2):192-196.

Smith, J.P. (1999). Healthy bodies and thick wallets: The dual relation between health and economic status. *The Journal of Economic Perspectives*, 13(2):145-166.

Smith, G.D., C. Hart, G. Watt, D. Hole, and V. Hawthorne (1998). Individual social class, area-based deprivation, cardiovascular disease risk factors, and mortality: The Renfrew and Paisley study. *Journal of Epidemiology and Community Health*, 52(6):399-405.

Snyder, S.E. and W.N. Evans (2006). The effect of income on mortality: Evidence from the social security notch. *The Review of Economics and Statistics*, 88(3):482-495.

Steel, R.P., J.R. Rentsch, and J.R. Van Scotter (2007). Timeframes and absence frameworks: A test of Steers and Rhodes' (1978) model of attendance. *Journal of Management*, 33(2):180-195.

Steers, R.M. and S.R. Rhodes (1978). Major influences on employee attendance: A process model. *Journal of Applied Psychology*, 63(4):391-407.

Stone, L. (1950). An Elizabethan coalmine. *Economic History Review*, 3(1):97-106.

Strand, K., E. Wergeland, and T. Bjerkedal (1997). Job adjustment as a means to reduce sickness absence during pregnancy. *Scandinavian Journal of Work, Environment and Health*, 23(5):378-384.

Treble, J. (2009). A tale of two continents: Insuring workers against loss of income due to sickness in North-American and Europe. *National Institute Economic Review*, 209(1):116-125.

Treble, J. and T. Barmby (2011). *Worker Absenteeism and Sick Pay*. Cambridge: Cambridge University Press.

Van Beukering, M.D.M. (2006). Werken tijdens zwangerschap en de periode postpartum, wetgeving. Over een bal die moet gaan rollen. *Tijdschrift voor Bedrijfs– en Verzekeringsgeneeskunde*, 14(9):492-500.

Van den Berg, G.J., M. Lindeboom, and F. Portrait (2006). Economic conditions early in life and individual mortality. *The American Economic Review*, 96(1):290-302.

Van Kippersluis, H., T. Van Ourti, O. O'Donnell, and E. Van Doorslaer (2009). Health and income across the life cycle and generations in Europe. *Journal of Health Economics*, 28(4):818-830.

Virtanen, M., M. Kivimäki, J. Vahtera, M. Elovainio, R. Sund, P. Virtanen, and J.E. Ferrie (2005). Sickness absence as a risk factor for job termination, unemployment, and disability pension among temporary and permanent employees. *Occupational and Environmental Medicine*, 63(3):212-217.

Vistnes, J.P. (1997). Gender differences in days lost from work due to illness. *Industrial and Labor Relations Review*, 50(2):304-323.

Weiss, A. (1985). Absenteeism and wages. *Economics Letters*, 19(3):277-279.

Wergeland, E. and K. Strand (1997). Need for job adjustment in pregnancy: Early prediction based on work history. *Scandinavian Journal of Primary Health Care*, 16(2):90-94.

Zhang, W., N. Bansback, and A.H. Anis (2011). Measuring and valuing productivity loss due to poor health: A critical review. *Social Science and Medicine*, 72(2):185-192.

Nederlandse samenvatting

Ziekteverzuim heeft in de wetenschappelijke literatuur niet zoveel aandacht gekregen als vergelijkbare empirische fenomenen van inactiviteit, zoals stakingen en werkloosheid. Een oorzaak hiervan kan zijn dat ziekteverzuim als een onvermijdelijk fenomeen wordt gezien, aangezien iedereen ziek kan worden en zich vervolgens genoodzaakt voelt absent te melden. Er bestaan echter veel verschillen in ziekteverzuim tussen werknemers, bedrijven en landen.

Gedurende de afgelopen decennia heeft het empirische onderzoek naar ziekteverzuim zich sterk ontwikkeld, mede dankzij de beschikbaarheid van administratieve werknemers-werkgever gekoppelde data. Aangezien er veel verschillen bestaan tussen bedrijven en werknemers is het van belang om transities of veranderingen die werknemers ondergaan onder de loep te nemen. Onderzoek naar ziekteverzuim in relatie tot baantransities en gezondheidsshocks moet meer duidelijkheid verschaffen naar de samenhang tussen ziekteverzuim en prikkels, selectie en gezondheid.

Literatuur en institutioneel kader

De literatuur rondom ziekteverzuim is erg gefragmenteerd, aangezien er onderzoek naar gedaan wordt binnen de disciplines van de geneeskunde, epidemiologie, sociologie, psychologie en economie. Binnen de economische literatuur omtrent ziekteverzuim zijn er ook verschillende perspectieven te onderscheiden, gerelateerd aan arbeidseconomie, sociale verzekeringen, gezondheidseconomie en arbeidsverhoudingen en –omstandigheden.

De economische literatuur benaderde ziekteverzuim oorspronkelijk vanuit een arbeidsaanbodperspectief. Individuele werknemers maximaliseerden hun nutsfuncties, onderworpen aan de tijds– en budgetrestrictie. Verschillen tussen werknemers in relatie tot geslacht, leeftijd, huwelijkse staat en het hebben van kinderen werden veelal onderzocht. Vervolgens werd het arbeidsaanbodperspectief geïntegreerd met de arbeidsvraagkant waarin er ruimte was voor een actievere rol van bedrijven. Verschillen tussen bedrijven met betrekking tot de inrichting van het productieproces, de bedrijfsomvang en de mate van complementariteit tussen productiefactoren werden aan het licht gebracht. Een belangrijk onderwerp binnen de arbeidseconomische literatuur betreffende ziekteverzuim is de rol van prikkels. Stimuli die veelal in verband worden gebracht met ziekteverzuim hebben te maken met lonen, loondoorbetaling tijdens ziekte, productiemethoden, baanzekerheid, bonussen en de conjunctuurcyclus.

Theoretische en empirische analyses in de verzuimliteratuur betrekken gezondheid vaak niet in de modellen. Theorieën worden meestal geformuleerd voor verzuim in het algemeen, in plaats van voor ziekteverzuim in het bijzonder. Dit is opmerkelijk, aangezien verzuim een duidelijke relatie heeft met ziekte. Een reden hiervoor kan zijn dat de oorzaak van verzuim vaak niet nauwkeurig geregistreerd wordt. Aangezien duidelijke verschillen tussen werknemers, bedrijven en landen waargenomen worden, omvat verzuim meer dan alleen het ziekteverzuim. Daarom is er ruimte om het verzuim op de marges te beïnvloeden.

In Nederland was er een duidelijke piek in verzuim in de jaren ’80 als gevolg van royale uitkeringen in geval van verzuim en daaropvolgende arbeidsongeschiktheid. De overheid was verantwoordelijk voor het handhaven van zowel de verzuim– als de arbeidsongeschiktheidsuitkeringen. Om de hoge instroom van arbeidsongeschikten en de daarbij behorende hoge uitgaven te verminderen, werd de Ziektewet geleidelijk geprivatiseerd. De verantwoordelijkheid werd overgeheveld van de overheid naar de werkgevers en het ziekteverzuimniveau daalde aanzienlijk. In 2002 is de Wet Verbetering Poortwachter (WVP) van kracht geworden, met ook als doel de instroom van arbeidsongeschikten te verminderen door zieke werknemers te stimuleren te re-integreren.

Doel van het proefschrift

Er bestaan veel verschillen in ziekteverzuim tussen bedrijven en werknemers. Wij onderzoeken daarom verschillende transities of shocks die werknemers kunnen doorstaan. Dit moet meer inzicht geven in de relatie tussen ziekteverzuim en prikkels, selectie en gezondheid. Het doel van het proefschrift is een analyse te geven van ziekteverzuim rondom baantransities en gezondheidsshocks, waarbij we zowel de arbeidsaanbodkant als de –vraagkant opnemen. Methodologisch gezien zijn de analyses in dit proefschrift vergelijkbaar, aangezien deze allemaal een transitie, verandering of shock bevatten waarvoor de we situatie voor, na of beide bestuderen.

Dit proefschrift onderzoekt ten eerste ziekteverzuim in de periode rondom baantransities. We focussen ons op werknemers die een baan-baantransitie maken en werknemers die een werkloosheid-

baantransitie ondergaan. Vervolgens bevat dit proefschrift analyses van gezondheidsshocks die invloed hebben op ziekteverzuim. We focussen ons op zwangerschappen en op breuken aan armen en benen.

Deel I: Ziekteverzuim rondom baantransities

Deel I van het proefschrift richt zich op ziekteverzuim rondom baantransities op de arbeidsmarkt. Hoofdstuk 2 en Hoofdstuk 3 geven een verschillend perspectief op hetzelfde fenomeen. Het thema van deze twee hoofdstukken is de toename in ziekteverzuim rondom transities op de arbeidsmarkt. We vinden een positief effect op ziekteverzuim rondom baan-baanwisselingen (Hoofdstuk 2) en rondom werkloosheid-baanwisselingen (Hoofdstuk 3).

Hoofdstuk 2 onderzoekt ziekteverzuim voor werknemers die een baan-baanwisseling doormaakten. Ziekteverzuim is procyclisch, wat inhoudt dat ziekteverzuim hoger is in een krappe arbeidsmarkt. In de wetenschappelijke literatuur rondom de procycliciteit van verzuim worden hiervoor twee verklaringen gegeven. Aan de ene kant kunnen economische prikkels ervoor zorgen dat ziekteverzuim hoger is in een krappe arbeidsmarkt, aangezien de kosten van verzuim lager zijn voor de werknemer. Aan de andere kant kunnen selectiemechanismen ervoor zorgen dat werknemers met een neiging tot hoog verzuim op de arbeidsmarkt toetreden wanneer de werkloosheidsgraad laag is. Niet alleen ziekteverzuim, maar ook baan-baanwisselingen hebben een procyclisch karakter. In tijden van economische groei is de kans op het vinden van een nieuwe baan groter en zullen werknemers meer baan-baantransities maken. Ziekteverzuim neemt toe in de periode vóór en af in de periode na de baantransitie. De resultaten laten zien

dat de toename vóór de transitie groter is dan de afname erna. De netto toename is gelijk aan 0.62 procentpunt. Hoofdstuk 2 concludeert daarom dat het procyclische karakter van ziekteverzuim versterkt wordt door deze netto toename in ziekteverzuim rondom baanwisselingen.

Hoofdstuk 3 onderzoekt de relatie tussen ziekteverzuim en werkloosheid op microniveau door het effect van individuele werkloosheidsperiodes in het verleden op ziekteverzuim tijdens een nieuwe baan te analyseren. Twee proposities, die voortkomen uit de literatuur omtrent krapte op de arbeidsmarkt, zijn onderzocht. Aan de ene kant kunnen economische prikkels impliceren dat werknemers die lange periodes van werkloosheid hebben doorstaan zich in hun nieuwe baan minder absent zullen melden, wat een negatief verband tussen de individuele werkloosheidsduur en ziekteverzuim zou inhouden. Aan de andere kant kunnen selectiemechanismen impliceren dat werknemers die onderaan de productiviteitsverdeling zitten en na een lange periode van werkloosheid op de arbeidsmarkt toetreden veel zullen verzuimen, wat een positief verband tussen de individuele werkloosheidsduur en ziekteverzuim zou inhouden. Aangezien wij geïnteresseerd zijn in selectie gerelateerd aan werknemers met een neiging tot hoog verzuim in plaats van selectie gerelateerd aan werknemers met een slechte gezondheid, controleren we voor gezondheid door informatie omtrent ziekenhuisopnames tijdens werkloosheid op te nemen. De resultaten suggereren dat het selectiemechanisme domineert. We vinden dat werknemers die meer dan een jaar werkloos zijn geweest voordat ze op de arbeidsmarkt terugtraden een 1.3 procentpunt hoger verzuimpercentage laten zien

dan werknemers die korter dan drie maanden werkloos zijn geweest. Bovendien verzuimen werknemers die meer dan een jaar werkloos zijn geweest nog eens 0.9 procentpunt extra wanneer zij een baan vinden in een bedrijf met een hoog gemiddeld ziekteverzuim. Het blijkt dat de werkloosheidsduur voor werknemers die terugtreden op de arbeidsmarkt nauwelijks als prikkel werkt om ziekteverzuim te verlagen.

Deel II: Ziekteverzuim rondom gezondheidsshocks

Deel II van het proefschrift richt zich op de relatie tussen ziekteverzuim en gezondheid. Twee gezondheidsshocks die sommige werknemers kunnen ondergaan, zwangerschappen en botbreuken, zijn geanalyseerd om te onderzoeken hoe gezondheidsshocks ziekteverzuimgedrag beïnvloeden. In Hoofdstuk 4 stellen we vast dat gezondheid een belangrijke factor is voor ziekteverzuim en dat het opgenomen moet worden in de absentievergelijkingen. Er is niet alleen een direct effect van gezondheid of de intensiteit van de aandoening op ziekteverzuim, maar er blijkt ook een indirect effect te zijn omdat de intensiteit van de aandoening de verklarende variabelen versterkt. In Hoofdstuk 5 passen we een strengere test toe om dit te verifiëren. We richten ons in dat hoofdstuk op een exogene gezondheidsshock, botbreuken, en bepalen of er nog steeds een effect is van lonen of sociale status op ziekteverzuim wanneer wordt geconditioneerd op gezondheid.

Hoofdstuk 4 onderzoekt ziekteverzuim in relatie tot zwanger-schappen. We nemen de intensiteit van de fysieke aandoening van zwangerschappen op als een verklarende variabele en we onderzoeken

de manier waarop absentie zich ontwikkelt wanneer de intensiteit van de fysieke aandoening steeds heviger wordt. Het is interessant om de intensiteit van de medische aandoening te onderzoeken omdat deze veelal niet wordt opgenomen in de absentievergelijking. We richten ons op de ontwikkeling van ziekteverzuim voor een homogene groep van vrouwelijke werknemers gedurende veertig weken zwangerschap. We opperen dat de intensiteit van de fysieke aandoening ofwel onafhankelijk ofwel afhankelijk is van de verklarende variabelen zoals vastgesteld in de literatuur. In geval van afhankelijkheid kan de fysieke aandoening de verklarende variabelen hetzij afzwakken, hetzij versterken. Wij vinden dat de intensiteit van zwangerschappen het effect van de verklarende variabelen versterkt in plaats van afzwakt. Bestaande verschillen tussen werknemers, gerelateerd aan de aanstelling, leeftijd, lonen, gemiddeld ziekteverzuim in het bedrijf, percentage vrouwen werkzaam in het bedrijf en bedrijfsomvang worden versterkt in de loop van de zwangerschap. Dit betekent dat ziekteverzuim méér toeneemt voor vrouwen met een korte aanstelling, een lage leeftijd, een laag loon, werkzaam in bedrijven met een hoog gemiddeld ziekteverzuim, werkzaam in bedrijven met een groot aandeel vrouwen en werkzaam in grote bedrijven. Er zijn verschillende verklaringen die dit verschil kunnen uitleggen, gerelateerd aan zowel arbeidsaanbodfactoren en het carrièrebelang van werknemers, als aan arbeidsvraagaspecten zoals de kosten van monitoren en baankenmerken.

Hoofdstuk 5 onderzoekt of er een sociale gradiënt bestaat in ziekteverzuim wanneer gezondheid wordt uitgesloten. Gezondheid, sociale status en ziekteverzuim zijn drie fenomenen die nauw met

elkaar verbonden zijn. Er is niet alleen een sociale gradiënt in gezondheid, gezondheid beïnvloedt zowel sociale status als ziekteverzuim. Wij analyseren of er een sociale gradiënt in ziekteverzuim bestaat wanneer gezondheid als verstorende variabele wordt uitgesloten. We maken gebruik van een quasi-experimentele opzet en passen een difference-in-difference schatter toe, door op een exogene gezondheidsshock die onafhankelijk is van sociale status te conditioneren: botbreuken. We vinden dat de sociale gradiënt in ziekteverzuim stand houdt wanneer we conditioneren op breuken. De toename in ziekteverzuim direct na de breuk is significant lager voor werknemers met relatief hoge lonen dan voor werknemers met lage lonen, namelijk 66 versus 75.2 procentpunt. Socio-economische verklaringen, zoals opleiding, kunnen niet gebruikt worden om de verschillen direct na de botbreuk te verklaren, aangezien de behandeling direct na de breuk voor iedereen gelijk is. Er zijn andere verklaringen die het patroon dat we vinden kunnen uitleggen. Een arbeidsaanbodverklaring kan zijn dat werknemers met hogere lonen meer betrokken en bewust zijn van hun carrièremogelijkheden, met als resultaat dat zij sneller zullen terugkeren naar hun werk. Daarnaast kan een arbeidsvraagverklaring zijn dat werknemers met relatief hoge lonen complexere banen hebben. In geval van een botbreuk kunnen zij fysieke taken afstoten en analytische taken behouden. Ook kunnen werkgevers hen onder druk zetten snel naar het werk terug te keren.

Hoofdstuk 5 bevestigt de resultaten die we in Hoofdstuk 4 gevonden hebben. In Hoofdstuk 4 wordt gesuggereerd dat ziekteverzuim meer omvat dan alleen de intensiteit van de fysieke aandoening, aangezien de effecten van de verklarende variabelen

versterkt worden wanneer de intensiteit van de aandoening toeneemt. In Hoofdstuk 5 passen we een strengere test toe door ons te focussen op een exogene fysieke aandoening: breuken. De resultaten laten zien dat op het moment dat de intensiteit van de aandoening het hoogste is, direct nadat de breuk heeft plaatsgevonden, er nog steeds een sociale gradiënt bestaat in ziekteverzuim.

Curriculum Vitae

Suzanne Margaretha Maria Heijnen was born in 1985 in Utrecht, the Netherlands. She graduated from high school (gymnasium) at De Breul in 2004. She studied Economics with a minor in Law at Utrecht University School of Economics (USE) from 2004-2007. As an undergraduate, Suzanne visited the University of Florida in Gainesville on an exchange programme for a period of five months. After receiving her Bachelor's degree (cum laude), she enrolled in the Research Master's Program Multidisciplinary Economics at USE in 2007. The title of her Master's thesis was "Health legislation and hospital performance in the Dutch hospital health care market". After she graduated (cum laude) in 2009, she started to work on her PhD thesis at USE, which was financed by NWO. Currently she works as a researcher at the CPB Netherlands Bureau for Economic Policy Analysis.

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