On the Economics of Sickness Absence and Presenteeism

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Chapter 1

Introduction

This thesis deals with economic aspects of employees' sickness. Besides the fact that sickness reduces personal well-being, it also diminishes labour productivity. In consequence, sickness prevents employees from going to work and supplying their contractually agreed working hours, thereby entailing substantial output losses. Accordingly, sickness absence is acknowledged as a highly relevant topic among labor economists and has been intensively researched (for an overview see an early survey by Brown and Sessions, 1996, or Treble and Barmby, 2011). The economic literature particularly stresses the deliberate component of employees' decisions to be absent.[1] But the negative economic effects of sickness are not solely entailed by the employees' decision to be absent. Being sick itself reduces the productivity of an employee independently of the absence decision. Hence, there is, besides the classical case of sickness absence in which an employee is completely unable to work and hence stays at home, the case of sickness presenteeism in which the employee comes to work despite being sick. In contrast to sickness absence, economic research on sickness presenteeism is still scarce.[2]

While the negative economic effects of absence seem straightforward, the economic evaluation of sickness presenteeism is more complex. Particularly, it depends on the specific medical condition of the employee and the type of work (see Schultz and Edington, 2007 for a survey on this issue). In some cases, the mobilizing effect of work facilitates the employee's recovery and rehabilitation (cf. Markussen et al., 2012), while in others the negative economic effects even exceed those of absence (Pauly et al., 2008). The latter is particularly the case under the following circumstances:

[1] See, for example, Cornelissen et al. (2013), Ichino and Maggi (2000), and Ichino and Riphahn (2005).

[2] Notable exceptions that will be discussed throughout this thesis in more detail are Bierla et al. (2013), Brown and Sessions (2004), Chatterji and Tilley (2002), and Pauly et al. (2008).

(i) when working is negative for recuperation with ensuing effects for the employee's health (Bergström et al., 2009) which might even lead to more absence in the future (Hansen and Andersen, 2009), (ii) when the disease is infectious and spreads at the workplace (Barmby and Larguem, 2009) and (iii) when production interdependencies exist, for example through team production (Pauly et al., 2008). In conclusion, it is not clear whether higher social losses are provoked by sickness absence or presenteeism. Hence, we acknowledge sickness presenteeism to be of similar economic interest as absence. For this reason, the thesis at hand covers research on both sickness states, absence and presenteeism, attempting to shed more light on these two related issues.

With a large number of existing studies, the research agenda for sickness absence is already turning to more specialized questions, be it on the effects of specific institutions or for specific groups of employees and additionally opens up towards behavioural approaches. In contrast, the phenomenon of sickness presenteeism is more or less unexplored. Hence, research on presenteeism is still in its infancy and mostly from social medicine. Furthermore, data availability on this issue is scarce and is limited primarily to cross-sections from northern Europe. Accordingly, the questions asked are still more fundamental than in the literature on sickness absence. Despite these differences, this thesis aims to address existing gaps in both strands of the literature and therefore is divided in two main parts. In the first part, we add to the literature on sickness absence by focusing on important labour market institutions. The second part aims at closing the existing gap in the literature on presenteeism by examining determinants of sickness presenteeism and subsequently analyzing interdependencies between both sickness states.

In the first part, we shed light on labour market institutions and sickness absence from two different perspectives. Chapter 2 presents a new explanation for large differences in the generosity of statutory sick pay entitlements between developed countries, which have in turn a strong impact on sickness absence behaviour.[3] The literature has already shown that social norms affect absence behaviour, which itself can affect political choices over sick pay entitlements.[4] In this vein, we present theoretical and empirical evidence that differences in the social norm against benefit fraud, called *benefit morale*, can explain cross country diversity in the generosity of public insur-

[3]Evidence for the impact of sick pay on absence from Germany is presented by Ziebarth and Karlsson (2010) and Puhani and Sonderhof (2010).

[4]For a theoretical approach see Lindbeck and Persson (2010), for an empirical investigation see Ichino and Maggi (2000).

ance programs against the loss of income due to illness.[5]

Chapter 2 is based on Arnold (2013) and describes a political economy model in which a stricter benefit morale in an economy reduces the absence rate with counteracting effects on the politically set sick pay replacement rate. On the one hand, less absence entailed by a stricter norm makes the tax-financed insurance cheaper, leading to the usual demand side effect and hence to more generous sick pay entitlements. On the other hand, being less likely to be absent due to a stricter norm, the voters prefer a smaller fee over more insurance. Numerical simulations show that the positive price effect of a marginal change in benefit morale prevails at low levels of benefit morale, while the negative probability effect dominates at high levels of benefit morale. We document both effects in a sample of 31 developed countries, capturing the years from 1981 to 2010. Hence, we find theoretical and empirical evidence for a hump shaped relationship between a country's level of benefit morale and its sick pay replacement rate. Accordingly, this study is the first to combine a positive theory with real institutional data as dependent variable in the research on benefit morale and welfare state generosity.

While Chapter 2 offers a new explanation for institutional differences which determine absence behaviour, Chapter 3 investigates how a specific labour market institution affects absence behaviour. In Germany, non-union workforce representation by works councils is widespread and has been shown to fundamentally shape labour relations. Among other things, works councils affect wages, productivity, employment and profitability.[6] Accordingly, they have not only a direct impact on the determinants of sickness-related absence but also on the managerial options to control absence behaviour. In their seminal article, Freeman and Lazear (1995) attribute a dual role to works councils: First, they protect employees against employer retaliation. Second, they can help improving working conditions and productivity. The first effect should be associated with higher absence rates; in contrast the second effect should reduce employee absence. In Chapter 3, which is joint work with Tobias Brändle and Laszlo Goerke, we investigate the relationship between the existence of works councils and illness-related absence and its consequences for plants. Using individual data from the German Socio-Economic Panel (SOEP), we find that the existence of a works council is positively correlated with the incidence and the annual duration of absence. Since it is not clear whether higher absence rates in firms with works council are

[5]Social norms are defined as socially shared beliefs about how one ought to behave (Elster, 1989). Here, benefit morale measures whether it is socially accepted to claim government benefits to which one is not entitled to.

[6]Addison (2009) provides an overview of economic research on German co-determination.

compensated for by higher productivity due to co-determination, we want to evaluate in a second step whether high absence rates cause a problem for firms with works councils. Therefore we use linked employer-employee data (LIAB) which suggest that employers are more likely to expect personnel problems due to absence in plants with a works council. All these findings are quite robust in different (sub)samples. We find a stronger relationship between works councils and all three absence indicators in western Germany, which fits to the fact that works councils have been part of the industrial relations system in western Germany for much longer than in the Eastern part, where they were first introduced after 1990. Additionally, this correlation can be interpreted causally in western Germany where we find significant effects in a difference-in-differences approach. All in all, our findings suggest that employees profit from the existence of works councils in the form of more absence days (keeping subjective health constant). This comes at the expense of the employers who complain that this causes problems for their firms.

The second part of this thesis covers two studies on sickness presenteeism. In Chapter 4, we empirically investigate the determinants of the annual duration of sickness presenteeism. Since personnel managers – and, albeit to a lesser degree, policy-makers as well – can shape work-related characteristics (e.g. contract type, workload, autonomy and others), we focus our investigation on work-related characteristics as determinants of sickness presenteeism. Although there is already some evidence on the incidence of sickness presenteeism (Aronsson et al., 2000; Aronsson and Gustafsson, 2005; Böckerman and Laukkanen, 2009, 2010; Leineweber et al., 2011; Preisendörfer, 2010) and its frequency (Johansson and Lundberg, 2004; Hansen and Andersen, 2008), there is a lack of studies on its annual duration. From an economic perspective, the annual duration of sickness presenteeism is more relevant than its incidence or frequency, since the productivity loss due to sickness presenteeism is among others a function of its (annual) duration (cf. Pauly et al., 2008). For our analysis, we use the European Working Conditions Survey (EWCS), the first large-scale dataset outside northern Europe which offers better external validity than previous surveys. Accordingly, our findings are not confined to the institutionally specific cases of north European countries with their generous welfare states, active labour market policies, and bold social norms. We find that presenteeism is a widespread phenomenon with more than 35 percent of European employees going at least once during 12 months to work whilst sick, amounting to an average of 2.4 sickness presenteeism days per year, which is about half the number of absence days (5.3 days per year).

In our cross-sectional analysis, we find work autonomy, workload, tenure and the work

environment to be the quantitatively most relevant work-related determinants of sickness presenteeism days in Europe when controlling for individual health status. Work autonomy, workload and tenure are positively related to the number of sickness presenteeism days, while a good working environment comes along with less presenteeism. We are, to the best of our knowledge, the first to investigate tenure in this regard and our significant and positive results for work autonomy are in contrast to the insignificant findings for presenteeism frequency in Denmark (Hansen and Andersen, 2008). Since the work-related characteristics might be related to the employees' health as well as with ensuing effects on sickness presenteeism, it is also interesting to evaluate the overall correlations between work-related factors and sickness presenteeism days, i.e. the direct and indirect health mediated channels taken together. Hence, besides the full model we additionally present models excluding health controls. The size of all correlations increase in this model, but those of the working environment variables gain the most and their size outranks the others. Accordingly, offering a good working environment might be a particularly good way to reduce sickness presenteeism since a good working environment relates to presenteeism not only directly but also through the employees' health.

Chapter 5 is joint work with Marco de Pinto. Here we analyse the interrelation between sickness absence and presenteeism. Most empirical studies look only at determinants of one of the two sickness states and neglect the possibility that both sickness states could be simultaneously affected by the same determinants. This is, for instance, the case in Chapter 3 where we do not know whether works councils reduce presenteeism which could affect the normative evaluation of this institution. From this normative perspective, it is highly relevant for (personnel) managers as well as policy makers to know the impact of a determinant with regard to both sickness states. Neither the SOEP, nor the LIAB used in Chapter 3 contain information on sickness presenteeism, which is one of the big advantages of the EWCS dataset we use here. The literature on absence behaviour neglects the possible interrelationship between absence and presenteeism altogether. In contrast, some studies on presenteeism implicitly assume a substitutive relationship (Aronsson and Gustafsson, 2005; Bierla et al., 2013; Brown and Sessions, 2004).[7] But this proposition has, as of yet, neither been explicitly theoretically derived nor comprehensively empirically investigated in the literature. Hence, we add to the literature by analyzing sickness absence and presenteeism behaviour with a focus on their interdependence. For the same reasons as in

[7] A substitutive relationship means that a determinant which reduces absence is assumed to increase presenteeism for a given health status (and vice versa).

Chapter 4, we focus our investigation on work-related characteristics as determinants of sickness absence *and* presenteeism.

We particularly ask whether work-related factors lead to a substitutive, a complementary or no relationship between sickness absence and presenteeism. Hence, we want to know whether changes in absence and presenteeism behaviour incurred by work-related characteristics point in opposite directions (substitutive), same directions (complementary) or whether they only affect either one of the two sickness states (no relationship). To answer this question, we, first, build a theoretical model that highlights mechanisms through which both sickness states can be affected at the same time. Second, we use empirical data to simultaneously analyse determinants of sickness absence and presenteeism and hence take explicitly into account their interdependence.

Sickness presenteeism in our theoretical model is more narrowly defined than in Chapter 4. In our model, we define it as a situation in which the negative sickness effects (reduced productivity, spread of illness etc.) are such that it would be profit-maximizing for the firm when the employee stayed at home (compare Chatterji and Tilley, 2002 for a similar definition). The innovation of our theoretical model is that the critical level of sickness that makes the firm indifferent between employee's absence and attendance and hence defines presenteeism is endogenously determined by work-related characteristics. Accordingly, work-related characteristics do not only have an impact on the absence decision but also on whether the presence of the employee is detrimental to the firm. Thus, they affect both sickness states separately. With this model at hand, we can show that the relationship between sickness absence and presenteeism with regard to work-related characteristics is not necessarily of a substitutive nature. Instead, a complementary or no relationship can emerge as well.

Turning to the empirical investigation, we find that only one out of 16 work-related factors, namely the supervisor status, leads to a substitutive relationship between absence and presenteeism. Few of the other determinants are complements, while the large majority is either related to sickness absence *or* presenteeism. Hence, our theoretical model which allows for a non-substitutive relationship between both sickness states is better able to explain our empirical findings than the existing literature which predominantly embraces a substitutive view. In sum, our investigation adds to the literature by explicitly investigating the interrelation between both sickness states not only empirically but also theoretically.

Finally, Chapter 6 summarizes the most important results derived in the previous chapters and provides suggestions for future research.

Part I

SICKNESS ABSENCE AND INSTITUTIONS

Chapter 2

Benefit morale and cross-country diversity in sick pay entitlements

We analyse the impact of a country's level of benefit morale on generosity of sick pay entitlements by means of a political economy model and an empirical investigation. Higher benefit morale reduces the incidence of absence. On the one hand, this makes insurance cheaper with the usual demand side reaction. On the other hand, being absent less often, the voter prefers less insurance. The former effect dominates at lower, the latter at higher levels of benefit morale. We present empirical evidence for both effects in a sample of 31 countries between 1981 and 2010.

This chapter is based on the article "Benefit morale and cross-country diversity in sick pay entitlements" (Arnold, 2013).

2.1 Introduction

There are large differences in the generosity of statutory sick pay benefits across developed countries, ranging from full replacement of the earned wage in some European countries to no benefits at all in the USA. Compared with other welfare programs, sick pay benefits display a particularly vast institutional diversity. This institutional diversity corresponds to considerable variation in average sickness absence days in OECD countries, ranging from four to 29 days per year per employee (Ziebarth and Karlsson, 2010).

We establish that cross-country differences in social norms against benefit fraud can explain cross-country diversity in mandatory sick pay benefits. Social norms are defined as socially shared beliefs about how one ought to behave while compliance is enforced either by informal social sanctions (Fehr and Gächter, 2000) or by internalization (Elster, 1989). This social norm regarding benefit fraud will be subsequently referred to as "benefit morale." In some countries people are more tolerant towards their fellow citizens committing benefit fraud compared to countries where the population exhibits a stronger sense of benefit morale. These differences can be substantial even within Europe. It has been theoretically (Lindbeck and Persson, 2010) and empirically (Ichino and Maggi, 2000) shown that social norms influence absence behavior, which in turn might affect choices over sick pay insurance. Hence, we present a political economy model and an empirical investigation analyzing the impact of benefit morale on the generosity of mandatory sick pay.

Since this chapter is concerned with publicly legislated insurance programs, the generosity of sick pay benefits is politically set in our model. We investigate the impact of exogenous changes in benefit morale on the political equilibrium replacement rate in a median voter model. Voters who are risk averse and aware of their exposure to sickness risk decide ex ante on the scope of the public insurance. Since sick pay insurance is plagued by moral hazard problems and benefit fraud due to asymmetric information about individual health status, benefit morale plays a role in the absence decisions of the insured.[1] Here, benefit morale is modeled as psychological costs incurred by individuals who commit benefit fraud. Therefore, when assuming a gradual health status, an increase in benefit morale reduces at the margin the number of peo-

[1]Even if a checkup with a physician is necessary to obtain sick pay, anecdotal evidence suggests that it is relatively easy to convince a physician to declare one sick without any real symptoms – at least for a short spell. This is supported by empirical studies documenting that the insurance level has a positive impact on the incidence and the duration of absence spells (Johansson and Palme, 2005; Osterkamp and Röhn, 2007; Frick and Malo, 2008; Puhani and Sonderhof, 2010; Ziebarth and Karlsson, 2010).

ple claiming sick pay. This not only reduces the expenses incurred by the insurance program but also increases its revenues due to more people working. In sum the changed working behavior in the whole population reduces, ceteris paribus, the price for insurance leading to a higher demand for insurance. But there is also an effect working in the opposite direction. The smaller the probability of receiving benefits for the voter due to a stricter benefit morale, the less desirable an increased insurance level becomes, compared to a reduced fee. The overall effect depends on the absolute magnitude of these counteracting effects. Numerical simulations indicate that the positive price effect prevails at low levels of benefit morale, while the counteracting probability effect becomes stronger at higher benefit morale levels. In some cases, the negative probability effect overcompensates for the positive price effect at higher levels. The negative relationship between benefit morale and sick pay benefits is a sick pay specific result insofar as benefit morale affects marginally the incidence of sickness absence in a more direct way than the incidence of unemployment.

We test empirically the predictions of our theoretical model in a sample of 31 developed countries over the period 1981-2010. We measure the generosity of the entitlements as the mandatory gross replacement rate in the first week of illness for an individual earning an average production worker's wage. Benefit morale is measured by the World Values Survey and has been widely used in empirical research on welfare state programs (Heinemann, 2008; Halla and Schneider, 2014; Algan and Cahuc, 2009). Using a pooled cross-section design and spline regression functions to capture the non-linear relationship in a flexible way, we find evidence of a significant positive relationship in the lower half of the benefit morale distribution that is followed by a significant negative slope that flattens for very high values. These results are robust to measuring benefit morale and sick pay generosity in different ways. Overall, the data corroborates the numerical predictions of our theoretical model.

In this chapter, we contribute to two strands of the literature. First, we add to the research field concerned with the impact of social norms on the design of public policies by offering evidence for benefit morale as a new explanation for cross-country diversity in sick pay entitlements. The concept underlying this investigation is closely related to that proposed by Algan and Cahuc (2009), who argue that civic mindedness on the part of individuals allows moral hazard problems to be solved in the case of insurance against unemployment risks. We transfer Algan and Cahuc's idea to public welfare entitlement programs that cover the risk of losing one's work income due to illness. Countries that have generous unemployment benefits do not necessarily have generous sick pay entitlements so that a separate investigation of the latter with re-

spect to benefit morale is needed.[2] However, there are two fundamental differences: i) we present a political economy model while Algan and Cahuc (2009) offer a normative analysis; ii) they disregard the probability effect since benefit morale does not directly influence the probability of becoming unemployed in their model. In a recent study, Algan et al. (forthcoming) find with cross-country survey data that individual demand for general income redistribution is negatively influenced by the individual's trustworthiness and positively influenced by the share of trustworthy people in the population. However, our contribution differs again in two ways: i) we investigate a *socially* shared norm that leads to a much more pronounced probability effect and, ii) we use real institutional outcomes instead of survey data on redistributive preferences. There are other socially shared beliefs that have an impact on public policies. Alesina et al. (forthcoming) show, for instance, that more family values lead to more strictly regulated labor markets.

There are several studies that consider the long-run effects of welfare state generosity on work norms (Lindbeck, 1995; Lindbeck et al., 2003; Halla and Schneider, 2014; Heinemann, 2008; Halla et al., 2010); we , however, aim at investigating the opposite effect of social norms on institutions. We argue that welfare state institutions and social norms affect each other and, therefore, are *inter*dependent. However, there are particularly good reasons to investigate the link from social norms to public policy programs in detail. Individuals follow social norms in a rather uncritical way and acquire them involuntarily during their childhood and social norms adapt very slowly to changing conditions (Lindbeck, 1995; Postlewaite, 2011). In contrast, it is easy to adapt public policy programs to changed conditions. For this reason, we deem it particularly worthwhile to investigate the effect of benefit morale on the institutional design of public sick pay programs.

Second, we contribute to the literature on sick pay and welfare state institutions in general. We add benefit morale as a new explanation to the literature on determinants of cross-country diversity in sick pay entitlements and include more countries than in previous studies. There are to date two empirical studies on determinants of cross-country diversity in sick pay generosity. However, neither Korpi (1989) nor Allan and Scruggs (2004) take social norms into account as a possible explanation for cross-country diversity in sick pay insurance generosity. Furthermore, we add to the theoretical understanding of sick pay insurance by endogeneizing the insurance generosity in the sick pay and benefit morale framework used by Lindbeck and Persson

[2]Sick pay and unemployment benefit generosity have a surprisingly small correlation coefficient of 0.27 in our sample.

(2010). Hence, we do not investigate the impact of benefit morale with respect to absence behavior as they do in their contribution but its impact with respect to the politically determined replacement rate for sick pay. We transfer the idea from Wright (1986) that voters' preferences for welfare benefits are driven by their probability of the insurance case. In contrast to our contribution, Wright (1986) offers a political economy model for unemployment benefits and does not take benefit morale into account. Hence, this study is to our knowledge the first investigation that combines positive theory, in the form of a political economy model with real institutional outcomes in the empirical investigation with regard to benefit morale as a determinant for welfare state generosity.

The remainder of this chapter is organized as follows: Section 2.2 introduces our political economy model of sick pay generosity and furnishes numerical simulations for comparative statics. Section 2.3 describes the data and the econometric method used, and presents estimation results as well as some robustness checks. Section 2.4 concludes this study.

2.2 Theoretical model

2.2.1 Description

The model is set up as follows. There are a large number of risk-averse individuals whose number is normalized to unity. As full employment is guaranteed, there are only two labor force states: either present and working or absent. The individuals gain utility from consumption and are hit by a disutility shock of value ϕ while working. This shock can be interpreted as disutility from sickness due to work effort. Following Engström and Holmlund (2007) and Lindbeck and Persson (2010), we model the sickness shock ϕ as a continuous random variable, which leaves scope for benefit morale to play a role in absence decisions at the margin. Individuals are heterogeneous in their exposure to this shock, which is drawn from probability distributions. In line with Lindbeck and Persson (2010),[3] individuals have to bear psychological or stigmatization costs when absent, $b \geq 0$. The level of the costs is associated with the stringency of the prevailing social norm in a society, such that b is constant within one society while varying between societies.

Following Engström and Holmlund (2007), we model a logarithmic consumption

[3]Note that the published version of this paper (Lindbeck and Persson, 2013) does not feature the relationship between social norms and absence behaviour, which is present in the discussion paper version cited here.

utility function. The utility of present and absent workers reads as follows: $u_p = \ln[w(1-t)] - \phi$ and $u_a = \ln[\rho w(1-t)] - b$. Present workers earn an exogenously determined wage w and have to pay taxes t that finance the sick pay benefits.[4] Absent workers are entitled to sick pay benefits with a replacement rate of ρ, $0 < \rho \leq 1$. For simplicity, we assume that benefits are taxed at the same rate as regular wage income. Since the individual health status is private information, individuals self-select into the two labor force states by comparing disutility from work against reduced consumption and psychological costs at home. Accordingly, employees hit by a shock which is higher (lower) than the reservation value, s, stay at home (go to work):

$$s = b - \ln \rho. \tag{2.1}$$

Here, the psychological costs b guarantee that individuals in a context with higher benefit morale are less likely to be absent (Ichino and Maggi, 2000; Lindbeck and Persson, 2010). Each individual is aware of his or her exogenous exposure to the sickness shock, i.e., the probability distribution of ϕ, which is private information. The aggregate shock in the population is a random variable drawn from a publicly known distribution $F(\gamma)$ with support $\left[\underline{\gamma}, \overline{\gamma}\right]$ and density $f(\gamma)$. As the size of the population equals unity, we can interpret $F(s)$ as the share of the population that works, while $[1 - F(s)]$ of the population stays at home. With this information and assuming that we exclude cross financing of other programs, we can write the budget equation as:

$$t = \frac{[1 - F(s)]\,\rho}{F(s) + \rho\,[1 - F(s)]}. \tag{2.2}$$

2.2.2 Political economy model

The population decides on the generosity of the sick pay insurance, ρ, in an election with a simple majority vote before the realization of the sickness shock. Due to a binding budget constraint, replacement rates and tax rates are chosen simultaneously. Thus, the vote simplifies to a single-issue ballot on the replacement rate. The concavity of the utility function guarantees single peaked preferences, which allows the median voter theorem to be applied. As the individuals are heterogeneous with

[4] The economic mechanism at stake here is not dependent on the assumption that sick pay is financed by a tax. A similar effect can be obtained when sick pay is directly financed by the employer, which is common in several countries. In this case, higher absence rates lead to lower equilibrium wages via reduced output. Hence, we have an effect similar to the price effect in the tax-financed model. As we take only budgetary costs into account in our model and disregard the output effect, we are at the lower level of effects brought about by norm-guided absence behavior.

regard to sickness risk, the individual with the median exposure to illness has the decisive vote. In order to allow the median's shock to differ from the shock in the overall population, we let $G(\phi)$ represent the cumulated distribution of the utility shock ϕ for the pivotal voter with density $g(\phi)$.[5] Substituting the tax rate t as in 2.2, expected utility of the median voter reads as follows:

$$\begin{aligned} EU_{median} = &\int_{\underline{\phi}}^{s} (\ln \left[\frac{F(s)w}{F(s) + \rho \left[1 - F(s)\right]} \right] - \phi) \, dG(\phi) \\ &+ \int_{s}^{\bar{\phi}} (\ln \left[\frac{\rho F(s)w}{F(s) + \rho \left[1 - F(s)\right]} \right] - b) \, dG(\phi). \end{aligned} \tag{2.3}$$

Due to the self-selection mechanism in equation (2.1), a higher replacement rate encourages more people to stay at home as the reservation value s decreases. The share of absent workers has, in turn, repercussions for the insurance terms, as it influences the benefits-to-tax ratio via the budget constraint, i.e., the "price" for any given level of ρ increases. This moral hazard effect caused by the insurance has to be taken into account by the pivotal voter when choosing the optimal replacement rate. Thus, the voter chooses ρ to maximize his or her expected utility subject to the incentive compatibility constraint (2.1) that takes the moral hazard effect into account. Assuming there is a maximum, it can be characterized by two optimality conditions[6]:

$$h(s, \rho) = \left[1 - G(s)\right] F(s) - G(s) \left[1 - F(s)\right] \rho - \frac{\rho f(s)}{F(s)} \equiv 0 \tag{2.4}$$

$$s(\rho, b) = b - ln(\rho). \tag{2.5}$$

The first optimality condition (2.4) takes direct and indirect effects of a changed replacement rate on the expected utility of the pivotal voter into account. The first two terms of $h(s, \rho)$ represent the standard insurance trade-off between more consumption when absent at probability $[1 - G(s)]$ and less consumption when present at probability $G(s)$. An increase in ρ has further (indirect) repercussions, as it in-

[5] If the pivotal voter has the same exposure to the risk as the whole population, the political economy solution is maximizing a utilitarian welfare function.

[6] The sign of the bordered Hesse Matrix, $\left|\bar{H}_2\right|$, is analytically indeterminate without further assumptions regarding $F(\phi)$ and $G(\phi)$. Simulations with different types of distributions for F and G (log-normal, normal, Weibull and Student-t distributions) suggest that $\left|\bar{H}_2\right| > 0$ holds for relevant parameter constellations. We thus assume the second-order condition to be fulfilled.

creases the absence rate in the population and thus individual costs for one unit of insurance, which is represented by the last term. The second condition (2.5) represents the incentive compatibility condition.

2.2.3 Comparative statics

We will now analyse the impact of changes in the value of the psychological costs b that reflect the level of benefit morale in a society on the equilibrium value of ρ^*, i.e., the generosity of the sick pay entitlements. According to the implicit function theorem, changes in ρ induced by exogenous changes in b can be written as:

$$\frac{\partial \rho^*}{\partial b} = -\frac{\frac{\partial h}{\partial b} + \frac{\partial h}{\partial s^*}\frac{\partial s^*}{\partial b}}{\frac{\partial h}{\partial \rho} + \frac{\partial h}{\partial s^*}\frac{\partial s^*}{\partial \rho}}. \tag{2.6}$$

From the second-order condition we can deduce a negative denominator. Since $\frac{\partial h}{\partial b} = 0$ and $\frac{\partial s^*}{\partial b} = 1$, the direction of the total effect hinges on the partial derivative $\frac{\partial h}{\partial s^*}$:

$$\begin{aligned}\frac{\partial h}{\partial s^*} =& -g(s^*)\{F(s^*) + [1 - F(s^*)]\,\rho\} + f(s^*)\{[1 - G(s^*)] + G(s^*)\rho\} \\ & - \frac{\rho f'(s^*)}{F(s^*)} + \frac{\rho\,[f(s^*)]^2}{[F(s^*)]^2} \gtrless 0.\end{aligned} \tag{2.7}$$

Analytically, it is not clear which of the counteracting effects in $\frac{\partial h}{\partial s^*}$ prevails. The first term in (2.7) represents the effects of an increase in the probability of the pivotal voter being present and working due to a marginal increase in s^* (probability effect). This effect reduces the utility gains from increased insurance, since this effect makes the voter more likely to be a net contributor to the insurance. The second term takes changes in the working behavior of the whole population into account. Since more people go to work instead of staying at home, each unit of insurance is less costly to the voter (price effect) which favors more insurance. Assuming $f'(s^*) \leq 0$ in the relevant range for s,[7] the third term represents the reduction of the negative moral hazard effect in the optimality condition $h(s, \rho)$, as weakly fewer people are marginally affected by increases in ρ when moving to higher values of s. Finally, the last term shows, that if more people go to work, the moral hazard costs of an increase in generosity are shared among more people working, which makes this increase in generosity cheaper for the median voter. Hence, the direction of the overall effect of a change in benefit morale on sick pay generosity depends on whether the negative probability effect is

[7]This assumption implies that the probability of a stronger shock occurring is not higher than the probability of a smaller shock or that more severe diseases are less prevalent, which seems plausible.

stronger in size than the combined positive effects that are brought about as more people work and the moral hazard effect is marginally reduced.

In the case of a positive partial derivative $\frac{\partial h}{\partial s^*}$ equation 2.6 establishes a positive connection between benefit morale and the equilibrium replacement rate. Here, the price sinks sufficiently due to stricter benefit morale that more insurance increases the median's utility albeit his or her reduced absence probability. In the other case, i.e., $\frac{\partial h}{\partial s^*} < 0$, the overall effect is negative. Here, the median's incidence of sickness absence is reduced by stricter benefit morale to the point that – even though the price is reduced – less generous insurance leads to utility gains for the median voter.

If the median has the same shock pattern as the whole population (welfare maximization), the overall effect is ambiguous except for the unplausible case that $F(s^*) < 1/2$.[8] To shed light on this analytically indeterminate problem, we run numerical simulations.

Using numerical simulations, we analyse several parameter constellations, vary the expected scope and the spread of the shock's distribution and assume different types of distribution for the sickness shock (the results are available upon request). The relationship between benefit morale level and replacement rate is concave in all these models. While the positive price effect prevails at low levels of benefit morale, the counteracting probability effect becomes stronger at higher benefit morale levels. In some cases, the negative probability effect overcompensates for the positive price effect at higher levels, which leads to a hump shaped pattern. With regard to the resulting absence rate, we replicate the negative impact of benefit morale presented in Lindbeck and Persson (2010) for all parameter constellations. This direct impact of benefit morale on the incidence of the insurance case distinguishes our model from the model in Algan and Cahuc (2009) covering unemployment benefits. We conclude from the simulation that the pattern between benefit morale and the replacement rate is characterized by a positive relationship at low levels that might turn negative for higher levels of benefit morale. In the following section, we empirically analyse the determinants of sick pay entitlements, with benefit morale as an additional explanation not present in the previous literature.

[8] In this case equation 2.7 simplifies to $\frac{\partial h}{\partial s^*} = f(s^*)\left[1-\rho\right]\left[1-2F(s^*)\right] - \frac{\rho f'(s^*)}{F(s^*)} + \frac{\rho[f(s^*)]^2}{[F(s^*)]^2}$. $F(s^*) < 1/2$ and $f'(s^*) \leq 0$, guarantee that equation 2.7 is positive, which produces an overall positive effect. However, under the more plausible assumption $F(s^*) > 1/2$, which implies that more than half of the population is present and working, the overall effect is again ambiguous.

2.3 Empirical evidence

2.3.1 Data

Our data set covers 31 developed countries between 1981 and 2010.[9] Our dependent variable is the statutory gross replacement rate in the first week of illness for a single household earning an average production worker's wage. We disregard privately concluded sick pay benefits as part of work contracts or collective bargaining agreements due to a lack of data. In addition, we do not discern whether the sick pay is financed by social contributions, general tax revenue or the employer, as the effects outlined in the theoretical model are qualitatively the same (see footnote 4). The gross replacement rate has a major advantage over the net replacement rate: namely, that it is independent of tax policy reforms. Since we assume that benefit fraud takes place in short spells of absence, we measure the generosity of sick pay during the first week of illness, and we take waiting days into account. As a robustness check, we present results with sick pay measured as a replacement rate that does not take waiting days into account.

The data on sick pay entitlements is taken from three different sources in order to obtain a number of observations as large as possible. For the 1980s and 1990s, we use the Social Citizenship Indicator Program data set (SCIP) provided by the Swedish Institute for Social Research (SOFI), which covers 18 major developed countries from 1930 to 1995 (Korpi and Palme, 2007). For the years after 2000, we expand our sample to the major EU-27 countries by using the EU's Mutual Information System on Social Protection (European Union, 2012), and for countries that are not members of the European Union, we use the Social Security Programs Throughout the World Series (US Social Security Administration and International Social Security Association, 2010).[10] Generally, there is much more variation between countries than there is variation over time. The replacement rates range from zero in the first week in some anglophone countries to 100% of the wage in some Central and North European countries. The bulk of the countries however, guarantee a gross replacement rate in the first week strictly between zero and one. Country averages of the sick pay data

[9] These countries are: Australia, Austria, Belgium, Bulgaria, Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Latvia, Lithuania, the Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

[10] To guarantee the most accurate and consistent data possible, we cross-checked the values between the different sources, where feasible, and reviewed the literature on sick pay institutions (Seffen, 1980; Salowsky and Seffen, 1993). Countries covered over the whole period and hence collected from different sources show a very consistent pattern over time in our data.

are in Table 2.2 in the appendix.

The variable of interest, benefit morale, is taken from the European and World Values Survey (European Values Study and World Value Survey Association, 2009) waves one to five, which has been widely used in empirical research on social norms and the welfare state (Algan and Cahuc, 2009; Halla and Schneider, 2014; Heinemann, 2008). The World Values Survey (WVS) is a survey of attitudes on a worldwide base, which provides over 500 representative observations per country for our sample. The question for benefit morale reads: "Do you think it can always be justified, never been justified or something in between to claim government/state benefits to which you have no rights?"[11] The scale ranges from one for "Never justifiable" to 10 for "Always justifiable". We disregard wave three due to a lack of sick pay data and, hence, consider four of the first five waves of the WVS: 1981-1982 (first wave), 1989-1990 (second wave), 1999-2001 (fourth wave), and 2004-2008 (fifth wave).[12] We work with waves as time units and take country averages over the duration of each wave for the annually measured controls. Since the institutional data from the last century is only available in five-year periods and the WVS is polled aperiodically, we associate the last year of a WVS wave with the next available generosity data point measured after a lag of at least one year.[13] As the World Values Survey does not cover the benefit morale item in all countries in each wave, we have an unbalanced panel covering 31 countries in four waves over the period 1981-2010.

We follow Algan and Cahuc (2009) in taking shares of individuals who have answered "Never justifiable" within each country as a measure of a country's benefit morale. The country average ranges from less then a quarter in Greece to around 90 percent in Denmark. With a gradual decline of about nine percent over the past 30 years, benefit morale can still be described as relatively stable over time. This fits our contention that benefit morale is a social norm, which is to a great extent internalized and transmitted from one generation to the next. Only in Finland do we observe one discordant value: the share of participants answering "Never justifiable" dropped in Finland from almost two thirds in the first wave to a mere twelve percent in 1990, which is the lowest value in our sample. In the mid-1990s this value again stabilized

[11] The item does not ask for the socially shared but the individual norm. Hence, it can be rather interpreted as the internalized part of the social norm. However, the aggregate country measures give a good idea of how much benefit morale is shared among the population.

[12] The sick pay data from SCIP ends in 1995 and MISSOC starts in 2004.

[13] Accordingly, benefit morale and lagged controls from 1981-82 are associated with the replacement rate in 1985, 1989-90 norms with institutions in 1995, 1999-2000 with 2004 and finally 2004-08, with entitlements in 2010.

at over 60 percent.[14] Thus, this observation is an outlier, in the strict sense of the term, and we disregard it in our subsequent investigation.[15]

We will now turn to the control variables. First, there are political factors drawn from the literature on comparative welfare state institutions that are deemed to affect public sick pay programs (Korpi, 1989; Allan and Scruggs, 2004). The political orientation of the government is measured by the government partisanship index, taken from the Comparative Political Data Sets I (Armingeon et al., 2009) and III (Armingeon et al., 2010), in which higher values are associated with more left-wing politicians in the cabinet. Furthermore, we take a communist past of a country into account. In addition to the political dimension, economic factors shape institutional choice. Economic problems might force governments to reform welfare programs, and for that reason, our model contains real GDP growth as a proxy for economic shocks. Moreover, in order to account for the absolute level of wealth in a country, we include GDP per capita measured in 2005 US dollars. In addition, welfare program generosity has been linked to economic openness which is measured as the ratio between the sum of imports and exports and a country's GDP, since these programs are seen as a means to reduce external risk from exposure to the world market (Rodrik, 1998). The economic controls are taken from IMF sources and the Penn World Tables. Finally, since Ichino and Riphahn (2005) have shown that employment protection reduces the incidence and the duration of sick spells, we include the Employment Protection Legislation Indicator (EPL) from the OECD (Version 1) that is supplemented with data for middle and eastern European countries from the literature.[16] Summary statistics are in Table 2.1 in the appendix.

2.3.2 Econometric method and results

In order to keep as many observations as possible in our analysis, we apply a pooled cross-section design. Despite the limited range of the dependent variable, an OLS model is selected over a tobit model, in order to avoid the stricter distributional as-

[14] Finland's situation in 1990 was characterized by a huge economic downturn accompanied by the disintegration of the Soviet Union, Finland's neighbor and biggest trading partner.

[15] Our results are sensitive to the inclusion of this outlier observation, but since we consider the exclusion of this peculiar observation reasonable, we present the results obtained without this outlier.

[16] Detailed information about the concept and measurement of the EPL indicator can be found in OECD (n.d.a). We choose the OECD Version 1 indicator since this measure is available for the longest time span, i.e., since 1985. For that reason, EPL is measured in the first wave in 1985 only. For supplementary data, we consult primary sources that apply the OECD methodology, i.e. Muravyev (2010) for the Baltic countries and Tonin (2009) for Bulgaria, and Romania. The results are not sensible to the inclusion of these additional data (regression results are available upon request).

sumptions inherent in the latter, which is presented in the next section as a robustness check. We abstain for two reasons from the inclusion of country dummies. First, this allows us to retain the dominant cross-country variation of sick pay in the model. Second, by doing so we can keep twelve countries in our analysis for which data is available only in the cross-sectional dimension.

Since the literature postulates a negative long-term impact of welfare state benefits on work norms, i.e., in the inverse direction, there is quite likely a reversed causality problem leading to a simultaneity bias (Lindbeck, 1995; Lindbeck et al., 2003; Halla and Schneider, 2014; Heinemann, 2008). However, due to the very temporary character and rather small amount paid by sick pay programs compared to other welfare programs, we seriously doubt that sick pay generosity has a strong and persistent bearing on the benefit morale level prevalent in a country. Unemployment benefits seem to be much better suited to have an impact on work norms due to higher amounts spent and longer duration of payments. The idea that the generosity of sick pay reflects the generosity of unemployment benefits finds little support in our data, which calculated a correlation coefficient of 0.27 between the replacement rate for unemployment and sickness.[17] Hence, countries with generous sick pay entitlements do not necessarily have generous unemployment benefits, which in turn are expected to affect the benefit morale level in the long run. Also problematic is the fact that our data covers almost 30 years, which increases the likelihood that social norms adapt to institutions. The gradual decline of benefit morale observed in our data of about six percentage points or nine percent could lead – if caused by generous sick pay entitlements – to a simultaneity bias. We can calculate the direction of this simultaneity bias, i.e. the asymptotic covariance between benefit morale and the error term, under some assumptions only.[18] With a claimed negative impact from generosity on benefit morale, according to the literature, benefit morale should under these assumptions be negatively correlated with the error term in our model and lead to a downward bias of the coefficient of interest. However, these considerations should be taken with some caution due to the restrictive underlying assumptions. Additionally, as political processes work slowly, independent variables are generally lagged, which also helps to mitigate the reversed causality problem.

To capture the predicted concave pattern that might decrease at higher levels in a

[17] The gross unemployment benefit rate for an average production worker is taken from van Vliet and Caminada (2012).

[18] The sign of the bias can only be calculated when we (i) disregard covariates in the two structural equations (benefit morale on welfare benefits and welfare benefits on benefit morale), (ii) assume that the error terms of the two structural equations are uncorrelated, and (iii) the product of the two structural coefficients is less than one, c.f. Wooldridge (2006, pp. 550-551).

flexible way, we use so called spline regressions (Greene, 2003, pp. 121-122). Spline regressions or piecewise linear regressions allow for different linear slopes in sections of the benefit morale range. We prefer spline regression models to quadratic regression models for their flexibility, but we will present the latter as a robustness test in the following section. We decide whether and where to put the knots of the spline regression, i.e., the kink points, by means of Wald tests of nested models. Hence, we test in which benefit morale range a different slope would add most to the fit of the model. The first knot is best at a benefit morale level of 0.56 with a p-value of 0.01 in the Wald test of nested models. Given this, the second knot is best at 0.72 with a p-value of 0.05. Hence we estimate different linear effects in these three value ranges.[19] Taken together, we analyse the correlation between benefit morale and sick pay insititutions by estimating the following model:

$$RR_{c,t} = \gamma_1 + \beta_1 BM_{c,t-1} + \beta_2 BM2_{c,t-1} + \beta_3 BM3_{c,t-1} + \boldsymbol{X_{c,t-1}}'\boldsymbol{\gamma_2} + \gamma_3 wave_t + \epsilon_{c,t}. \quad (2.8)$$

In this equation, $RR_{c,t}$ represents the gross effective replacement rate in country c, at date t; $BM_{c,t-1}$ denotes the benefit morale in country c, at date $t-1$; $BM2_{c,t-1}$ represents the second linear effect starting at a benefit morale level of 0.56; $BM3_{c,t-1}$ represents the third linear effect starting at 0.72 of benefit morale. Finally, the vector $\boldsymbol{X_{c,t-1}}$ includes lagged control variables; $wave_t$ represents time fixed effects; and $\epsilon_{c,t}$ is an error term. In order to guarantee consistent standard error estimates, we use heteroskedasticity-robust standard errors that take clustering by country into account.[20] The regression results are in Table 2.3.

[Insert Table 2.3 about here]

Looking at the baseline specification (1) in Table 2.3, we find a positive and highly significant coefficient for the general benefit morale variable (β_1), a negative and significant coefficient for the second linear effect starting at 0.56 (β_2) and finally a positive but less significant coefficient for the third linear effect starting at 0.72 (β_3). In the lower section, we obtain a highly significant positive relationship. Combining

[19] These data generated ranges happen to cut the relevant value range, 0.24-0.90, into the lower half and split the remaining upper half into two almost equally sized sections. Hence we have (i) a first range with observations between benefit morale levels of 0.24 and 0.56; (ii) a smaller middle range between 0.56 and 0.72 and finally (iii) the upper range with observations between 0.72 and 0.90. The lower part contains one quarter of the observations, the middle range 45% and the upper range 30 %.

[20] Since it could be argued that the cluster adjustment with only 31 countries is biased, we also estimate Huber-White standard errors which does not change the significance of the results (results are available upon request).

β_1 and β_2 in the middle section we find a significant negative slope while the combined effect in the third section is positive but insignificant. This fits with the results of our theoretical model and its numerical simulations that point to a hump shaped pattern indicating a dominant price effect at lower levels of benefit morale, while at higher levels, this positive effect is outweight by the negative probability effect. Hence, higher levels of benefit morale are associated with an increase in generosity in the lower half of benefit morale, a decrease in the middle, and no effect in the upper range. The effects are economically sizable. Hence, in the lower half of benefit morale an increase of one standard deviation of benefit morale in this subsection (0.09) is associated with an increase of about 19 percentage points in sick pay generosity. Due to the negative simultaneity bias, we should consider the negative slope more cautiously, but taken at face value a change in benefit morale of one standard deviation in the middle range (0.04) comes with a reduction of six percentage points of generosity.
Concerning the controls, we find that openness, higher GDP per capita, stricter EPL and a communist past are significantly positively associated with generous sick pay entitlements. In contrast with the literature, we do not find any effect of the cabinet composition, which might be due to the weakened polarization between left and right in many countries.

2.3.3 Robustness checks

As a robustness check, we use differently measured variables for sick pay generosity and benefit morale in models (2) and (3), respectively. Specifically, we calculate the replacement rate by using the benefits paid after waiting days have elapsed, which does not fundamentally change our results (model 2). By constructing a broader defined benefit morale measure, we try to address the potential of an extreme response bias in the WVS which leaves our results basically unaffected (model 3).[21] Given the structure of our data with the limited range of the dependent variable between zero and one, a tobit model can be considered, but this does not fundamentally change our results (model 4). Finally we present a quadratic regression model to make sure that the results are not only driven by the chosen spline regression models. Again, the Wald test of nested models calls for the inclusion of the quadratic term (p-value of 0.05) leading to a hump shaped pattern with a turning point at a benefit morale

[21] In some cultures, people are reluctant to choose extreme values in surveys (Johnson et al., 2005). For that reason, we take the country share of individuals choosing the two most negative options of the benefit morale item and apply the spline model with the knots guaranteeing the best fit, here, at 0.74 and 0.82.

level of 0.63. Hence this model approves that the positive price effect prevails at lower levels and is compensated for by the negative probability effect at higher levels of benefit morale. Note that a quadratic model can either be U-shaped or hump-shaped, which means that the slope is large in size and, hence, is significant only at high and low levels. In contrast, the spline model is more flexible with regard to the direction of the slope. For this reason we prefer the spline model to the quadratic model despite its limitation to constant slopes inside each benefit morale range.

In order to see whether the results are driven by single countries, we rerun the baseline model excluding one country at a time, which does not alter our results fundamentally (not shown). The results are generally robust to the exclusion of single waves with two exceptions: When dropping wave 1, the positive combined effect in the highest range becomes significant, whereas without wave 4 the negative middle range becomes insignificant. Unchanged point estimates with increased standard errors suggest that this result is caused by the reduced number of observations.

2.4 Conclusion

In this chapter, we propose benefit morale as an additional explanation for cross-country diversity in public sick pay generosity. In particular, we analyse the impact of benefit morale on sick pay generosity in a political economy model and present empirical evidence for 31 countries between 1981 and 2010. Since benefit morale is predicted to reduce absence behaviour, it affects the sick pay replacement rate in two ways. On the one hand, less absence reduces insurance costs as fewer people claim benefits which favors, ceteris paribus, increased generosity due to lower prices (price effect). On the other hand, being less frequently absent makes a generous insurance less desirable for voters (probability effect). Numerical simulations suggest that the positive price effect prevails at low levels of benefit morale, while the counteracting probability effect becomes stronger at higher benefit morale levels. In some cases, the negative probability effect overcompensates for the positive price effect. We find empirical evidence for the positive price effect in the lower benefit morale range, for the negative probability effect in the medium range flattening for high values. Due to a potential negative simultaneity bias, the negative effect should be considered cautiously.

The existence of the positive effect is already covered in the literature for other welfare state dimensions, while the negative probability effect in this dimension is a new finding. The negative relation is mostly due to the fact that higher benefit morale re-

duces the incidence of the insurance case by making absence rather unattractive for the employed individuals through additional psychological costs. In extremum, reduced absence behaviour leads to presenteeism meaning that people go to work sick, which negatively affects overall productivity. In this sense, generous entitlements could be a means to counterbalance too strict benefit morale standards in some countries in order to prevent presenteeism. The combination of benefit morale and presenteeism could be an interesting subject for further research. Furthermore, the negative effect could be taken as argument to see benefit morale not only as a social precondition for sick pay entitlements but also as its substitute. The same argument could also apply – to a lesser degree – to other welfare programs, for instance, to disability insurance.

2.5 Appendix

Table 2.1: Summary statistics

Variables	Mean	Standard deviation (overall)	(between)	(within)	Min.	Max.
Sick pay generosity (gross replacement rate)	.51	.36	.35	.03	0	1
Sick pay generosity (after waiting days)	.63	.29	.28	.03	0	1
Benefit morale (population share)	.64	.13	.14	.05	.24	.90
Benefit morale (broader definition)	.75	.12	.13	.03	.38	.92
Govern. partisanship (Schmidt Indicator)	2.49	1.36	1.06	.93	1	5
Empl. Prot. Legisl. (OECD Version 1)	1.96	.95	.84	.3	0.21	3.67
GDP per capita (th 2005 US $)	25.866	8.515	8.685	4.787	7.995	49.236
Real GDP growth (percentage change)	3.13	1.93	1.70	1.33	-1.13	9.85
Trade openness (share of GDP)	.75	.36	.36	.09	.19	1.74
Communist past	.15	.36	.48	0	0	1

Each variable has 72 observations from 31 countries.

Table 2.2: Great averages of sickpay generosity (with and after waiting days)

US	0; 0	AUS	0; 0.28	CAN	0; 0.55	NZ	0; 0.21	UK	0.13; 0.23
IRL	0.14; 0.25	GRE	0.22; 0.39	IT	0.29; 0.5	FR	0.29; 0.5	POR	0.31; 0.55
ESP	0.34; 0.6	JPN	0.37; 0.62	SVK	0.42; 0.42	CZ	0.43; 0.43	DK	0.56; 0.59
NL	0.61; 0.71	LTV	0.67; 0.91	EST	0.69; 0.8	SWE	0.69; 0.81	ROM	0.75; 0.75
BUL	0.76; 0.76	HUN	0.8; 0.8	POL	0.8; 0.8	LIT	0.84; 0.84	SVN	0.9; 0.9
BEL	0.95; 1	AUT	1; 1	FIN	1; 1	GER	1; 1	NOR	1; 1
CH	1; 1								

Table 2.3: Sick pay generosity regression results

	(1) (OLS)	(2) (OLS)	(3)[1] (OLS)	(4) (tobit)	(5) (OLS)
Benefit morale β_1	2.14***	1.77***	1.77***	2.87***	4.56**
	(0.67)	(0.50)	(0.50)	(0.95)	(2.07)
Second range (0.56-1) β_2	-3.95***	-3.22***	-5.27***	-5.5***	
	(1.29)	(0.92)	(1.50)	(1.87)	
Third range (0.72-1) β_3	2.84*	1.62	5.15**	3.43*	
	(1.44)	(1.11)	(2.22)	(1.93)	
Cabinet composition	0.01	-0.01	0.02	0.02	0.01
	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Trade openness	0.31***	0.25**	0.31***	0.48***	0.31**
	(0.10)	(0.12)	(0.11)	(0.17)	(0.12)
GDP per capita	0.02***	0.02*	0.02***	0.03*	0.02***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)
Real GDP growth	0.00	-0.00	0.01	-0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)
Communist past	0.59***	0.35*	0.64***	0.62**	0.63***
	(0.19)	(0.19)	(0.18)	(0.29)	(0.19)
EPL (Version 1)	0.18***	0.18***	0.20***	0.25***	0.22***
	(0.05)	(0.05)	(0.05)	(0.08)	(0.05)
Benefit morale squared					-3.6**
					(1.7)
Wave dummies	Yes	Yes	Yes	Yes	Yes
Combined linear effects					
First range	2.14***	1.77***	1.77***		
Second range	-1.81**	-1.45***	-3.50***		
Third range	1.03	0.18	1.65		
Joint sign. of benefit morale	0.01	0.01	0.01	0.01	0.08
N	72	72	72	72	72
n	31	31	31	31	31
R^2 / Pseudo-R^2	0.56	0.56	0.57	0.40	0.52

Heteroskedasticity-robust standard errors, clustered by country, in parentheses.
Constant not shown. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

[1] In column (3) the benefit morale variables are measured in the broader definition and with accordingly changed ranges. Second range: 0.74-1; Third range: 0.82-1.

Chapter 3

Sickness absence and works councils

Using both household and linked employer-employee data for Germany, we assess the effects of non-union representation in the form of works councils on (1) individual sickness absence rates and (2) a subjective measure of personnel problems due to sickness absence as perceived by a firm's management. We find that the existence of a works council is positively correlated with the incidence and the annual duration of absence. We observe a more pronounced correlation in western Germany which can also be interpreted causally. Further, personnel problems due to absence are more likely to occur in plants with a works council.

This chapter is joint work with Tobias Brändle and Laszlo Goerke.

3.1 Introduction

In Germany, non-union workforce representation by works councils is widespread. Works councils have wide-ranging information, consultation and codetermination rights and their effects on wages, productivity, employment and profitability have been studied intensively. In contrast, the relationship between works councils and sickness-related absence has not been thoroughly considered. This is surprising because absence in Germany is relatively high in international comparison (OECD, n.d.b, p. 95) and causes substantial output losses. Furthermore, works councils have considerable impact on the determinants of sickness-related absence and on the means available to firms to respond to such employee behaviour. The direction of the impact is, however, ambiguous. On the one hand, works councils may prevent firms from monitoring absence behaviour and from imposing sanctions for illness-related absence. In this case, they are likely to increase absence. On the other hand, works councils can act as the employees' voice and help to improve working conditions and productivity. In this latter case, they presumably reduce absence.

Besides a study considering the specific case of apprentices, there is – to the best of our knowledge – no general investigation of the relationship between works councils and absence for Germany. More specifically, Pfeifer (2014b) combines firm data for 2007 from the Federal Institute for Vocational Education and Training with administrative employee data. He finds absence rates to be lower in the presence of a works council for apprentices, i.e. a subgroup of mostly very young employees who have fixed-term contracts. Moreover, they are subject to different legal regulations than regular employees. Therefore, and because of the specific role works councils play in the German apprenticeship system, Pfeifer's findings cannot easily be generalised. Furthermore, some analyses focussing on related issues suggest a positive relationship between works councils and absence of employees. Ziebarth and Karlsson (2014) use data from the German Socio-Economic Panel to investigate the effects of an increase in statutory sick pay in 1999. They show in one robustness check that employees working in firms without a works council in 2001 were absent for fewer days between 1997 and 2000. Pfeifer (2014a) focusses on various aspects of human resource management using data from the Institute for Employment Research Establishment Panel for the year 2006. One of the relevant questions relates to work absence. He finds the existence of a works council to be positively correlated with expected absence problems. Moreover, Heywood and Jirjahn (2004) use firm-level data from the 1996 wave of the Hannover Firm Panel to investigate the relationship between teamwork and absence. They show that the existence of a works council is positively associated

with a firm's absence rate. Finally, Berger et al. (2011) employ a dataset of 305 firms from 2006 to analyse the impact of incentive schemes on cooperation among employees. They show that the average number of missed work days is higher in firms with a works council.

In Germany, collective bargaining mainly takes place at the industry level. Therefore, the plant-level representation of employees heavily rests on the shoulders of works councils. Our analysis is, hence, also related to contributions which indicate a positive relationship between firm-level collective bargaining and absence for Spain (García-Serrano and Malo, 2009), Canada (Dionne and Dostie, 2007), and the United States (Allen, 1981, 1984; Leigh, 1981, 1985). In partial contrast, centralised collective bargaining seems to have no impact on sickness absence in Britain (Heywood et al., 2008) and Germany (Heywood and Jirjahn, 2004), and union density does not appear to affect absence rates in Norway (Mastekaasa, 2013).

In sum, the literature suggests a positive impact of employee representation at the plant level on absence. However, a systematic investigation of works councils and absence behaviour and of its consequences for firms is not available. Hence, in this chapter we, first of all, use the German Socio-Economic Panel (SOEP) to investigate the effects of the presence of a works council on individual absence behaviour. The SOEP contains information on the incidence and the duration of sickness absence on an annual basis, as well as, for some years, on the existence of a works council. The estimates from pooled cross-sectional models suggest that an employee working in a plant with a works council is about three and a half percentage points more likely to be absent at least one day in a given calendar year than an otherwise similar employee who is not represented by a council. The corresponding difference in the annual duration of absence amounts to more than one day. These effects are quantitatively sizeable, given an average incidence (duration) of about 58% (9 days). Using a difference-in-differences approach, we obtain evidence which is compatible with a causal interpretation of the positive correlation for western Germany. Second, we use linked employer-employee data (LIAB). We exploit a unique variable which is derived from questions directed at plant managers or high-ranking personnel staff, inquiring whether they expect personnel problems due to high absence rates. We show that the existence of a works council is associated with an increase in the likelihood of such problems by about three percentage points. This is also an economically sizeable impact, given an average probability of 12%.

The remainder of this chapter develops as follows. Section 3.2 outlines the institutional set-up and its consequences for absence behaviour, while Section 3.3 provides

detailed descriptions of the data and the econometric methodology. In Section 3.4 we present and discuss our main results. Section 3.5 reports various robustness checks, subsample-specific effects and results from a difference-in-differences approach. Finally, Section 3.6 summarises.

3.2 Institutional set-up

Initially, we describe the legal framework relating to works councils and sickness absence in Germany. However, such a legal perspective may not be sufficient, since works councils have been shown to affect economic outcomes, such as wages, which the relevant law (the Works Constitution Act; WCA) explicitly removes from their realm (see, e.g., Addison et al., 2010). Consequently, we take a wider perspective in the last part of this section.

3.2.1 The legal setting

The German system of industrial relations is characterised by a dual structure: Collective bargaining, mainly at the industry level, determines wages and overall working conditions, while works councils constitute a codetermination body at the plant level (see Addison, 2009). The WCA establishes information, consultation and codetermination rights, which become more extensive the larger the firm. Although the law states that works councils are to be set up in private sector plants with at least five permanent employees, in 2011 (2001) they existed only in about 10% (12%) of eligible plants, which employed 44% (50%) of the eligible employees in western Germany and 36% (41%) in the eastern part of the country. Since their incidence rises along with firm size, about 90% of plants with a workforce exceeding 500 persons have a works council (Ellguth and Kohaut, 2012).

Works councils are closely linked to trade unions in Germany, but cannot and do not act as agents of unions within plants per se. This is the case because works councils are legally obliged to cooperate with management to the advantage of the workforce and the firm (WCA §2). Moreover, a works council is made up exclusively of employees of the plant, so that trade unions can only affect them directly by getting their members elected as councillors. In recent years, this type of influence has declined, since union membership of works councillors has fallen to below 60% (Goerke and Pannenberg, 2007; Behrens, 2009).

The rights of works councils as detailed in the WCA are more extensive with regard to personnel policy and social affairs and less pronounced with respect to financial

and economic aspects. As a general entitlement, the management has to provide the council with the information it needs to perform its legal duties. The WCA establishes consultation rights of the works council, which require its information and (weak forms of) consent, in particular with respect to personnel policy, changes in the organisation of the work process, the work environment and the treatment of apprentices. Additionally, in establishments with more than 20 employees, the consultation requirements with respect to personnel policy are expanded substantially (WCA §99); for example, the works council has to consent to all job-to-job transfers of employees within an establishment. Codetermination rights exist in particular with respect to what the law calls 'social matters' (WCA §87). They include vacation arrangements, principles of remuneration - though not its level -, and health and safety regulations. Note, finally, that works councils are explicitly forbidden to organise strikes (WCA §74(2)) and to negotiate over issues commonly dealt with in collective bargaining, unless explicitly allowed to do so in the respective contract. This restriction contained in WCA §77(3) is most relevant with respect to wages.

The most important regulations concerning illness-related absence result from the Continued Remuneration Act ('Entgeltfortzahlungsgesetz'). During the period relevant for our analysis, this law obliged employers to pay absent workers their full wage for the first six weeks of sickness if they have been employed for more than four weeks. Employees who are continuously absent for more than six weeks (referred to as 'long-term ill') receive 70% of their gross or, at most, 90% of their net wage. Such payments are financed by a mandatory health insurance to which virtually all employees in our sample belong. Generally, employees missing work due to illness have to present their employer with a doctor's certificate that confirms the temporary inability to attend work from the third day of illness onwards.

3.2.2 The works constitution act and absence behaviour

When looking for explicit regulations with respect to employee absence, one will search the WCA in vain. However, a number of provisions pertaining to personnel policy can have an impact. §87 WCA, for example, furnishes the works council with codetermination rights relating to working-time arrangements and overtime. Furthermore, the use of technical devices to control the behaviour and performance of employees requires the councils' approval. Finally, this paragraph and §89(2) WCA establish codetermination and information rights with respect to workplace safety, a driving factor of workplace-related injuries. All these regulations can have an impact on the causes of sickness absence and its monitoring. Nonetheless, they do not provide a

clear indication of the direction of the effect a works council may have on absence behaviour and resulting personnel problems. In addition, §102 WCA states that the works council has to be consulted prior to a dismissal and that any dismissal without such consultation is void. Moreover, a works council can object to dismissals and can effectively delay them, thus making them more costly.

Moving beyond the WCA, dismissals in firms with fewer than ten employees are subject to general civil law. However, larger firms are additionally subject to the Protection Against Dismissal Act (PADA). It establishes illness to be one valid justification for an individual's dismissal (PADA §1(2)). Furthermore, a works council's objection to a dismissal creates additional rights for dismissed employees if the PADA is applicable. Accordingly, a works council can severely restrict a firm's possibilities to terminate employment contracts.[1] This suggests a positive impact on absence, given the substantial evidence that employment protection fosters absence (Ichino and Riphahn, 2005; Olsson, 2009; Scoppa and Vuri, 2014).

3.2.3 Beyond the works constitution act

Although the WCA does not mention illness-related absence, as detailed above, there are a number of further channels through which works councils can affect absence behaviour. §80(1) WCA, for example, states that the main obligation of a works council is to ensure that regulations and laws beneficial to the workforce are actually applied. Therefore, working conditions in plants in which a works council exists are likely to be better than in plants without such institutions (cf. Heywood and Jirjahn, 2009 with respect to family-friendly policies). Better working conditions, in turn, can reduce the incidence of illnesses, improve the motivation of employees and reduce absenteeism (cf. Afsa and Givord, 2014). However, better working conditions may also imply that employees are less likely to attend work when ill (i.e. reduce sickness presenteeism) and potentially increase absence. Furthermore, works councils can act as a collective voice (Freeman and Lazear, 1995) and reduce exit behaviour. While exit is usually associated with permanently leaving the firm, a more short-term interpretation suggests that exit could also be represented by absence behaviour. Viewed from this perspective, works councils could mitigate sickness absence as a

[1] However, the evidence that works councils actually reduce dismissals is limited. Höland (1985, pp. 97 ff.) finds that councils did not object to dismissals in 70% to 80% of all cases in the 1980's. Frick and Sadowski (1995), using different data, report even higher percentages. While Sadowski et al. (1995) and Frick (1996) argue that dismissal rates are lower in plants with a works council, Kraft (2006) questions this claim. Hirsch et al. (2010) further show that works councils are associated with lower separation rates, but cannot clearly identify dismissals

form of short-run exit behaviour. Moreover, works councils have been shown to affect various economic outcomes which, in turn, are related to absence behaviour. For example, although works councils are explicitly forbidden to negotiate over issues bargained in collective contracts, they have been observed to increase wages through various indirect channels (Addison et al., 2001; Hübler and Jirjahn, 2003; Addison et al., 2010). Moreover, higher wages tend to reduce absence in Germany (Puhani and Sonderhof, 2010; Ziebarth and Karlsson, 2009). These relationships may result in a negative correlation between the presence of a works council and absence. In addition to wages, the existence of a works council is positively correlated with tenure of employees, temporary contracts, and firm size, inter alia.[2] Since all of these features can also have an impact on absence behaviour, works councils may, hence, affect sickness absence via the composition of the workforce and firm characteristics.
The considerations above imply that the direction of the impact of works councils on absence behaviour, and on its consequences from a firm's perspective, are theoretically ambiguous and ultimately an empirical issue, to which we now turn.

3.3 Data and empirical specification

3.3.1 SOEP

To empirically investigate whether the existence of a works council is systematically associated with individual absence behaviour, we use the German Socio-Economic Panel (SOEP), a representative longitudinal dataset for Germany.[3] We exclude the self-employed, civil servants ('Beamte') and employees working either in public administration or in plants with fewer than five employees, since these individuals, by law, cannot be represented by works councils (cf. Section 3.2). Furthermore, our sample is restricted to employees who work in energy, mining, manufacturing, construction, and service industries. Finally, we focus on respondents aged 18 to 65. In consequence, there is a maximum of 15,778 observations of 10,147 individuals. Note, finally, that we apply survey weights for the descriptive statistics, but not for the regression analyses.
The SOEP regularly contains information on the self-reported number of working days missed due to sickness in the previous calendar year. The item reads: "How many days were you not able to work in 20XX because of illness? Please state all the days,

[2]For example, Boockmann and Hagen (2003) establish a connection between works councils and temporary employment, while Engellandt and Riphahn (2005) find lower absence for temporary workers.

[3]More specifically, we use the SOEP long v29 dataset. For a general in-depth discussion of the SOEP see Wagner et al. (2007).

not just those for which you had an official note from your doctor. (a) None (b) A total of X days". We consider two dimensions of absence: first, whether an employee was absent at all in the previous calendar year, i.e. the incidence of sickness absence, and second, the annual duration of absence measured in days. There is also an item which asks whether the respondent was continuously absent for more than six weeks ('long-term illness'), but the information is not detailed enough to separate short- and long-term absence spells and their respective durations. Unfortunately, there is no data on work accidents in the relevant time period.

Turning to works councils, the SOEP contains information which indicates the existence of such an institution at the workplace of the individual (1 = yes; 0 = no) in the years (waves) 2001, 2006 and 2011. We associate the works council status and the controls with the absence data from the subsequent wave, because the question on absence is retrospective.

In our sample, 58.2% of the observations miss at least one day of work due to illness per year. On average, sickness absence amounts to 9.24 days per year in the full sample and drops to 6.48 days when excluding the long-term ill. More than 62% of respondents work in a plant with a works council. This percentage shrinks to about 50% when we additionally exclude the vaguely-defined public sector ('öffentlicher Dienst').[4]

Turning to the control variables, we take standard confounding factors into account (Ziebarth and Karlsson, 2009, 2010; Puhani and Sonderhof, 2010; Goerke and Pannenberg, 2012). Accordingly, we control for personal characteristics such as disability status, being female, marital status, living with a partner, being of foreign nationality, having a foreign background (immigrant), subjective general health status (good, bad), having children under the age of 14, age, educational attainment, satisfaction with current health status, and 12 regional dummies.[5] Furthermore, we include job characteristics such as working part-time, being an apprentice, a blue collar worker, or working in the public sector,[6] having a temporary or marginal employment contract,

[4]This number is broadly comparable to the percentage reported by Ellguth and Kohaut (2012) for the first decade of this millennium and consistent with the percentages calculated by Jirjahn and Lange (2011) and Gralla et al. (2012) on the basis of SOEP data.

[5]We use the regional categories common for LIAB data that guarantee a sufficient number of observations per region. The federal states are grouped into regions as follows: Hamburg and Schleswig-Holstein; Lower Saxony and Bremen; North Rhine-Westphalia; Hesse; Rhineland-Palatinate and Saarland; Baden-Württemberg; Berlin; Brandenburg and Mecklenburg-West Pomerania; Saxony; Saxony-Anhalt; Thuringia.

[6]Since we think our argumentation holds in publicly-owned private firms, i.e. those in a competitive environment, we exclude only those employees who work in the public administration but not those who claim to work in the vaguely-defined public sector ('öffentlicher Dienst'). In Germany, a number of firms are owned by the state but are legally private enterprises and may, hence, have a

the size of the plant, log gross monthly earnings, tenure categories, a work autonomy scale, and seven industry codes (energy/ mining, manufacturing, construction, trade, transport/ information/ communication technology, banking/ insurance, other services). This division guarantees similar classifications across the SOEP and the LIAB data, described below. Regrettably, the SOEP contains no information on collective bargaining coverage in the period under investigation. However, we can indirectly capture a potential coverage effect because it varies systematically across industries and with firm size. Additionally, we include the unemployment rate measured at the level of the respective federal state (provided by the Federal Employment Agency), as well as general time dummies. Descriptive statistics are provided in Table 3.4.

3.3.2 LIAB

To investigate the impact of works councils on absence-related personnel problems, we use the LIAB Cross-sectional Model 2 1993-2010 from the Institute for Employment Research (IAB) in Nuremberg. It is a linked employer-employee dataset with rich information based on a representative annual plant-level survey (the IAB Establishment Panel), together with personal data generated in the labour administration and social security records by employees working in these plants (see Jacobebbinghaus and Seth, 2010 for an overview). The IAB Establishment Panel is a representative sample of about 1% of German plants which is stratified over industries and firm size classes. Hence, large plants are slightly overrepresented, such that the data covers about 7% of all German employees. The individual data (the Integrated Employment Biographies, IEB) is drawn from official registers and is of very high quality, but the number of individual variables observed is limited. To use a comparable sample to the SOEP, we restrict our data to plants from mining, energy, manufacturing, construction and service industries with at least five employees, one of whom must be subject to social security in order to be included in the sample in the first place. This results in a maximum of 42,444 observations in 21,453 plants (theoretically covering over 4 million employees). The descriptive statistics are weighted at the individual level. For the regression analysis, however, we present unweighted estimates.[7]
Most importantly, the LIAB dataset contains a unique set of variables, namely responses to a series of questions directed at plant managers or high-ranking personnel

works council. Our results are robust to the (inclusion and) exclusion of employees working in the widely-defined public sector.

[7]While most of the results are robust against the use of sample weights, their inclusion could bias the results if the effect of works councils on our dependent variable differs by firm size.

staff on the existence of personnel problems: "What kind of problems with human resources management do you expect for your plant during the next two years?". Subsequently, replies with respect to various topics are requested, inter alia: "High rate of lost working time and absence due to illness". This information particularly suits the investigation of the relationship between works councils and the economic consequences of sickness absence, because the response reflects an evaluation of those individuals who determine a plant's adjustment behaviour to absence. Our data covers the years 2000, 2004, 2006, 2008, and 2010, as plant managers have been asked about personnel problems in 2000 and every other year since 2004 and, because prior to 2000, changes were made in the questionnaire regarding several variables we employ in the empirical investigation. Information on the existence of a works council is provided for every year. As a robustness check we also include an indicator of the degree of cooperation between management and works council which, however, is only available for 2006 and has also been used by Pfeifer (2014a).

Regarding our dependent variable, a total of 4,952 plants (6.92% of all plants employing 13.71% of all employees) state that they expect personnel problems caused by high absence rates during the following two years. Such personnel problems appear to be temporary, since managers in only 2.31% of all plants (in which 5.77% of all employees work) expect problems more than once during the observation period. Furthermore, 16,346 plants (14.31% of all plants employing 49.87% of all employees) are covered by a works council.[8]

To account for confounding factors, we control for firm size and a large number of other covariates. Based on individual-level data, we incorporate plant-specific means of employee characteristics with respect to sex, nationality, tenure, age, qualification, occupational status (blue collar worker), working time (part-time) and daily wages.[9] Using plant-level information, we control for collective bargaining status (including orientation, i.e. a firm's voluntary application of the terms of collective agreements, and the existence of wage cushions), the share of vacancies and of workers with temporary contracts, the churning rate, investment activity, firm age, foreign and public ownership, modern technical assets, status as a single plant, status as limited firm, and

[8]The numbers are somewhat higher than those provided by Ellguth and Kohaut (2012), because we only use plants with at least five observations in the personnel records and exclude some industries with low works council incidence.

[9]While being of high quality, the wage information in the LIAB is calculated from social security contributions and therefore censored at the contribution limit. This affects about 5.7% of all employees. We have controlled for this circumstance by including a variable which reflects the share of employees with censored earnings. Regressions on median or imputed wage levels or using the per employee pay bill yield very similar estimates.

the existence of (other) human resource management problems. Moreover, we include industry, region, firm size and year dummy variables comparable to the ones used in the SOEP as well as the unemployment rate at the regional level ('Landkreis'). Furthermore, there exist additional variables which might influence our dependent variable, but which have a significant share of item-non-response. Therefore, we include them in some specifications, but only after controlling for sample selection bias by estimating the restricted model on the restricted sample. These variables consist of the natural logarithm of total investments, the share of expansion investments, standard weekly working time, the share of exports, the existence of overtime, firm-sponsored training and of performance-related pay, and expectations with respect to rising turnover and employment levels. Using these additional variables decreases our sample by about 40% to 23,916 observations in 12,744 plants. A full description of all variables can be found in Table 3.6.

3.3.3 Empirical strategy

When analysing absence behaviour and expectations regarding future personnel problems, the stylized estimation equation for the different models reads as follows:

$$F(Y_{it})^{-1} = \beta_1 + \beta_2 \,\text{workscouncil}_{it} + \boldsymbol{X_{it}}' \boldsymbol{\gamma} + \delta \,\text{year}_t + \epsilon_{it}. \tag{3.1}$$

Here, Y_{it} represents the dependent variable. Given the binary nature of absence incidence and personnel problems we estimate pooled Probit models. For the duration of sickness absence, which includes the observations with zero days of absence, we estimate pooled OLS models (F = a linear function) and additionally present results from count data models in Section 3.5.1. The subscript i represents individuals (plants) at time t when using SOEP (LIAB) data. The dummy variable workscouncil_{it} indicates the existence of a works council, while the vector $\boldsymbol{X_{it}}$ contains confounding factors, year_t represents year dummies, and ϵ_{it} is the error term. In order to account for multiple observations of individuals or plants over time we use cluster-robust standard errors. As regards the Probit models, we additionally present the marginal effect for our variable of interest, evaluated as a discrete change from zero to one.
Estimating equation (3.1) allows us to establish a correlation between works council status and sickness absence indicators. However, such a relationship can not only arise because works councils affect absence behaviour or resulting future personnel problems, but also because of selection of employees or the endogeneity of the existence of a works council. To get closer to a causal interpretation, we use information with

respect to changes in works council status in the longitudinal dimension. We expect different effects for changes into and out of council status. This is the case because anecdotal evidence suggests that works councils are usually not abolished actively but cease to exist when no new councillors are elected in the regular elections taking place every four years. This is likely to be the case in plants in which works councils have already ceased to operate properly. Hence, we primarily expect the adoption of a works council to affect absence. Using individual data, we can furthermore distinguish between stayers (in a plant) and movers (across plants).[10] With regard to stayers, a change in works council status can come about because a council is established or dissolved. Hence, we expect the impact for stayers to be similar to the effects observed in plant-level data.

Since we anticipate different effects for changes into and out of works council status, and because of the small panel dimension in our datasets, we estimate difference-in-differences (DiD) models (cf. Grund and Schmitt, 2013, Gralla and Kraft, 2012b). Moreover, we present separate models for a change into works council status where the control group is defined by never being covered by a works council, and for a change out of works council status for which the control group consists of employees or plants which are covered by a works council throughout the observation period. Our estimation equation reads:

$$F(Y_{it})^{-1} = \beta_1 + \beta_2 \,\text{treatmentgroup}_i + \beta_3 \,(\text{no})\text{workscouncil}_{it} + \boldsymbol{X_{it}}' \boldsymbol{\gamma} + \delta \,\text{year}_t + \epsilon_{it}. \quad (3.2)$$

As the 'treatment' does not occur at the same moment in time, but throughout the observation period, we follow Imbens and Wooldridge (2009, p. 68) to discern two effects. The time-invariant dummy variable treatmentgroup_i captures the selection effect of plants and individuals into the treatment and control group. It is set equal to one only if the employee or plant changes works council status at some point in time. This allows us to see whether works councils are introduced in plants experiencing different absence rates, or levels of personnel problems due to absence, before its adoption (reversed causality) and whether individuals with different absence behaviour sort themselves into plants with a council (selection effect).[11] When looking

[10] We define stayers to have at least 5.5 (10.5) years of tenure in 2006 (2011), which indicates that they have not changed their employer since 2001. Accordingly, an employee, first observed in 2006, must have at least 5.5 years of tenure in 2011 to be classified as a stayer.

[11] Jirjahn (2009) finds that works councils are more likely to be adopted in plants experiencing economic distress. In our case, high absence rates and ensuing problems could be characteristics that are associated with the introduction of a works council.

at changes into works council coverage, the variable workscouncil$_{it}$ captures the exposure to the 'treatment', indicating whether a plant or individual i is covered by a works council in period t (treatment or DiD effect). In contrast, when looking at changes out of works council coverage, the treatment effect is captured by the variable no workscouncil$_{it}$ which is set equal to one if a plant or individual i is not covered. We present the results of the DiD models in Section 3.5.3.

3.4 Results

3.4.1 Absence behaviour

The subsequent descriptive statistics of the weighted raw data from the German Socio-Economic Panel (SOEP) suggest that employees who work in a plant with a works council exhibit more sickness absence days and are more likely to be absent at least once a year than those who are employed in a plant without a council. On average, that is, including observations from individuals who are never absent, employees in a plant without a works council report 7.67 days of absence per annum, while those represented by a works council miss 10.18 days. When looking at a sample without those respondents who state that they have been long-term ill at least once, the difference is almost halved, to 5.60 days without and 7.01 days with works council coverage. The incidence of sickness absence (without long-term ill employees) amounts to 60.7% (58.8%) for respondents who work in a plant in which a works council exists and to 53.9% (52.0%) for those not represented by such an institution.
The results of the regression models based on the pooled dataset are summarised in Table 3.1. We successively add control variables, but only depict the estimated coefficients (and marginal effects) of interest. Full results for specifications (3) and (6) are contained in Table 3.5 (in the Appendix). Specifications (1) and (4) in Table 3.1, relating to the incidence of absence and its annual duration, respectively, contain works council status as sole explanatory variable. Here, the coefficients of interest are positive, statistically highly significant and mirror the differences from the (weighted) raw data. Adding dummy variables for firm size classes, industries, regions and years reduces the size of the works council effect for both dimensions, but not its significance (specifications 2 and 5). In the absence incidence model with the full set of control variables, the coefficient remains highly statistically significant and the marginal effect still maintains a value of more than 3.6 percentage points (specification 3). This difference is economically sizeable, given an absence incidence of 58% in our sample.

Since the raw difference in the incidence observed between employees working in a firm with and without a works council is about 6.8% (see above), more than 50% of this difference (3.6/6.8) is actually associated with a council's presence.

Table 3.1: Absence incidence (pooled Probit estimates) and duration (pooled OLS estimates)

	Absence incidence			Absence annual duration		
	(1)	(2)	(3)	(4)	(5)	(6)
Works council	0.173***	0.115***	0.099***	2.01***	1.90***	1.23**
	(0.022)	(0.028)	(0.030)	(0.39)	(0.49)	(0.48)
Marginal effect	0.068***	0.045***	0.036***			
Dummy variables		Yes	Yes		Yes	Yes
Individ.-level contr.			Yes			Yes
N. of obs.	15,778	15,778	15,778	15,778	15,778	15,778
Pseudo-R^2 / R^2	0.003	0.012	0.058	0.002	0.006	0.110

Source: Own calculations from SOEP long v29. Note: Standard errors clustered at the individual level in parentheses. Dummy variables: firm size classes, industries, regions and years. Individual-level control variables: as in Table 3.5; Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Turning to the annual duration of absence, the works council coefficients are sizeable and highly significant (p-value in the full model at 0.01). Given an average annual duration of slightly more than nine days in our sample, the implied difference of more than 1.2 days when including the full set of control variables (specification 6) is also quantitatively sizeable. It translates – if taken at face value – into a reduction in GDP of more than 0.22%, given that the total loss of production due to absence is estimated to be about 1.7% of GDP in 2010 (Badura et al., 2011, p. 224). Almost 50% of the raw difference between individuals working in a plant with and without a works council (of two and a half days; 10.18 - 7.67) is accounted for by the existence of a works council.

With regard to the control variables (see Table 3.5 in the Appendix), the estimated coefficients are generally in line with results based on SOEP data (Ziebarth and Karlsson, 2009; Puhani and Sonderhof, 2010; Goerke and Pannenberg, 2012).[12] When in-

[12] In addition to the variables mentioned in Section 3.3.1, and following Goerke and Pannenberg (2012), we also included individual trade union membership as a covariate in specifications (3) and (6), which has to be imputed for 2006. While the size of the works council dummies is slightly reduced, they remain statistically highly significant. Individual trade union membership is associated with a higher incidence and greater duration of absence. Furthermore, our results are robust to the inclusion

terpreting the results shown in Table 3.1, it is important to note that we control for the health status of individuals in specifications (3) and (6). Thus, higher absence in plants with a works council is not due to employees having inferior health.

3.4.2 Personnel problems due to high absence rates

In our sample based on the LIAB, there are 4,952 plants for which managers expect to face personnel problems due to high absence rates within the following two years; 2,735 of those have a works council, while 2,217 do not. Using representative sample weights, the plants with a works council account for 25.6% of all plants that expect personnel problems due to high absence, but cover 64.5% of employees. This can be explained by the oversampling of large plants, which almost always have a works council. Comparing plants without a works council to those with such an institution, personnel problems due to high absence are expected to arise in only 6.0% of the former, while this number is 12.4% for the latter. A similar ratio at a higher level can be observed for the share of employees (9.7% versus 17.7%).

Table 3.2: Personnel problems due to absence (Pooled Probit estimates)

	(1)	(2)	(3)	(4)	(5)	(6)
Works council	0.380***	0.103***	0.124***	0.177***	0.174***	0.180***
	(0.019)	(0.024)	(0.027)	(0.028)	(0.038)	(0.038)
Marginal effect	0.074***	0.019**	0.021***	0.029***	0.028***	0.030***
Dummy var.		Yes	Yes	Yes	Yes	Yes
Plant-level contr.			Some	Some	Some	All
Indiv.-level contr.				Yes	Yes	Yes
N. of Obs.	42,444	42,444	42,444	42,444	23,916	23,916
N. of Clusters	21,453	21,453	21,453	21,453	12,744	12,744
Chi^2	421.20	1505.61	3511.53	3794.27	2279.66	2285.62
Pseudo-R^2	0.02	0.06	0.14	0.17	0.17	0.17

Source: LIAB QM2 9310 waves 2000, 2004, 2006, 2008 and 2010; own calculations (controlled remote data access via FDZ). Note: Standard errors clustered at the plant level in parentheses. Dummy variables: firm size classes, industries, regions and years. Other control variables: as in Table 3.7; Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

of several other control variables that are insignificantly related to the two dimensions of sickness absence behaviour: temporary agency contract, fear of job loss, or occupational categories (KLDB 1992 or ISCO-2). Substituting the part-time dummy with contractual or actual weekly working hours does not affect our results, either. Results are available upon request.

The results for the variables of interest from the pooled Probit estimates are summarised in Table 3.2. Again, we successively add control variables and depict full results in Table 3.7 (in the Appendix). Specification (1) in Table 3.2 only contains the works council status as an explanatory variable. The coefficient is highly significant and the marginal effect mirrors the (weighted) raw difference from the descriptive statistics of about seven percentage points. In specification (2), we include dummy variables for firm size classes, industries, regions and years. This reduces the size of the coefficient, but not its statistical significance. When adding plant-level control variables (specification 3), and covariates gathered from the individual level (specification 4), the coefficient becomes larger again. In the preferred specification (4), we find a highly significant estimated coefficient. The probability that personnel problems due to high absence rates arise is about three percentage points or 25% higher in a plant with a works council. Hence, the estimated marginal effect is considerably lower than the one obtained by Pfeifer (2014a) for the year 2006. Moreover, since it is less than half the difference found in the raw data, about 40% of it can be attributed to the existence of a works council. Observation-sensitive control variables are added in specification (6). Furthermore, we check for sample selection bias in specification (5) by using the variables from the previous specification (4) in the smaller sample utilised in specification (6). The significance of the estimated coefficient does not change when adding all covariates and neither does the size of the marginal effect. Also, there is no indication of sample selection bias.

Turning to the control variables (see Table 3.7 in the Appendix), the signs of most of the estimated coefficients are in line with expectations regarding personnel problems.[13] They are also consistent with the few existing analyses on human resource management problems using IAB EP data (Pfeifer, 2014a; Gralla and Kraft, 2012a). In addition, the estimated parameters of the variables measuring the impact of bargaining coverage are not significantly different from zero. Hence, we cannot discern an association between collective bargaining and expected personnel problems due to absence.

[13]Controlling additionally for occupational group shares (KLDB 1992) – as with the SOEP data (see footnote 12) – does not affect our results. The coefficients of these share variables are insignificant. Similarly, the inclusion of temporary agency workers does not change the results. We would have to discard, however, the first wave of the LIAB when including this covariate. Results are available upon request.

3.5 Robustness checks, effect heterogeneity and DiD-models

Having established a positive correlation between the existence of a works council and various indicators of sickness absence, the objective of this section is threefold. First, we analyse the robustness of the results concerning the annual duration of absence and present findings from count data models (Section 3.5.1). Second, we scrutinise whether the correlation between works councils and absence indicators varies across subgroups (Section 3.5.2). Finally, we present the findings from DiD models for the absence incidence models in order to shed some light on (reversed) causality and selection issues (Section 3.5.3). The main results for the models presented in Sections 3.5.1 and 3.5.2 are summarised in Table 3.8 in the Appendix.

3.5.1 Count data models

Since the number of absence days has a count data structure, according models could be considered (see Cameron and Trivedi, 1998, pp. 59 ff.). Applying a negative binomial model corroborates qualitatively and quantitatively the results from the OLS model, since we observe a highly significant difference of 1.14 days (p-value 0.013; Table 3.8) between employees who work in a plant in which a works councils exists and those in a plant without one. In order to take into account the excess number of zeroes (i.e. the fact that more than 40% of the respondents are not absent a single day in a calendar year), we additionally estimate a zero inflated negative binomial model (ZINB). Again, the combined effect confirms the effect size and significance of the OLS model (p-value 0.008).

3.5.2 Group-specific effect heterogeneity

We also look at subgroups of plants or employees, in or for which works councils may play a different role. Following, for example, Addison et al. (2010) or Mueller (2012), we look at a subsample of medium-sized plants with 20 to 200 employees. This allows us to avoid extrapolation between small firms that usually do not have, and large firms that generally do have, a works council. Furthermore, in this subsample we can keep constant (1) the intensity of employment protection legislation (PADA) and (2) the intensity of codetermination rights that increase together with plant size, according to the WCA. The significant and positive relationship between works councils and absence is affirmed with respect to the incidence measure, which becomes slightly

more pronounced with a difference of 3.8 percentage points, as well as for expected personnel problems (marginal effect of 4.0 percentage points). In contrast, the estimated coefficient of the works council dummy becomes insignificant when looking at the annual duration of absence. When probing deeper into the relationship between firm size, works councils and absence, we find the incidence of absence to be higher only in firms with fewer than 200 employees, while the annual duration is affected if there are 200 or more employees. With respect to expected personnel problems no such size effects can be discerned. Since our data does not allow us to differentiate between alternative channels by which works councils affect absence behaviour and its consequences, the issue of whether the relationship varies systematically with firm size remains a topic for future research.

Because the WCA has been in force in western Germany since 1952 and only became applicable to the eastern part of the country after re-unification (in 1990), we also split our sample along this regional dimension. For both components of absence behaviour – incidence and annual duration – we find quantitatively stronger effects in western Germany than for the whole of the country. For eastern Germany, the estimated coefficients of interest are insignificant. As regards expected personnel problems due to absence, the estimated marginal effect for the eastern German sample is about 20% smaller than the effect for western Germany. These findings are consistent with results which document changes in the impact of works councils over the duration of a council's lifetime (cf. Jirjahn et al., 2011, Mueller and Stegmaier, 2014) because works councils in East Germany may not have existed for long enough to fully unfold their properties. Since information on a works council's age is not available in the SOEP, and only for newly-founded councils in the LIAB in the period under investigation, it is, however, impossible to analyse further the learning hypothesis with regard to the observed regional differences.

Our estimates presented thus far are based on a sample which excludes the public sector, when narrowly defined. We also consider samples with a more strictly defined private sector.[14] The results from the full sample (Tables 3.1 and 3.2) also hold in these subsamples (see Table 3.8). Hence, we can rule out the possibility that the council impact is actually a public sector effect.

Furthermore, we can look at a sample based on the SOEP data which does not in-

[14]In particular, in the SOEP, we also exclude the employees claiming to work in the somewhat vaguely-defined 'public sector' and not only those respondents who state that they are members of the public administration or civil servants ('Beamte'). In the LIAB data, we identify the public sector (apart from the industry classifications) using information on whether at least one civil servant ('Beamter') works in the plant, whether it is publicly owned, whether the budget volume is stated instead of turnover, and whether the legal form of the plant is a public corporation.

clude employees who are long-term ill and whose sick pay will therefore be financed by the mandatory health insurance. Hence, the financial consequences for firms are different for long-term than for shorter absence periods. Moreover, the same is true for employees because the level of sick pay is lower for long-term absentees. Finally, Ose (2005) hypothesises that short-term absences are more likely to be voluntary and responsive to economic incentives than longer periods of absence. These arguments indicate that the effects of works councils on absence behaviour may differ with the duration of absence. The estimated coefficient of the works council dummy in the incidence equation when excluding long-term ill becomes larger (not documented in Table 3.8), while the magnitude of the coefficient in the duration equation drops by about one-third, relative to the sample which includes the long-term ill. Both estimated coefficients remain highly significant. Hence, the works council effect is neither driven by nor systematically related to long-term absence periods.

With regard to expected personnel problems, in the wave 2006 of the LIAB we can differentiate between works councils that are characterised by the management as either hostile or pragmatic on the one hand or as management-friendly on the other hand. We find that the effects on personnel problems due to absence are more pronounced and larger for hostile or pragmatic works councils, while they are insignificant for management-friendly councils. Pfeifer (2014b) obtains comparable findings for the first type of council, but also observes a significantly positive effect for management-friendly works councils.

Finally, we look at potential gender differences (cf. Leigh, 1983, Vistnes, 1997, Ose, 2005). Using SOEP data, we observe that both the marginal effect and the level of significance are higher for females than for males with regard to absence incidence. In contrast, the size of the effect for the annual duration of absence is similar for males and females with reduced significance, mostly due to the smaller sample sizes. Similarly, in the LIAB, an increase in the share of female employees does not affect the marginal effect of the works council variable along its distribution. Consequently, the relationship between works councils and sickness absence does not exhibit a clear-cut gender-specific component.

3.5.3 Difference-in-differences models

To get closer to a causal interpretation and to shed some light on reversed causality and selection issues, we subsequently present the findings from DiD models (cf. equation (3.2)). Using individual data (SOEP), we obtain significant effects with respect to the

incidence of absence for western Germany (see Table 3.3).[15] We observe 326 changes into (159 movers, 167 stayers) and 288 changes out of works council coverage (161 movers, 127 stayers). Both DiD samples are reasonably representative of the full sample with respect to covariates.

Table 3.3: DiD models of absence incidence for western Germany (pooled Probit)

	Stayer and mover		Stayer		Mover	
	In	Out	In	Out	In	Out
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment group	0.121	0.023	0.064	-0.117	0.211#	0.194
	(0.085)	(0.085)	(0.119)	(0.123)	(0.129)	(0.135)
Marginal effect	0.044	0.008	0.023	-0.042	0.072#	0.068
Works council	0.171#		0.027**		-0.065	
	(0.010)		(0.137)		(0 .173)	
No works council		-0.174*		-0.084		-0.296*
		(0.10)		(0.139)		(0.156)
Marginal effect	0.061#	-0.063*	0.097**	-0.030	-0.022	-0.103*
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
N. of obs.	2,530	5,133	1,652	4,053	878	1,080
Pseudo-R^2	0.074	0.061	0.088	0.062	0.110	0.100

Source: Own calculations from SOEP long v29. Note: Standard errors clustered at the individual level in parentheses. Control variables: as in Table 3.5; Significance levels: # $p < 0.15$, * $p < 0.10$, ** $p < 0.05$.

As regards changes into the council status, the estimated parameter is at the edge of significance in the full sample (combining movers and stayers) with a p-value of 0.100 (column 1). This change comes along with an increase in absence incidence of about six percentage points. When focussing on changes out of works council status in the full sample (column 2) we obtain a similarly-sized, significant marginal effect (6.3 percentage points). A more detailed look at separate stayer and mover subsamples offers additional insights. We find a highly significant works council effect for the introduction of a works council (stayer, into works council) of almost ten percentage points (column 3). In contrast, there is no evidence for reversed causality, since employees in plants in which a works council is introduced (treatment group) are not characterised by a significantly higher sickness incidence before its introduction. As

[15] We find qualitatively similar yet slightly less statistically significant results for the annual duration of absence which are, however, sensitive to the exclusion of outliers.

regards the dissolution of a works council (stayer, out of works council), we neither find a significant treatment effect (no works council), nor evidence indicating reversed causality (column 4). These results are consistent with our expectations that there will only be an effect due to the introduction, but not because of the abolition, of a works council. Turning to the smaller mover sample, we do not find a significant works council effect for those respondents coming to a plant with a works council (column 5). Moreover, there is some evidence that absence-prone individuals select themselves into plants with works councils (p-value 0.102). Finally, looking at those employees who leave a plant with a works council (mover, out of works council), we observe a significant treatment effect (no works council) amounting to more than ten percentage points (column 6), while the selection effect is positive yet insignificant.
Taken together, there is some evidence for treatment effects from works councils on individual sickness absence incidence for western Germany. Hence, our results can, with due care, be interpreted causally. A caveat is that the applied DiD models can only wipe out group-specific time invariant heterogeneity between the treatment and control group, while individual heterogeneity is not accounted for. But the fact that we observe a strong effect for the introduction, but not for the abolition of a works council, makes us quite confident that we capture a genuine works council effect. Furthermore, there are weak signs of selection by more absence-prone employees into plants with a works council and no evidence of reversed causality for the introduction (abolition) of works councils in firms with already high (low) absence incidence. We interpret this as evidence that the positive correlation in the pooled models is neither fully driven by self-selection, nor by reversed causality. However, these findings are restricted to western Germany and individual data. With regard to the expectation of personnel problems due to high absence rates within the following two years, we do not find evidence that the adoption of a works council alters these perceptions. This might, inter alia, be due to the small number of cases in which works council are adopted or abolished (234 (0.48%) adoptions and 241 (0.45%) abolitions of works councils in our sample).

3.6 Summary

We have identified a gap in the literature on the economic effects of non-union representation in Germany, namely the impact of works councils on sickness-related absence and its consequences for plants. Using individual and linked employer-employee data, we find that employees working in a plant with a works council are more than three

and a half percentage points more likely to be absent and to miss over one day per year more than those working in a plant without such an institution. Furthermore, the probability that personnel problems due to high absence rates are expected is approximately three percentage points higher in plants in which a works council exists. When looking at various subgroups, these findings can basically be confirmed. As an exception, both individual-level and linked employer-employee data suggest that the relationship between works councils and absence is stronger in the western part of Germany. Consistent with these results, we also obtain some evidence which allows us to interpret the correlation between works councils and the incidence of absence causally for western Germany using the SOEP data.

We can tentatively conclude that works councils increase sickness absence. In addition, the findings with regards to personnel problems suggest that works council cannot compensate for the higher absence rates through higher productivity. Consequently, non-union representation of employees in Germany via works councils does not appear to benefit firms via its impact on sickness-related absence, but rather seems to help employees at the expense of their employers. However, our data does not allow us to determine how this effect comes about. The scrutiny of the channels by which works councils influence absence behaviour and resulting personnel problems remains a topic for future research.

3.7 Appendix

Table 3.4: Descriptive statistics (SOEP)

Variable	Mean	Standard deviation	Min.	Max.
Sickness absence (incidence)	0.582	0.493	0	1
Sickness absence (annual duration)	9.236	23.998	0	365
Works council	0.624	0.484	0	1
Age	41.254	10.802	18	65
Disabled	0.059	0.236	0	1
Female	0.438	0.496	0	1
Foreigner	0.09	0.286	0	1
Married	0.583	0.493	0	1
Partner	0.228	0.42	0	1
Immigrant	0.182	0.386	0	1
Bad health	0.105	0.306	0	1
Good health	0.587	0.492	0	1
Apprentice certificate	0.734	0.442	0	1
Abitur	0.267	0.442	0	1
University degree	0.198	0.399	0	1
Children	0.306	0.461	0	1
Satisfaction with health	7.02	2.004	0	10
Log gross monthly income	7.615	0.7	3.448	10.161
Part-time	0.173	0.378	0	1
Temporary contract	0.12	0.326	0	1
Apprentice	0.04	0.197	0	1
Marginally employed	0.029	0.169	0	1
Autonomy in job	2.524	1.152	0	5
Blue collar worker	0.345	0.475	0	1
Public sector	0.185	0.388	0	1
5-19 employees	0.169	0.375	0	1
20-99 employees	0.217	0.412	0	1
100-199 employees	0.112	0.316	0	1
200-1999 employees	0.258	0.438	0	1
$\geq$ 2000 employees	0.243	0.429	0	1
Tenure ($<$ 1 year)	0.114	0.317	0	1
Tenure ($\geq$ 1 & $<$ 3 years)	0.154	0.361	0	1
Tenure ($\geq$ 3 & $<$ 5 years)	0.118	0.322	0	1
Tenure ($\geq$ 5 & $<$ 10 years)	0.194	0.395	0	1
Tenure ($\geq$ 10 & $<$ 15 years)	0.144	0.351	0	1
Tenure ($\geq$ 15 & $<$ 20 years)	0.1	0.3	0	1
Tenure ($\geq$ 20 years)	0.177	0.382	0	1
Unempl. rate in state	8.921	3.98	3.8	19.7

Note: Each variable has 15,778 observations from 10,147 individuals in 2001, 2006 and 2011.
Source: Own Calculations from SOEP long v29; Survey weights are used.

Table 3.5: Pooled sickness absence estimations (SOEP)

	Absence Incidence		Absence duration	
	Probit		OLS	
	Coeff.		Coeff.	SE
Works council	0.099***	0.03	1.227**	0.479
Age	-0.038***	0.008	-0.299*	0.168
Age^2	0.0002***	0.0001	0.004*	0.002
Disabled	0.282***	0.053	6.534***	1.574
Female	0.232***	0.031	1.228**	0.517
Foreigner	0.047	0.056	1.598*	0.918
Married	0.069**	0.034	0.179	0.65
Partner	0.101***	0.035	0.079	0.582
Immigrant	-0.003	0.039	-0.019	0.647
Bad health	0.291***	0.047	12.494***	1.385
Good health	-0.172***	0.028	-2.061***	0.403
Apprentice certificate	0.005	0.031	0.335	0.489
Abitur	0.079**	0.033	-1.048**	0.492
University degree	-0.067*	0.039	-1.163*	0.595
Children	0.064*	0.033	-0.077	0.542
Children*Female	-0.025	0.048	0.157	0.809
Satisfaction with health 0-2	(base)		(base)	
Satisfaction with health 3-4	-0.034	0.087	-20.958***	3.923
Satisfaction with health 5-6	-0.15*	0.086	-21.695***	3.887
Satisfaction with health 7-8	-0.232***	0.087	-23.671***	3.825
Satisfaction with health 9-10	-0.455***	0.09	-24.747***	3.814
Log gross monthly income	0.128***	0.029	-0.399	0.543
Part-time	-0.142**	0.038	-1.706**	0.743
Temporary contract	-0.016	0.045	-1.468**	0.639
Apprentice	0.044	0.091	0.474	1.251
Marginally employed	-0.698***	0.083	-6.894***	1.48
Autonomy in job	-0.081***	0.018	-0.521	0.351
Blue collar worker	-0.013	0.035	1.773***	0.681
Public sector	0.108***	0.033	1.519***	0.577
5-19 employees	(base)		(base)	
20-99 employees	-0.004	0.036	0.975*	0.574
100-199 employees	-0.05	0.045	0.924	0.773
200-1999 employees	0.011	0.04	0.884	0.636
$\geq$ 2000 employees	0.044	0.042	1.452**	0.672
Tenure ($<$ 1 year)	(base)		(base)	
Tenure ($\geq$ 1 & $<$ 3 years)	0.079	0.042	0.019	0.693
Tenure ($\geq$ 3 & $<$ 5 years)	0.094	0.046	0.555	0.797
Tenure ($\geq$ 5 & $<$ 10 years)	0.091	0.043	-0.005	0.784
Tenure ($\geq$ 10 & $<$ 15 years)	0.115	0.046	0.86	0.868
Tenure ($\geq$ 15 & $<$ 20 years)	0.029	0.051	0.987	1.01
Tenure ($\geq$ 20 years)	0.062	0.051	0.065	1.005
Unemployment rate in state	-0.016	0.009	-0.17	0.23
N. of obs.	15,778		15,778	
N. of clusters	10,147		10,147	
Pseudo-R^2 / R^2	0.058		0.1095	

Source: Own calculations from SOEP long v29. Note: Standard errors clustered at the individual level in parentheses. Constant, regional, industry and year dummies included but not shown; Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.6: Descriptive statistics (LIAB)

Variable	Mean	Std. Dev.	Min	Max
Personnel problems due to high absence rates	0.14	0.33	0	1
Works council	0.5	0.5	0	1
Type of works council: Hostile or pragmatic**	0.37	0.51	0	1
Type of works council: Management-friendly **	0.1	0.27	0	1
Collective bargaining agreement (CBA)	0.57	0.49	0	1
Share of female employees	0.44	0.29	0	1
Share of foreign employees	0.07	0.1	0	1
Tenure dummies				
(≥ 1 & < 3, ≥ 3 & < 5, ≥ 5 & < 10, ≥ 10 & < 15, ≥ 15 & < 20, ≥ 20)				
Mean employee age	40.75	4.61	19.01	62.75
Std. deviation employee age	10.82	1.93	0.95	20.03
Share of non-social security employees	0.14	0.18	0	1
Share of apprentices	0.05	0.09	0	1
Share of skilled employees	0.59	0.26	0	1
Share of high-skilled employees	0.09	0.15	0	1
Share of blue collar workers	0.35	0.31	0	1
Share of part-time employees	0.25	0.25	0	1
Mean of gross daily wages (censored)	72.85	31.81	1.19	178.04
Share of employees at social security contribution limit	0.06	0.11	0	1
Orientation to a CBA	0.18	0.38	0	1
Plants with a wage cushion	0.33	0.47	0	1
Share of vacancies	0.02	0.05	0	1
Share of temporary workers	0.06	0.13	0	1
Churning rate (hires and quits over growth)	0.05	0.17	0	13.01
Any investment activity in the last year	0.77	0.42	0	1
Modern technical assets	0.73	0.44	0	1
Firm age (in years up to 1990)	16.66	5.73	0	20
New firm (after 1990)	0.27	0.45	0	1
Public ownership	0.07	0.26	0	1
Foreign ownership	0.08	0.27	0	1
Single firm	0.59	0.49	0	1
Limited firm (0: Private partnership 1: Limited firm 2: Other type)	0.96	0.58	0	2
Sum of all personnel problems	1.56	1.34	0	9
Standard weekly working time*	38.55	2.29	4	66
Log. of total investments*	9.91	5.75	0	21.08
Share of expansion investments*	0.23	0.33	0	1
Share of exports*	0.14	0.26	0	1
Firm-sponsored training*	0.77	0.42	0	1
Overtime dummy*	0.77	0.42	0	1
Rising turnover outlook*	0.34	0.47	0	1
Rising employment outlook*	0.19	0.39	0	1
Performance-related pay exists*	0.28	0.45	0	1
Regional unemployment rate	9.89	4.51	1.64	31.33
Region dummy variables (10 regions in Germany)				
Industry classification (Nace-1; 9 industries)				
Firm size dummies (5-19, 20-99, 100-199, 200-1999, 2000+)				
Year dummies				

Source: LIAB QM2 9310, Waves 2000, 2004, 2006, 2008, 2010. Own calculations using controlled remote data acces (FDZ). Note: 43,444 observations in 21,453 plants; * 23,916 observations in 12,744 plants; ** 8,711 observations and plants in 2006. Means and standard deviations weighted by employee-representative weights.

Table 3.7: Personnel problems due to absence and works councils: Pooled Probit estimates

	(1)	(2)	(3)	(4)	(5)	(6)
Works council	0.3800***	0.1026***	0.1238***	0.1769***	0.1737***	0.1803***
	(0.0185)	(0.0238)	(0.0265)	(0.0279)	(0.0376)	(0.0379)
Collective bargaining agreem.			0.1079***	0.0194	0.0049	0.0098
			(0.0307)	(0.0315)	(0.0417)	(0.0421)
Firm-level contract			0.1107***	0.0407	-0.0337	-0.0308
			(0.0405)	(0.0411)	(0.0548)	(0.0550)
Orientation to a CBA			0.0565*	0.0206	0.0079	0.0093
			(0.0297)	(0.0301)	(0.0393)	(0.0395)
Wage cushion, weighted			-0.0426	-0.0331	-0.0548	-0.0494
			(0.0261)	(0.0266)	(0.0351)	(0.0352)
Share of vacancies			-0.0610	-0.0020	-0.2565	-0.1336
			(0.1598)	(0.1616)	(0.2342)	(0.2374)
Share of temp workers			0.1157*	0.0635	0.0975	0.0899
			(0.0680)	(0.0728)	(0.1178)	(0.1177)
Churning rate			0.1894***	0.1249**	0.1477**	0.1524**
			(0.0559)	(0.0508)	(0.0727)	(0.0728)
Investment activity last year			0.0334	0.0799***	0.0282	0.1007
			(0.0221)	(0.0226)	(0.0303)	(0.1030)
Modern technical assets			-0.1390***	-0.0978***	-0.0991***	-0.0950***
			(0.0199)	(0.0202)	(0.0271)	(0.0273)
New firm (after 1990)			-0.0073**	-0.0081**	-0.0117***	-0.0117***
			(0.0029)	(0.0033)	(0.0045)	(0.0045)
Firm age (up to 1990)			-0.0301	-0.0282	-0.0549	-0.0493
			(0.0398)	(0.0416)	(0.0537)	(0.0538)
Public ownership			0.0371	0.0946**	0.1977**	0.1941**
			(0.0433)	(0.0432)	(0.0786)	(0.0789)
Foreign ownership			-0.1319***	-0.0528	-0.0554	-0.0575
			(0.0389)	(0.0406)	(0.0511)	(0.0515)
Single firm			-0.0026	-0.0341	-0.0049	-0.0118
			(0.0216)	(0.0219)	(0.0301)	(0.0304)
Limited firm			0.0121	0.0302	0.0845***	0.0859***
			(0.0233)	(0.0240)	(0.0326)	(0.0326)
Public sector			-0.0624	-0.0280	0.1105	0.0945
			(0.0415)	(0.0429)	(0.1003)	(0.1006)
Multiple personnel problems			0.2795***	0.2793***	0.2856***	0.2866***
			(0.0065)	(0.0066)	(0.0089)	(0.0089)
Employee share tenure 1-3 years				0.2429**	0.2685*	0.2594*
				(0.1015)	(0.1491)	(0.1493)
Employee share tenure 3-5 y.				0.3397***	0.3971***	0.3893***
				(0.1043)	(0.1457)	(0.1463)
Employee share tenure 5-10 y.				0.3736***	0.4078***	0.4011***
				(0.0967)	(0.1338)	(0.1345)
Employee share tenure 10-15 y.				0.4012***	0.4315***	0.4331***
				(0.1100)	(0.1492)	(0.1499)
Employee share tenure 15-20 y.				0.4527***	0.5791***	0.5852***
				(0.1245)	(0.1647)	(0.1655)
Employee share tenure > 20 y.				0.2689*	0.2951	0.3185*
				(0.1421)	(0.1875)	(0.1889)

	(1)	(2)	(3)	(4)	(5)	(6)
Share of female employees				0.2433***	0.2317***	0.2439***
				(0.0571)	(0.0745)	(0.0747)
Share of foreign employees				0.6917***	0.6260***	0.6335***
				(0.1035)	(0.1420)	(0.1425)
Mean employee age				0.0013	-0.0045	-0.0056
				(0.0027)	(0.0038)	(0.0038)
Std. dev. employee age				-0.0065	0.0052	0.0061
				(0.0053)	(0.0074)	(0.0074)
Share of non-soc.sec. empl.				-0.5097***	-0.5967***	-0.5744***
				(0.1036)	(0.1416)	(0.1432)
Share of trainees				-0.2629*	-0.4930**	-0.4938**
				(0.1585)	(0.2237)	(0.2246)
Share of skilled worker				-0.1321***	-0.1852***	-0.1853***
				(0.0420)	(0.0552)	(0.0553)
Share of high-skilled w.				-0.9888***	-1.1272***	-1.1077***
				(0.1233)	(0.2021)	(0.2020)
Share of blue collar worker				0.5469***	0.5141***	0.5087***
				(0.0643)	(0.0851)	(0.0855)
Share of part-time empl.				0.3483***	0.3857***	0.3851***
				(0.0764)	(0.1121)	(0.1130)
Mean of gross daily wages				0.0003	-0.0000	0.0004
				(0.0009)	(0.0013)	(0.0013)
Empl. at s.s. contrib. limit				-1.6072***	-1.3555***	-1.3348***
				(0.2475)	(0.3284)	(0.3273)
Std. weekly working time						0.0124*
						(0.0068)
Log. of total investments						-0.0069
						(0.0088)
Share of exports						0.0122
						(0.0384)
Share expansion investm.						0.0266
						(0.0631)
Firm-sponsored training						-0.0129
						(0.0318)
Overtime dummy						0.0744**
						(0.0317)
Good business outlook						-0.0206
						(0.0277)
Good employm. outlook						-0.0533
						(0.0346)
Performance pay exists						-0.0641**
						(0.0311)
Dummy variables		Yes	Yes	Yes	Yes	Yes
Constant	-1.3547***	-1.5216***	-1.8202***	-2.4266***	-2.2141***	-2.7131***
	(0.0127)	(0.0492)	(0.0842)	(0.1856)	(0.2580)	(0.3725)
N. of obs.	42444	42444	42444	42444	23916	23916
N. of clusters	21453	21453	21453	21453	12744	12744
Chi^2	421.20	1505.61	3511.53	3794.27	2279.66	2285.62
Pseudo R^2	0.02	0.06	0.14	0.17	0.17	0.17

Source: LIAB QM2 9310 waves 2000, 2004, 2006, 2008, and 2010; own calculations (controlled remote data access via FDZ). Note: Standard errors clustered at the plant level in parentheses. Dummy variables: firm size classes, industries, regions and years. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3.8: Overview of robustness checks and effect heterogeneity

	NegBin	ZINB			20-200 employees	
	Duration	Duration		Incidence	Duration	Personnel Probl.
Works council	0.122**	0.071		0.103***	0.789	0.217***
	(0.049)	(0.047)		(0.042)	(0.736)	(0.032)
Works council		-0.175***				
(Inflate equation)		(0.060)				
Marginal effect	1.141**	1.134***		0.038***		0.040***
	(0.462)	(0.426)		(0.155)		(0.006)
N	15,778	15,778		5,154	5,154	20,500
	West-Germany			East-Germany		
	Incidence	Duration	Personnel probl.	Incidence	Duration	Personnel probl.
Works Council	0.131***	1.67***	0.291***	0.022	0.122	0.278**
	(0.035)	(0.569)	(0.031)	(0.059)	(0.863)	(0.048)
Marginal Effect	0.048***		0.052***	0.008		0.039**
	(0.127)		(0.006)	(0.022)		(0.006)
N	12,091	12,091	27,599	3,687	3,687	14,845
	Narrowly defined private sector			Non-longterm ill	WC-Management relation	
	Incidence	Duration	Personnel probl.	Duration	Coeff.	Marg. eff.
Works council	0.108***	1.329***	0.296***	0.784***		
	(0.032)	(0.512)	(0.029)	(0.273)		
Marginal effect	0.040***		0.048***			
	(0.012)		(0.005)			
Hostile or					0.3288***	0.0480***
pragmatic WC					(0.0635)	(0.0096)
Management					0.1005	0.0127
friendly WC					(0.0809)	(0.0106)
N	12,724	12,724	34,922	15,778	8,711	
	Females		Males			Share of females
	Incidence	Duration	Incidence	Duration		Personnel. probl.
Works council	0.132***	1.173*	0.064	1.142*		0.323***
	(0.044)	(0.684)	(0.041)	(0.663)		(0.0400)
Marginal effect	0.046***		0.024			
	(0.015)		(0.015)			
Share of						0.296***
female employees						(0.0648)
Interaction effect						-0.079
						(0.0715)
N	7,062	7,062	8,716	8,716		42,444

Source (Incidence and Duration): SOEP long v29; own calculations. Note: Standard errors clustered on the individual level. All estimated coefficients rely on control variables used in Table A2.
Source (Personnel Problems): LIAB QM2 9310 waves 2000, 2004, 2006, 2008, and 2010 (2006 only for works council type); own calculations (controlled remote data access via FDZ). Note: All estimated coefficients rely on control variables used in specification (4) from Table A4; Standard errors clustered at the plant level in parentheses, where possible. Else: robust standard errors.
Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Part II

SICKNESS PRESENTEEISM

Chapter 4

Determinants of the annual duration of sickness presenteeism

Sickness presenteeism, i.e. going to work while sick, causes substantial productivity losses. Focusing on work-related characteristics, we investigate the determinants of the annual duration of sickness presenteeism using European cross-sectional data. We find work autonomy, workload, tenure and the work environment to be the quantitatively most relevant determinants of sickness presenteeism days. Work autonomy (control over one's work, being supervisor), workload (weekly working hours, time pressure) and tenure are positively related to the number of sickness presenteeism days. In contrast, a good work environment (good working conditions and social support) is associated with fewer presenteeism days.

4.1 Introduction

Employee sickness has substantial economic implications for firms and employees, not only in form of sickness absence but also through sickness presenteeism behaviour. While there is a lot of research on the determinants of sickness absence behaviour, less is known about sickness presenteeism, i.e. the case where employees come to work while sick. Neither in terms of productivity, nor in terms of the employee's health is it clear whether an employee should stay at home or go to work when sick. While it is safe to say that employees are less productive when they work whilst sick compared to when they are healthy (see Schultz and Edington, 2007 for a survey on this issue), the size of this effect is job and sickness specific (Pauly et al., 2008). Additionally, there is the possibility that presentees spread their illness to other employees with further negative repercussions on firm productivity (Barmby and Larguem, 2009). Turning to the health effects, there is evidence for a negative impact on presentees' future general health (Bergström et al., 2009) and for more sickness absence at a later date (Hansen and Andersen, 2009). Nevertheless in some cases it might be better for the recovery and rehabilitation of the employee – if the job and the sickness allows – to come to work when sick (Markussen et al., 2012). Notwithstanding the economic comparison between the two sickness states, we argue that sickness presenteeism is economically relevant and hence it is worthwhile to further investigate its determinants.

While there is already some knowledge about the incidence of individual sickness presenteeism behaviour (Aronsson et al., 2000; Aronsson and Gustafsson, 2005; Böckerman and Laukkanen, 2009, 2010; Leineweber et al., 2011; Preisendörfer, 2010) and its frequency (Johansson and Lundberg, 2004; Hansen and Andersen, 2008), there is a lack of studies investigating the annual duration of sickness presenteeism. This is a deplorable lack of knowledge since the (direct) impact of presenteeism on productivity depends much more on the annual duration than on its incidence or frequency. Hence, in this chapter, we tentatively answer the following question with cross-sectional correlations: what are the quantitatively most important work-related determinants of the annual duration of sickness presenteeism? We contribute to the literature by using the annual duration of sickness presenteeism as dependent variable, which is more relevant for the economic effects of sickness presenteeism than its frequency or incidence. Furthermore, we use the European Working Conditions Survey (EWCS), the first large-scale dataset on sickness presenteeism outside Scandinavia, covering 34 European countries. Hence, our findings have better external validity and are not confined to the institutionally specific cases of Scandinavian countries with their generous welfare states, active labour market policies, and bold social norms. We find

that presenteeism is a widespread phenomenon with more than 35 percent of European employees going to work whilst sick at least once during 12 months, amounting to an average of 2.4 sickness presenteeism days per year.

In count data models and controlling for health status, we find work autonomy, workload, tenure and the work environment to be the quantitatively most relevant work-related determinants of sickness presenteeism days in Europe. Work autonomy, workload and tenure are positively related to the number of sickness presenteeism days, while a good working environment comes along with less presenteeism.[1] Besides the positive linear tenure effect on presenteeism days, we observe significantly less presenteeism in the first year of an employment relationship. While we are, to the best of our knowledge, the first to investigate the relationship between tenure and presenteeism, our significant and positive result for work autonomy is in contrast to an insignificant finding for presenteeism frequency in Denmark (Hansen and Andersen, 2008). This result shows that sickness presenteeism behaviour is different outside Scandinavia and hence merits further investigation. Our results for workload and the work environment are in line with the literature. While work autonomy and workload lead in terms of economic significance, the other two factors are not far apart. The effect of the working environment on sickness presenteeism is increased particularly when combining direct and indirect, health mediated effects. Regarding the other determinants, we mostly confirm the picture presented in the literature: health status is the most important determinant of sickness presenteeism followed by work-related factors and sociodemographics. The main results are robust to the application of OLS models and to using a more homogeneous subsample comprising EU member states.

The rest of this chapter develops as follows: Section 4.2 discusses the related literature, Section 4.3 delivers detailed descriptions of the data, while Section 4.4 contains the empirical strategy and presents the main results. Finally, Section 4.5 contains robustness checks, and Section 4.6 concludes.

[1] We capture work autonomy with a control over work index and supervisory status. Workload is measured by weekly working hours and a subjective measure of time pressure. Job tenure is not only measured in years but also by an additional new job dummy for the first year of tenure. A good work environment is characterized by satisfaction with the working conditions and by support from colleagues and management.

4.2 Related literature

The literature on sickness presenteeism is dominated by empirical studies from social medicine.[2] These studies mostly use binary variables to measure sickness presenteeism taken from North European data, and hence neglect its annual duration. Aronsson et al. (2000) find that employment in so-called human service jobs and a low replaceability are highly correlated to the incidence of presenteeism in a Swedish cross-sectional sample. In a follow-up study, Aronsson and Gustafsson (2005) present workload and control over work pace as additional determinants. Böckerman and Laukkanen (2009) find in a small Finnish cross-sectional sample of union members that the incidence of presenteeism is much more sensitive to working time arrangements than absenteeism, particularly to the number of weekly working hours, shift work and the mismatch between actual and desired working hours. In a follow up study, they show that the effect of working time mismatch is mostly driven by employees with a poor health status (Böckerman and Laukkanen, 2010). Preisendörfer (2010) uses a very small German sample and finds a positive relationship between fear of job loss and presenteeism incidence.

Furthermore, there are two studies that adjust only for some of the confounding factors when investigating determinants of presenteeism, which in turn increases the likelihood of omitted variable bias. In this vein, Leineweber et al. (2011) find that support from colleagues and supervisors as well as low autonomy are positively related to presenteeism using data from Swedish police officers but control only for either age, gender or supervisor status. Biron et al. (2006) look at the share of presenteeism days in relationship to the sum of presenteeism and absenteeism days in a Canadian public sector sample. While controlling only for age, gender and occupational grade as confounders, they report workload, contract type, and work autonomy to be the most relevant determinants. Additionally, Biron et al. (2006) present reasons for presenteeism given by their respondents. Workload comes first (32 %), followed by professionalism and guilt feelings (27 %). Less important are an insufficient severity of the illness (15%), a lack of replacement (13 %) and fear from negative repercussions (10 %). Caverley et al. (2007) report similar findings for a Canadian public sector organization with 40 % claiming workload and deadlines to be the reason for their presenteeism behaviour.

[2]Besides the empirical literature there are two theoretical papers. Brown and Sessions (2004) include presenteeism in the Barmby et al. (1994) absenteeism framework. Chatterji and Tilley (2002) take negative productivity externalities from presenteeism as explanation for voluntary supra mandatory sick pay packages offered by employers.

Besides the empirical investigations with direct measures of presenteeism, there are two contributions by Bierla et al. (2011, 2013) in which they infer presenteeism behaviour from absence data. They assume that the excess zeros in a zero-inflated negative binomial model capture presenteeism behaviour since these individuals follow a 'never absent rule'. Excess zeros are a binary event and hence this paper investigates at best the incidence of presenteeism. They find that higher responsibility and the team manager's presenteeism probability are positively related to presenteeism. These investigations offer in our opinion an interesting look at the joint decision on sickness absence and presence behaviour but rest upon a highly speculative assumption with regard to presenteeism.

While there is, to the best of our knowledge, no study with data on the annual duration of sickness presenteeism, two Scandinavian studies analyse its frequency. Johansson and Lundberg (2004) find in a cross-sectional sample from Stockholm (n=4924) that control over work effort, called adjustment latitude, is not significantly related to presenteeism frequency, while attendance requirements are positively related to presenteeism. There are several differences to our study. First, they exclude all respondents that report neither absence nor presence behaviour since they want to investigate the decision between absence and presence behaviour ('illness flexibility'). This sample selection could lead to biased estimates if the excluded observations are systematically related to the explanatory variables, which is quite likely. Second, their dependent variable is measured in vaguely defined four ordinal categories (never, once, a few times, many times). Finally, controlling only for age, health, financial situation and family means that the authors do not convincingly address potential omitted variable bias.

Hansen and Andersen (2008) investigate presenteeism frequency in a large cross-sectional data set from Denmark (12,000 observations). They present time pressure and a good relationship with colleagues as the most relevant work-related determinants for the frequency of sickness presenteeism, which is in line with our findings. In contrast to our results they find a significant impact of firm size while finding none for work autonomy. When we estimate a model that allows for a different autonomy effect in northern Europe, we find that work autonomy is insignificantly related to presenteeism in northern Europe while remaining significant and positive in the other countries, which might be due to institutional differences. Tenure and satisfaction with working conditions, which are among the relevant determinants in our study, are not looked at by Hansen and Andersen (2008). But there are also methodological differences to our study: Hansen and Andersen (2008) utilize arbitrarily set categories

to measure the frequency of presenteeism, while we measure the annual duration more precisely in days per year. Furthermore, we disregard normative attitudes towards sickness absence as explanatory variables due to endogeneity concerns, since we argue that these attitudes are quite likely determined by actual presenteeism behaviour. In contrast, we focus on work-related factors because they are more relevant than personal circumstances from a policy and management perspective.

4.3 Data

For our investigations, we use the 2010 wave of the European Working Conditions Survey (EWCS), a repeated cross-sectional survey on working conditions in Europe. The EWCS is conducted every 5 years by the European Foundation for the Improvement of Living and Working Conditions, an agency of the European Union, and profits from a single questionnaire which guarantees consistent data across countries. In 2010, the EWCS covered for the first and only time an item on sickness presenteeism and is hence the first large-scale survey about sickness presenteeism outside Scandinavia. It covers the active population aged 15 and above living in 34 European countries.[3] We consider employees aged 18-65 years who have been employed during the last 12 months working at least ten hours per week,[4] excluding self-employed, students, apprentices, and employees without work contracts. Since we are not interested in the presenteeism behaviour of employees with chronic diseases, we disregard observations with more than 50 sickness presenteeism days in 12 months.[5] The number of observations amounts to 18,953.

We are, to the best of our knowledge, the first to investigate the determinants of the annual duration of sickness presenteeism. The relevant item reads as follows: "Over the past 12 months did you work when you were sick? a) Yes b) No. If yes, how many working days?" This item has advantages compared to the items widely used in the literature on presenteeism. First of all, the annual duration of sickness presenteeism is more relevant from an economic perspective than the frequency or the incidence of sickness presenteeism episodes. Furthermore, asking for the number of sickness presenteeism days in an open question is less prone to biased responses than offering predefined frequency categories as done by Hansen and Andersen (2008) and Johans-

[3]The sample covers all 27 European Union member states, Albania, Croatia, Kosovo, Macedonia, Montenegro, Norway, and Turkey.

[4]We also disregard employees unrealistically claiming to work more than 80 hours per week. The results are not sensitive to the exclusion of either of these two groups of observations.

[5]This means we disregard a little more than 100 observations. The central results do not depend on this sample selection (see robustness section).

son and Lundberg (2004). Furthermore, the item from the EWCS neglects normative aspects. Here, presenteeism is neither contingent on the judgment that it would have been better to take sick leave (Aronsson et al., 2000; Johansson and Lundberg, 2004; Aronsson and Gustafsson, 2005; Böckerman and Laukkanen, 2009, 2010; Leineweber et al., 2011), nor on the legitimacy of taking sick leave (Hansen and Andersen, 2008). The descriptive statistics show that sickness presenteeism is a widespread phenomenon in Europe. During the period under investigation, more than 35 percent of the employees went to work for at least one day while being sick during the period under investigation. The average number of days amounts to almost 2.4 (2.9 days if also including the chronically ill with more than 50 sickness presenteeism days per year). The conditional mean amounts to more than seven days. The distribution of the conditional sickness presenteeism days is shown in Figure 4.1.

[Figure 4.1 about here.]

In order to filter the impact of work-related factors in a cross-sectional model, the choice of covariates is key. We include work-related characteristics as comprehensively as possible in our model. Our choice is guided by the literature on sickness absence behaviour (Frick and Malo, 2008; Puhani and Sonderhof, 2010; Ziebarth and Karlsson, 2010; Livanos and Zangelidis, 2013) and by the literature on sickness presenteeism (Aronsson et al., 2000; Aronsson and Gustafsson, 2005; Hansen and Andersen, 2008; Böckerman and Laukkanen, 2009, 2010; Preisendörfer, 2010; Leineweber et al., 2011). Besides the work-related characteristics, we control for health status and sociodemographic characteristics.

First, we present the work-related variables, that have been found to be most relevant for sickness presenteeism, and then turn to the other work-related characteristics. The former are: work autonomy, workload, job tenure and good work environment. Work autonomy is captured on the one hand by an index measuring the number of autonomy dimensions in which the employee has control over work, i.e. work order, methods and speed, and on the other hand by supervisory status. Workload is measured in four dimensions: the number of hours usually worked per week, a subjective indicator asking whether the employee lacks time to get work done (five-point scale), and two dummy variables indicating whether the employee works in a second job and whether she works during evenings or weekends (unusual working time). Job tenure is not only measured in years but also by an additional new job dummy for the first year of tenure. Finally, the work environment is captured on one side by the satisfaction with the working conditions (five-point scale), and on the other by social support

from colleagues and the management, which is here measured by summing up two five-point scales quantifying whether the respondent is helped and supported from colleagues and the manager respectively.
The other work-related factors comprise job specific characteristics such as job insecurity (five-point scale measuring fear to loose one'e job within 6 months), the annual net income from the main job (measured in 21 categories), blue collar status, having a temporary contract and plant specific characteristics such as the size of the plant ($<$ 10 employees, 10-49 employees, 50-99 employees, 100-249 employees, $\geq$250 employees), private sector and industry dummies (modified NACE 17 classification). Albeit the generosity of sick pay entitlements is crucial for absence behavior (Frick and Malo, 2008; Puhani and Sonderhof, 2010; Ziebarth and Karlsson, 2010), we prefer including country dummies as a better way to account for aggregated country differences (labour market institutions, social norms, health care and other country specific effects) in cross-sectional data sets.[6]

[Table 4.1 about here.]

Turning to the sociodemographic variables, we include sex (female=1), having children, living with a partner, age categories (aged 18-24, 25-34, 35-44, 45-54, and 55-65 years), and educational status (primary, secondary and higher education status). The most important determinant of presenteeism, health status, is taken into account by four subjective categories (very good, good, fair and, finally, bad and very bad in one category) and an objective index measuring the number of different kinds of health problems from which the respondent has suffered during the last 12 months.[7] Descriptive statistics are provided in Table 4.1.

4.4 Econometric investigation

We estimate the relationship between the explanatory variables and the number of sickness presenteeism days by applying zero-inflated negative binomial regression mod-

[6]With cross-sectional data, including both, country dummies and sick pay generosity, is not feasible due to multi-collinearity.

[7]Regarding the subjective measure, we integrated the two worst categories into one single category since only 0.2 percent of the sample claimed to have a very bad health status. The health problems include: hearing problems; skin problems; backache; muscular pain in shoulders, neck and/or upper limbs; muscular pain in lower limbs; headaches and eyestrain; stomach ache; respiratory difficulties; cardiovascular diseases; injuries; depression or anxiety; overall fatigue; insomnia or general sleeping problems; other. Using instead dummy variables for each of these health problems did not improve the fit of the model while leaving the main results unchanged and was hence discarded (results available upon request).

els (ZINB) with cluster adjusted standard errors on the country level. Since our data consists of non-negative integers of which the large majority is smaller than ten with a large mass at zero, a count data model is appropriate to describe the data (cf. Cameron and Trivedi, 1998, pp. 59ff.). Due to overdispersion, i.e. the variance of the presenteeism days is much larger than its mean, we prefer a negative binomial over a Poisson distribution. Furthermore, with a significantly positive Vuong test (z-stastics 39.93) we include a zero-inflate part into our model. As a robustness check we present a simple OLS model in Section 4.5 to make sure that the results are not driven by the choice of the ZINB model. The econometric model reads as follows:

$$\begin{aligned}\text{presenteeism days}_i = \alpha_0 + \ & \mathbf{work\,characteristics}_i' \boldsymbol{\alpha_1} + \mathbf{sociodemographics}_i' \boldsymbol{\alpha_2} \\ & + \mathbf{health\,status}_i' \boldsymbol{\alpha_3} + \mathbf{country}_i' \boldsymbol{\alpha_4} + \epsilon_i.\end{aligned}$$

Here, presenteeism days_i indicates the number of days spent at work while being sick during twelve months for individual i. $\mathbf{work\,characteristics}_i$, $\mathbf{sociodemographics}_i$ and $\mathbf{health\,status}_i$ represent the different vectors of independent variables. In order to account for country-specific effects we include country dummies and ϵ_i is the error term. Besides the preferred full model, depicted in Table 4.2, we present in Section 4.5 additionally a model that does not partial out the effects that are mediated by health, since the overall effect of work-related factors on sickness presenteeism days, i.e. the direct and indirect health mediated effects taken together, is economically highly relevant as well.

[Table 4.2 about here.]

We present the count and the inflate part of the ZINB model in column 1 and 2, while we are more interested in the combined average marginal effects in column 3 with beta-coefficients in squared brackets to capture their economic significance. We find work autonomy, workload, tenure and the work environment to be the quantitatively most relevant work-related determinants of sickness presenteeism days. While we are the first to investigate tenure in this regard, our significant and positive results for work autonomy are in contrast to insignificant findings for presenteeism frequency in Denmark (Hansen and Andersen, 2008). The findings for workload and the work environment are in line with the literature on presenteeism frequency. The work autonomy index and the usual weekly hours lead in terms of economic significance with beta coefficients larger than 0.04. The tenure variables and working conditions follow with beta coefficients around 0.03.

Having more autonomy over one's work is associated with more presenteeism days

mostly due to a significant effect in the inflate part of the model. Having discretion over work speed, methods and order makes a difference of almost 0.7 days compared to someone without such autonomy.[8] Hence, employees who can control to some extent their work effort are more likely to come to work albeit sick. A potential explanation could be that they can avoid or postpone the most strenuous part of their work. More autonomous employees could also be more intrinsically motivated and hence go to work more often while sick. This result is in line with findings for presenteeism incidence (Biron et al., 2006; Leineweber et al., 2011), while contrasting insignificant findings for presenteeism frequency (Johansson and Lundberg, 2004; Hansen and Andersen, 2008). Estimating a regional-specific coefficient for North European countries (Denmark, Norway, Finland and Sweden) with regards to work autonomy shows that there is no significant relationship between work autonomy and sickness presenteeism in these countries, while there is one in the rest of Europe, which reconciles the divergent findings (not shown, estimation results available upon request). Whether these differences are due to different labour market institutions or cultural traits in Scandinavia is an open question for further research. Being supervisor contributes more than 0.2 additional days which could be explained by more autonomy, but also by less replaceability and their function as a role model for subordinates. The significant result for supervisors is in line with findings by Hansen and Andersen (2008) and driven by the count part of the ZINB model.

There are several dimensions of workload captured in our model which are all positively associated with sickness presenteeism days. The economically and statistically most significant dimension is the number of hours usually worked per week. Increasing weekly hours by twenty, which represents a switch from part to full time employment, comes along with an additional 0.6 presenteeism days per year. The result for the subjective measure asking whether the employee lacks time to get her or his work done points in the same direction and totals 0.11 additional days for an increase of one unit on the Lickert-scale which represents one standard deviation. Working during evenings and weekends could also be a proxy for an onerous workload and adds 0.20 sickness presenteeism days. Here the relationship with colleagues could also play a role in the sense that employees are, during weekends and evenings, more reluctant to leave their colleagues alone or to be replaced by a colleague. These results corroborate findings by Hansen and Andersen (2008). Finally, working in two jobs comes with 0.27 additional days of presenteeism. The significance of the workload variables

[8] This difference equals three points in the work autonomy index (for each dimension one additional point) which translates to an increase of approximately 0.7 days ($0.69 = 3 \cdot 0.23$)

is brought about by the inflate part of the ZINB model, except for the weekly hours variable which is significant in both parts.

Regarding tenure, there are two effects on the number of sickness presenteeism days. Having recently changed the employer (new job) is associated with significantly less presenteeism, while presenteeism increases with each year of tenure.[9] The dummy is significant in both parts of the ZINB model, whereas the linear tenure effect is fully driven by the count part. The positive slope could be interpreted with increasing loyalty and identification with the firm, whereas the negative first year effect is more puzzling. Reduced presenteeism at the beginning of an employment relationship does not conform to higher effort in the form of presenteeism during the critical first year in a job where contracts are often temporary and employees have to gain reputation among coworkers and management. Furthermore, sick pay eligibility criteria should push towards more presenteeism during the first year, not less, since sick pay entitlements are, in many European countries, only available after a qualifying period (cf. European Union, 2012). The fact that young and hence also healthier employees are more likely to change a job partially explains this story, since the significance of the new job effect vanishes once we condition our sample on employees aged over 35 (results available upon request). In contrast, the size of the new job effect increases if conditioning on employees with a poor general health status to directly control for the better health of younger job changers. Of course, the question remains why only younger employees exhibit significantly less presenteeism in the first year of an employment relationship.

Finally, we turn to the working environment which is captured by satisfaction with one's working conditions and by the support from colleagues and the management. Working conditions have a significant impact at the lower bound of the distribution (inflate part), while social support in the count part of the ZINB model. Increasing the satisfaction with the working conditions by one standard deviation (0.68 units on the 4 point Likert Scale) is associated with 0.15 fewer sickness presence days. A similar change in social support equalling two units on the 8 point Likert Scale has a value of 0.12 days. The result for social support from colleagues and management confirms findings from Hansen and Andersen (2008) for Denmark.

The other work-related factors are not significantly related to the number of sickness presenteeism days. In contrast to Hansen and Andersen (2008) we do not find a significant impact of firm size on sickness presenteeism days. This might be explained

[9]The negative first year effect is robust to a more flexible approach with several tenure categories (results available upon request).

by the cross country nature of our data without homogeneous regulations in function of firm size. The sociodemographic and health control variables confirm mostly the results known from the literature on presenteeism. Health status is the quantitatively most relevant determinant for sickness presenteeism days, followed by work-related factors and sociodemographics.

4.5 Robustness checks

As robustness checks, we present models with different sets of control variables, with an alternative estimation technique and in a subsample that is characterized by a more homogeneous institutional setting. The corresponding regression results are depicted in Table 4.3. First, in order to measure the direct and indirect health mediated effects of the work-related characteristics, we estimate the ZINB model without the health controls (column 1). The results are mostly unchanged in terms of statistical significance when excluding the health variables, while the estimated average marginal effects change substantially in some cases. Particularly, the marginal effect of the work environment variables increase considerably (up to the factor of three), which suggests a strong relationship of good working conditions and social support with presenteeism via its effect on health. The same is true for the subjective lack of time variable which gains in economic and statistical significance and thereby points to a negative health impact of (perceived) workload. Work autonomy as well as weekly working hours are still highly economically relevant for sickness presenteeism days here but are overtaken by good working conditions. Job insecurity, work interdependence, income and private sector employment become significant if no longer controlling for health status. Hence, these controls are related to presenteeism behaviour only through health. Being dependent on the work pace of coworkers (interdependence), working as a blue collar worker and job insecure are associated with more presenteeism days, a higher income with less.
In column 2 we present a parsimonious model including only the significant determinants to alleviate multi-collinearity concerns which does not change our results. Furthermore, the results are robust to estimating the number of presenteeism days by an OLS model instead of the preferred ZINB model (column 3). Finally, restricting our sample to EU member states which are in various dimensions homogeneous due to common EU regulations corroborates our finding (Column 4).
Additional robustness checks are presented in the following but not included in Table 4.3 and available upon request. Rerunning our preferred model in samples excluding

the observations from each country at a time does not change the results. Accordingly, our results are not driven by a single country. Furthermore, including long-term presentees, i.e. those with more than 50 sickness presenteeism days per year, in our preferred ZINB specification does not fundamentally change our results either. The marginal effect for second jobs becomes insignificant at the ten percent level when including presentees with up to 100 sickness presenteeism days. When additionally including those with up to 200 sickness presenteeism days the social support, supervisory and the unusual working hours variables are no longer significant either.

4.6 Conclusion

Sickness presenteeism is known to have negative repercussions with regard to productivity and health. While there is already some knowledge about the incidence and frequency of individual sickness presenteeism behaviour, there is, to the best of our knowledge, no study investigating its annual duration. This is a deplorable lack of knowledge, since the impact of presenteeism on productivity depends much more on the number of sickness presenteeism days than on its incidence or frequency. We investigate the quantitatively relevant work-related determinants for the annual duration of sickness presenteeism in Europe in a cross-sectional sample. We contribute to the literature by taking the annual duration of sickness presenteeism as dependent variable and by using the European Working Conditions Survey (EWCS), the first large-scale dataset on sickness presenteeism outside Scandinavia, covering 34 European countries. Hence, our findings have better external validity and are not confined to the institutionally specific cases of Scandinavian countries.

We find work autonomy, workload, tenure and the work environment to be the quantitatively most relevant work-related determinants of sickness presenteeism days in Europe. Work autonomy, workload and tenure are positively related to the number of sickness presenteeism days while a good working environment comes along with less presenteeism. Besides the positive linear tenure effect on presenteeism days, we observe significantly less presenteeism in the first year of an employment relationship. While we are, to the best of our knowledge, the first to investigate tenure in this regard, our significant and positive results for work autonomy are in contrast to insignificant findings for presenteeism frequency in Denmark (Hansen and Andersen, 2008). Estimating a model that allows for a different autonomy effect in northern Europe reveals that work autonomy is insignificantly related to presenteeism in this

region while remaining significant and positive in the other countries, which might be due to institutional differences. The findings for workload and the work environment are in line with the literature on presenteeism frequency. The impact of work autonomy and workload lead in terms of economic significance (beta coefficients) followed by the other two work-related factors. Overall, health status is the quantitatively most relevant determinant for sickness presenteeism days, followed by work-related factors and sociodemographics.

The effect of the working environment on sickness presenteeism is particularly increased when combining direct and indirect, health mediated effects. The main results are robust in a more homogeneous subsample comprising EU member states only and to the application of OLS models. Since all results are based on cross-sectional models only, practical and policy implications should be taken with caution. Although panel data is needed to draw causal conclusions, our results suggest that employers who want to reduce presenteeism should, besides offering health improving working conditions, consider limiting the workload per employee and offer a good working environment. One interesting feature of our findings is that our findings mirror the dual nature of sickness presenteeism which is similarly related to good as well as to bad job characteristics (work autonomy, time pressure). Accordingly, coming to work when being sick can, on the one hand, be facilitated by good working conditions, or on the other be forced by obligations. The first case is rather commensurate with a situation in which coming to work is socially beneficial because negative health effects are limited. In contrast, the latter is more likely a situation in which the negative effects dominate over the positive effects. Accordingly, it will be one of the crucial questions for future research to distinguish between productivity and health improving forms of presenteeism and those that are not.

4.7 Appendix

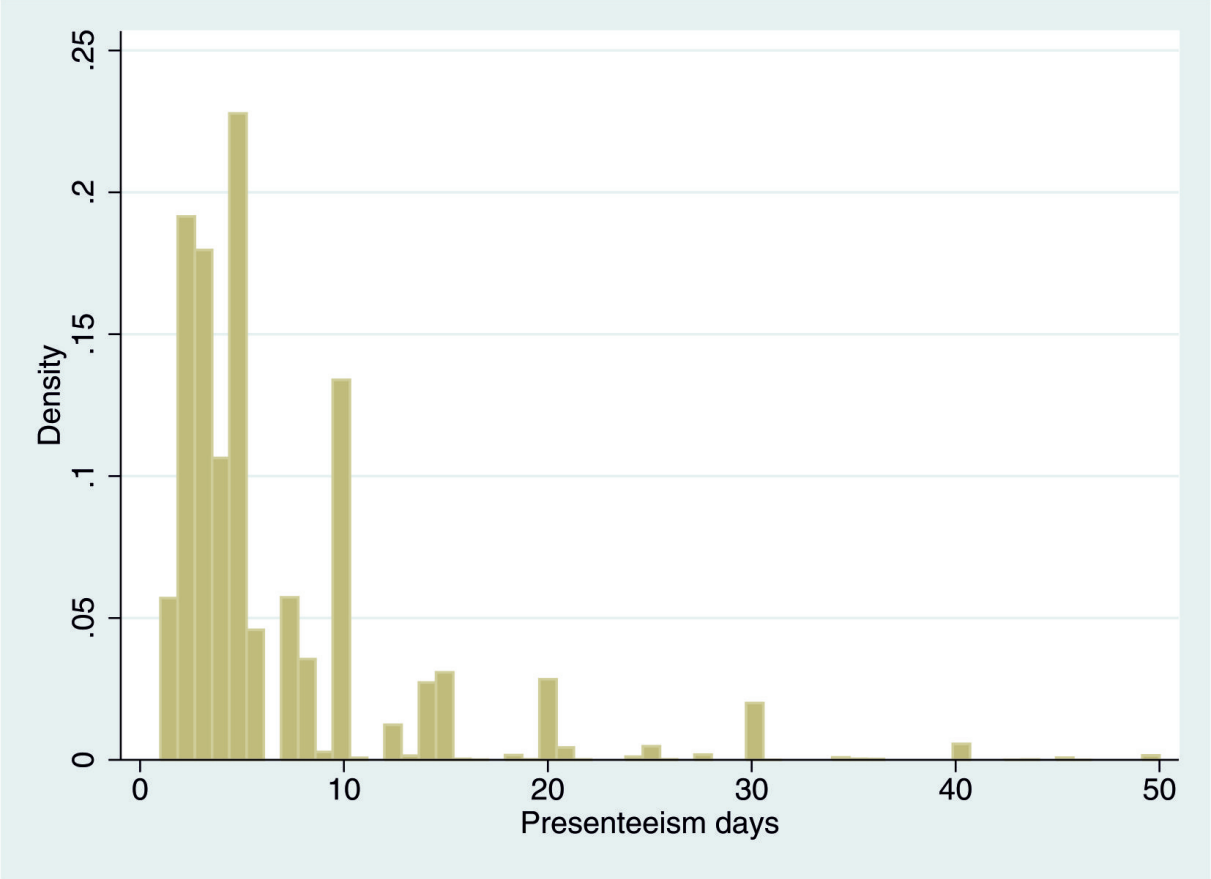

Figure 4.1: Distribution of sickness presenteeism days conditional on presenteeism. Observations with zero sickness presenteeism days not shown but included in analysis (64 % of the full sample). Source: 2010-EWCS. Own calculations, survey weights used.

Table 4.1: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Sickness presenteeism days	18,953	2.37	4.9	0	50
Sickness presenteeism incidence	18,953	0.36	0.48	0	1
Work autonomy index	18,953	1.92	1.19	0	3
Supervisor	18,953	0.15	0.36	0	1
Usual weekly working hours	18,953	38.0	9.1	10	80
Lack of time to get work done	18,953	2.11	0.99	1	5
Unusual working time	18,953	0.58	0.49	0	1
Second job	18,953	0.07	0.26	0	1
New job (tenure <1 year)	18,953	0.08	0.27	0	1
Tenure	18,953	9.49	9.05	0	47
Good working conditions	18,953	3.04	0.68	1	4
Social support	18,953	5.57	1.94	1	8
Job insecurity	18,953	2.18	1.85	1	5
Blue collar worker	18,953	0.34	0.47	0	1
Temporary contract	18,953	0.13	0.33	0	1
Net income category	18,953	11.35	3.83	1	21
Work interdependence	18,953	0.46	0.50	0	1
Size (<10 employees)	18,953	0.27	0.45	0	1
Size (10-49 employees)	18,953	0.34	0.47	0	1
Size (50-99 employees)	18,953	0.13	0.34	0	1
Size (100-249 employees)	18,953	0.11	0.31	0	1
Size (≥250 employees)	18,953	0.15	0.36	0	1
Private sector	18,953	0.67	0.47	0	1
Sex (female=1)	18,953	0.46	0.50	0	1
Children	18,953	0.54	0.50	0	1
Partnership	18,953	0.74	0.44	0	1
Age (18-24 years)	18,953	0.07	0.26	0	1
Age (25-34 years)	18,953	0.26	0.44	0	1
Age (35-44 years)	18,953	0.29	0.46	0	1
Age (45-54 years)	18,953	0.26	0.44	0	1
Age (55-65 years)	18,953	0.11	0.32	0	1
Primary education	18,953	0.31	0.46	0	1
Secondary education	18,953	0.34	0.47	0	1
Higher education	18,953	0.35	0.48	0	1
Very good health	18,953	0.26	0.44	0	1
Good health	18,953	0.55	0.50	0	1
Fair health	18,953	0.18	0.39	0	1
Bad and very bad health	18,953	0.02	0.13	0	1
# of health problems	18,953	2.71	2.38	0	14

Source: 2010-EWCS. Own calculations, survey weights used.

Table 4.2: Number of sickness presenteeism days (ZINB)

	(1) Count		(2) Inflate		(3) ME [beta coeff]	
			Work autonomy			
Work autonomy	0.02*	(0.01)	-0.12***	(0.03)	0.23*** [0.048]	(0.05)
Supervisor	0.07***	(0.02)	-0.05	(0.06)	0.24** [0.016]	(0.10)
			Workload			
Usual weekly hours/10	0.05***	(0.02)	-0.11***	(0.03)	0.29*** [0.045]	(0.06)
Lack of time	0.00	(0.01)	-0.08***	(0.03)	0.11** [0.019]	(0.05)
Unusual working time	-0.01	(0.02)	-0.18***	(0.04)	0.20*** [0.018]	(0.07)
Second job	-0.02	(0.04)	-0.25**	(0.10)	0.27** [0.013]	(0.13)
			Tenure			
New job	-0.10***	(0.03)	0.28***	(0.09)	-0.65*** [0.032]	(0.14)
Tenure in years	0.01***	(0.00)	-0.00	(0.00)	0.02*** [0.033]	(0.00)
			Working environment			
Good working condit.	-0.01	(0.02)	0.16***	(0.03)	-0.22*** [0.027]	(0.07)
Social support	-0.02***	(0.01)	0.00	(0.01)	-0.06** [0.020]	(0.02)
			Other work-related factors			
Job insecurity	0.00	(0.01)	-0.03	(0.02)	0.04 [0.009]	(0.04)
Temporary contract	-0.03	(0.04)	-0.04	(0.06)	-0.02 [0.001]	(0.12)
Work interdependence	0.01	(0.02)	-0.01	(0.04)	0.03 [0.003]	(0.06)
Net income	-0.01**	(0.01)	-0.01	(0.01)	-0.01 [0.012]	(0.02)
Blue collar	0.05	(0.03)	0.14***	(0.05)	-0.03 [0.003]	(0.08)
Size (<10 employees)	(base)		(base)		(base)	
Size (10-49 employees)	0.05	(0.03)	0.06	(0.05)	0.06 [0.005]	(0.11)
Size (50-99 employees)	0.00	(0.03)	-0.08	(0.06)	0.11 [0.007]	(0.13)
Size (100-249 employees)	0.03	(0.04)	-0.07	(0.07)	0.17 [0.009]	(0.16)
Size (>250 employees)	-0.01	(0.03)	-0.04	(0.08)	0.03 [0.002]	(0.14)
Private sector	-0.02	(0.03)	0.01	(0.05)	-0.06 [0.005]	(0.10)
			Sociodemographics			
Sex (female=1)	0.10***	(0.03)	-0.16***	(0.05)	0.48*** [0.044]	(0.09)
Children	0.05	(0.03)	-0.13***	(0.04)	0.30*** [0.027]	(0.10)
Partnership	-0.07***	(0.02)	-0.02	(0.04)	-0.18** [0.015]	(0.08)
Aged 18-24	(base)		(base)		(base)	
Aged 25-34	0.02	(0.07)	0.04	(0.09)	0.01 [0.001]	(0.21)
Aged 35-44	0.01	(0.07)	0.28***	(0.10)	-0.34 [0.028]	(0.23)
Aged 45-54	-0.07	(0.07)	0.50***	(0.09)	-0.86*** [0.069]	(0.23)
Aged > 55	-0.08	(0.08)	0.73***	(0.11)	-1.16*** [0.074]	(0.28)
Elementary education	(base)		(base)		(base)	
Secondary education	-0.03	(0.04)	-0.15**	(0.07)	0.12 [0.011]	(0.14)
Higher education	-0.08*	(0.04)	-0.22***	(0.06)	0.07 [0.006]	(0.13)
			Health status			
# of health problems	0.07***	(0.01)	-0.22***	(0.01)	0.47*** [0.207]	(0.02)
Very good health	(base)		(base)		(base)	
Good health	0.12***	(0.04)	-0.19***	(0.07)	0.58*** [0.052]	(0.11)
Fair health	0.28***	(0.04)	-0.29***	(0.07)	1.15*** [0.085]	(0.16)
(Very) bad health	0.63***	(0.08)	-0.42***	(0.16)	2.30*** [0.063]	(0.36)
N	18953					

Source: 2010-EWCS, own calculations.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Country and industry dummies included, standard errors clustered at the country level in parentheses. Logit model for the inflate part. Number of nonzero obs. 7331, zero obs. 11622. Vuong test $z = 39.93$ (p-value 0.00).

Table 4.3: Robustness checks

	(1) No health		(2) Parsimonious		(3) OLS		(4) EU-27	
				Work autonomy				
Work autonomy	0.28***	(0.05)	0.23***	(0.05)	0.21***	(0.05)	0.28***	(0.05)
Supervisor	0.31***	(0.11)	0.21**	(0.10)	0.35***	(0.11)	0.22**	(0.11)
				Workload				
Usual weekly hours/10	0.35***	(0.07)	0.24***	(0.06)	0.27***	(0.07)	0.29***	(0.06)
Lack of time	0.27***	(0.06)	0.11**	(0.05)	0.15**	(0.06)	0.11**	(0.06)
Unusual working time	0.35***	(0.07)	0.20***	(0.06)	0.16**	(0.07)	0.24***	(0.07)
Second job	0.39**	(0.16)	0.30**	(0.13)	0.29*	(0.17)	0.35***	(0.11)
				Tenure				
New job	-0.70***	(0.13)	-0.69***	(0.14)	-0.67***	(0.14)	-0.64***	(0.16)
Tenure in years	0.02***	(0.00)	0.02***	(0.00)	0.02***	(0.01)	0.02***	(0.00)
				Working environment				
Good working condit.	-0.79***	(0.07)	-0.22***	(0.07)	-0.28***	(0.08)	-0.21***	(0.07)
Social support	-0.12***	(0.03)	-0.06**	(0.03)	-0.07***	(0.03)	-0.07***	(0.03)
				Other work-related factors				
Job Insecurity	0.11**	(0.04)			0.02	(0.05)	0.06	(0.04)
Temporary contract	0.00	(0.12)			0.01	(0.11)	-0.06	(0.14)
Work interdependence	0.20***	(0.05)			-0.01	(0.06)	0.01	(0.06)
Net income	-0.07***	(0.02)			-0.03	(0.02)	-0.02	(0.02)
Blue collar	0.17**	(0.08)			-0.08	(0.07)	-0.04	(0.09)
Size (<10 employees)	(base)				(base)		(base)	
Size (10-49 employees)	0.14	(0.12)			0.09	(0.11)	0.15	(0.12)
Size (50-99 employees)	0.23*	(0.14)			0.12	(0.13)	0.16	(0.15)
Size (100-249 employees)	0.17	(0.18)			0.18	(0.16)	0.23	(0.18)
Size (>250 employees)	0.15	(0.16)			0.07	(0.15)	0.10	(0.15)
Private sector	-0.11	(0.11)			-0.03	(0.10)	-0.02	(0.11)
				Sociodemographics and health status				
Sex (female=1)	0.76***	(0.09)	0.55***	(0.08)	0.49***	(0.10)	0.42***	(0.10)
Children	0.31***	(0.10)	0.30***	(0.10)	0.34***	(0.11)	0.28**	(0.11)
Partnership	-0.22***	(0.08)	-0.17**	(0.08)	-0.18**	(0.09)	-0.17**	(0.08)
Aged 18-24	(base)		(base)		(base)		(base)	
Aged 25-34	0.20	(0.19)	-0.02	(0.21)	-0.07	(0.17)	-0.09	(0.24)
Aged 35-44	0.04	(0.21)	-0.37	(0.23)	-0.46**	(0.21)	-0.40	(0.25)
Aged 45-54	-0.29	(0.21)	-0.90***	(0.24)	-0.99***	(0.21)	-0.90***	(0.26)
Aged > 55	-0.42*	(0.25)	-1.22***	(0.28)	-1.32***	(0.24)	-1.24***	(0.31)
Elementary education	(base)				(base)		(base)	
Secondary education	0.00	(0.15)			0.15	(0.15)	0.22	(0.15)
Higher education	-0.14	(0.17)			0.12	(0.14)	0.17	(0.14)
# of health problems			0.47***	(0.02)	0.52***	(0.03)	0.48***	(0.02)
Very good health			(base)		(base)		(base)	
Good health			0.58***	(0.11)	0.34***	(0.10)	0.58***	(0.12)
Fair health			1.14***	(0.16)	1.02***	(0.18)	1.09***	(0.17)
(Very) bad health			2.30***	(0.35)	3.87***	(0.74)	2.04***	(0.37)
N	18953		18953		18953		16485	

Source: 2010-EWCS, own calculations.* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Except in column (3) average marginal effects from ZINB models; in column (3) coefficient estimates from OLS regression. Standard errors clustered at the country level in parentheses. Country and industry dummies included.

Chapter 5

Sickness absence, presenteeism and work-related characteristics

This chapter investigates how changes in work-related factors affect workers' absence and presenteeism behavior. Previous studies (implicitly) assume that there is a substitutive relationship – specifically, that a change in a work-related factor that decreases the level of absence simultaneously increases presenteeism (or vice versa). We set up a theoretical model in which work-related characteristics not only affect a worker's absence decision but also the critical level of sickness that defines presenteeism. Our model shows that non-substitutive relationships between absence and presenteeism are also conceivable. Using European cross-sectional data, we find only one substitutive and few complementary relationships, while the bulk of the work-related characteristics are related only to one of the two sickness states.

This chapter is joint work with Marco de Pinto.

5.1 Introduction

It is well established that sickness absence and presenteeism – that is, going to work while sick, have negative economic effects through reduced or less productive labour supply (for absence see Pauly et al., 2002, for presenteeism see Pauly et al., 2008). Motivated by this stylized fact, a large number of papers investigate the determinants of absence and presenteeism behaviour. Since most of the studies in this field look only at the determinants of one of the two sickness states, the possibility that the same factor might influence absence *and* presenteeism behaviour at the same time is neglected.[1] Albeit of this lack of empirical evidence on the interrelationship between both sickness states with regards to their determinants, some studies suggest a substitutive relationship between both sickness states. This means that a determinant which reduces absence is assumed to increase presenteeism (and vice versa). This proposition is presented rather implicitly by describing both sickness states as the result of the same decision process (Aronsson and Gustafsson, 2005; Brown and Sessions, 2004) or by deducing hypotheses for determinants of presenteeism negatively from the literature on absence (Bierla et al., 2013). Hence, there is a vague consensus that absence and presenteeism have a substitutive relationship which is neither explicitly theoretically derived, nor comprehensively empirically investigated.

In this chapter, we contribute to the existing literature by analyzing the interrelation between sickness absence and presenteeism in a more explicit and comprehensive manner. This topic is highly relevant for (personnel) managers and policy makers, since it clearly makes a difference whether a measure aimed at reducing absence days is associated with more, unchanged or even fewer presenteeism days. While a decline in absence is an economic improvement (for the manager, but of course also for the society), reducing absence at the cost of more presenteeism could reduce overall productivity, depending on the specific productivity effects of presenteeism (see Schultz and Edington, 2007, for a survey on the productivity effects of presenteeism). On the contrary, economic improvement clearly survives in cases of unchanged or even lower presenteeism. It is thus important to determine how different factors simultaneously affect both sickness states. This is in particular true for factors that managers and

[1] Only three studies investigate both sickness states at once, and these will be discussed in more detail below (Böckerman and Laukkanen, 2009, 2010; Johansson and Lundberg, 2004). In contrast there is a bulk of literature that investigates either sickness absence or presenteeism behaviour. While the former also includes economic studies (for an early survey article, see Brown and Sessions, 1996; for literature using European cross-country data, see Frick and Malo, 2008; Livanos and Zangelidis, 2013; Lusinyan and Bonato, 2007), the latter is mostly from social medicine (Aronsson et al., 2000; Aronsson and Gustafsson, 2005; Böckerman and Laukkanen, 2009; Hansen and Andersen, 2008, 2009; Leineweber et al., 2011; Preisendörfer, 2010).

policy makers can directly influence. In our investigation, we therefore focus on work-related characteristics (e.g. contract type, workload, autonomy and others) which are at least partially under manager's (and to a smaller degree under policy maker's) control and analyse how they are related to absence and presenteeism behaviour.
When investigating the impact of work-related characteristics on sickness absence and presenteeism, we distinguish three possible interrelations between the two sickness states: (i) If a change in one work-related factor leads to a change in absence and presenteeism in the opposite direction, we find a substitutive relationship between both sickness states with respect to this work-related factor. (ii) If a change in one work-related factor implies a change in absence and presenteeism in the same direction, we find a complementary relationship between both sickness states with respect to this work-related factor. (iii) If a change in one work-related factor affects only one of the sickness states while leaving the other constant, we find no relationship between them with respect to this work-related factor. Summing up, we ask whether work-related factors lead to a substitutive, a complementary or no relationship between absence and presenteeism. To find an answer to this question, we proceed with a two-step approach. First, we build a theoretical model that highlights mechanisms through which both sickness states can be affected at the same time. Second, we make use of a rich data set in which indicators for sickness absence and presenteeism are compiled in one survey. With these data at hand, we are able to *simultaneously* analyse determinants of sickness absence and presenteeism and hence take explicitly into account their interdependence.
In our theoretical model, the worker's utility of being attendant negatively depends on their sickness intensity. Accordingly, we can show that if the sickness level of an individual exceeds a certain threshold, she decides to stay at home. Hence, we call this threshold the individual critical level of sickness, which – and this is important – depends (among others) on work-related characteristics (see Brown and Sessions, 2004 for a similar approach). Moreover, we present a formal definition of presenteeism which is narrower than in Chapter 4. The crucial mechanism behind this definition is that a worker's sickness level does not only negatively affect her utility level but also the firm's profit situation. If the worker's sickness level exceeds a certain threshold, it is profit-maximzing for the firm that the worker stays at home. We call this threshold the firm critical level of sickness. Then, presenteeism is defined as a situation where the worker decides to be attendant at the workplace despite the fact that her attendance reduces the firm's profit – in other words, her sickness level is higher than

the firm critical level (compare Chatterji and Tilley, 2002, for a similar definition).[2] Since work-related factors influence the impact of sickness on the firm's profit situation, the firm critical level of sickness and thus presenteeism are also functions of the work-related factors.

There are two benefits from our theoretical analysis. First, we find that the relationship between absence and presenteeism with regard to a work-related characteristic is not necessarily of a substitutive nature, as is commonly assumed in the literature. Indeed, the interrelation of both sickness states is more complex as work-related characteristics do not only affect the worker's absence decision but also the firm's costs of the worker's attendance while sick as stated above. Second, we derive conditions under which work-related factors lead to a substitutive, a complementary or no relationship between sickness absence and presenteeism. These conditions depend on the sign and the magnitude of the changes in the firm and/or the individual critical level of sickness brought about by changes in the work-related characteristics. With this at hand, we are able to identify the underlying mechanism for the variation in sickness absence and presenteeism behaviour, which in particular guides our understanding of the empirical findings.

In our empirical investigation, we estimate the relationship between work-related characteristics and the number of sickness absence and presenteeism days. For that purpose, we use the European Working Conditions Survey (EWCS), a cross-sectional survey which covers 34 European countries. This allows us to relate in OLS regressions 16 different work-related characteristics of more than 18,000 employees to their sickness absence and presenteeism behaviour.[3] Since there is no panel data on presenteeism available, we cannot deliver causal analysis of the interrelation between absence and presenteeism behaviour, but our empirical investigation offers several improvements in other dimensions. First, we comprehensively cover work-related characteristics instead of only two as in Johansson and Lundberg (2004), which reduces omitted variable bias. Second, absence and presenteeism are measured more accurately in numbers of days per year instead of arbitrarily set frequency categories (Johansson and Lundberg, 2004) or incidence measures (Böckerman and Laukkanen, 2009, 2010). A (potentially) substitutive relationship between absence and presenteeism should be felt more strongly when measured in days than in frequency categories or in bi-

[2]Notably, we assume that the firm cannot observe the true sickness level of the individual. Hence, the firm is not able to prevent presenteeism in its workforce.

[3]Specifically, we look at supervisory and blue collar status, temporary contracts, tenure categories, weekly working hours, whether working in a second job and during evenings or weekends, net income, firm size, private sector employment, work interdependence, work autonomy, job insecurity, satisfaction with working conditions, support by coworkers and the management, and time pressure.

nary measures. Third, we use data that is representative for each European country and Europe as a whole instead of samples from Stockholm county (Johansson and Lundberg, 2004) or from Finnish trade union members (Böckerman and Laukkanen, 2009, 2010). Accordingly, our results have better external validity. Finally, covering relationships with both sickness states, we are able to see whether factors reducing absence days come at the price of more presenteeism. This is particularly an advantage over causal studies that investigate moral hazard effects in absence behaviour such as Puhani and Sonderhof (2010) and Ziebarth and Karlsson (2010), since they are not able to discern whether the changed moral hazard effect entails changes in presenteeism. Hence, their normative conclusions must be taken cautiously.

The main results are as follows: (i) We find that only one work-related factor (namely the supervisor status) leads to a substitutive relationship between absence and presenteeism. This finding casts doubt on the predominant view in the literature that both sickness states are interlinked in a substitutive manner. (ii) There are only two work-related factors (namely working conditions and tenure) which lead to a complementary relationship between absence and presenteeism. While an improvement of working condition is accompanied with a reduction of both absence and presenteeism, an increase in tenure is positively correlated with both sickness states. (iii) The bulk of the considered work-related characteristics is only related to one of the two sickness states while leaving the other unchanged. From a managerial and policy perspective, this shows that it is possible to reduce absence without negative side-effects on presenteeism or to reduce presenteeism without the threat of higher absence. The former case could be interpreted as a situation in which the absence is – at least partially – not due to health problems. According to our results, this can be observed in the public sector, in large firms and for employees with an open-ended contract. Our results are robust against count data models and in differently defined subsamples.

How can we explain these results? Our theoretical model shows that if a change in a work-related factor only influences the absence/attendance decision of individuals and hence the individual critical level of sickness, absence and presenteeism are indeed substitutes with respect to the changing factor. To put it differently, both sickness states are then determined by the same decision process – as is also argued in the literature (see above). But since this substitutive relationship is rarely observed in the empirical investigation, there must be a second channel through which at least one sickness state is affected. Taking up the lessons from our model, this channel is given by the influence of work-related factors on the firm critical level of sickness which in turn defines presenteeism. Hence, our theoretical model is able to explain

the none-substitutive relationships between sickness absence and presenteeism thanks to the endogenous firm critical level of sickness, which is its major innovation.

Regarding the related literature, there are few studies empirically looking at both sickness states and even fewer focusing on the interrelation between them. Two Finnish studies investigate work-related determinants of both sickness states, but they do not focus on their interrelation and use binary measures for both sickness states (Böckerman and Laukkanen, 2009, 2010). In their first study, Böckerman and Laukkanen (2009) find that only few determinants are related to both sickness states, be it complementary as shift work or substitutive as regular overtime. Only one of the two variables of interest is related to both sickness states in their follow-up study (Böckerman and Laukkanen, 2010), while the other is only correlated with presenteeism. The match between desired and actual working hours is associated with less sickness absence and presenteeism, whereas a strong emphasis of efficiency in the work place increases presenteeism. However, the data set used is not representative for the Finish workforce since it comprises only a small sample of Finnish trade union members.

Johansson and Lundberg (2004) is the only study that explicitly investigates the substitution between sickness absence and attendance, which they refer to as 'illness flexibility'. Contrary to their expectations, presenteeism and absence have only a substitutive relationship with regards to attendance requirements, but not with regards to adjustment latitude (the possibility to adjust work effort when ill). The latter is positively related to the frequency of sickness absence for females, while not affecting presenteeism. There are several differences in regards to our study. First, they exclude all respondents that report neither absence nor presence behaviour since they want to investigate the decision between absence and presence behaviour ('illness flexibility'). This sample selection could lead to biased estimates, if the excluded observations are systematically related to the explanatory variables, which is quite likely. Second, their dependent variable is measured in four vaguely defined ordinal categories (never, once, a few times, many times). Finally, controlling only for age, health, financial situation and family demands, the authors do not convincingly address potential omitted variable bias.

In addition, this chapter is also related to the theoretical analysis on sickness absence and presence behaviour by Brown and Sessions (2004). In this study, the authors enhance the Barmby et al. (1994) model of absenteeism by including sickness presenteeism into their shirking model. While our model is inspired by their model, we depart in three ways. We do not focus on shirking and detection technology since

we cannot directly discern shirking from legitimate absence in our data. More importantly, we expand their model by defining presenteeism through the firm critical level of sickness. Finally, we focus on the interrelation between sickness absence and presenteeism, which is not done in their study.
The remainder of this chapter is structured as follows. In Section 5.2, we present our theoretical model and derive conditions for the existence of a substitutive, a complementary or no relationship between sickness absence and presenteeism. The empirical analysis is conducted in Section 5.3. Section 5.4 concludes.

5.2 Theoretical model

5.2.1 Preliminaries

In this section, we build a model that formalizes the absence/attendance decision of individuals and shows under which conditions presenteeism is conceivable. There are three properties of our model. First, we consider the behaviour of individual i who is employed at firm j. By assumption, there is a contract between both which specifies the wage rate $w_{ij} > 0$ and the working hours per day $h_{ij} > 0$. In addition to individual i, the firm employs an exogenously given number of individuals $N_{-i,j}$.
Second, we assume that the employment relationship between individual i and firm j is characterized by several work-related factors, such as tenure, contract type and others, which are the focus of our investigation. In order to keep our framework as general as possible, we use X_{ij} as a vector that subsumes all relevant work-related factors in the employment relationship between i and j.
Third, the individual is confronted with health shock δ_i. We assume that δ_i is randomly distributed over the interval $[0, 1]$ with the density $f(\delta_i)$ and increases in the severity of sickness (see Brown and Sessions, 2004, for a similar approach). Since the health state has an impact on the worker's utility, she decides conditional on δ_i whether she will be absent from the workplace (absence) or attendant at the workplace (attendance). There is an individual critical level of sickness, $\widetilde{\delta}_{ij}$, at which she is indifferent between absence and attendance. If the revealed health state exceeds (falls short of) $\widetilde{\delta}_{ij}$, the individual is absent (attendant). Notably, we assume that δ_i is private information to the individual i.
The timing structure of our model is as follows: First, individual i and firm j sign a contract. Second, the individual formulates a decision rule for being attendant or absent – that is, determines the threshold level $\widetilde{\delta}_{ij}$. Third, the realization of the health

shock is drawn, and the individual goes to work or stays at home in accordance with the formulated decision rule. We exclude the possibility of re-contracting after the state of health is revealed. Finally, production takes place. Note that the health shock recurs on a daily basis, implying that the individual renews her absence/attendance decision every day.

5.2.2 Absence/attendance decision

Under which conditions does individual i decide to be absent (attendant) from (at) the workplace? To find the answer to this question, we first have to introduce the individual's utility functions. For notational simplicity, we drop the indizes i and j in the following.

The individual's realized utility can either be U^h in the case of attendance or U^a in the case of absence. Formally, we assume:

$$U^h = (1-\delta) \cdot u^h \left(w, T-h, X\right), \tag{5.1}$$

$$U^a = u^a \left(s, T, X\right), \tag{5.2}$$

where T stands for the individual endowment in time and s $(0 \leq s \leq w)$ denotes the exogenously given firm-financed sick pay which the individual receives in the case of absence. The sub-utility functions u^h and u^a are concave in w, $(T-h)$, s and T with $\partial u^h/\partial w > 0$, $\partial u^h/\partial (T-h) > 0$, $\partial u^a/\partial s > 0$ and $\partial u^a/\partial T > 0$. Note further that the higher the level of sickness δ, the lower the utility of being attendant. Intuitively, an increasing δ implies a rise in the worker's disutility of working, and thus the overall utility of being attendant drops.[4]

Regarding the vector X, the sign of the partial derivatives depends on the respective work-related factor. For example, if job insecurity increases, u^h might decline, while the reverse could be true in the case of an improvement in working conditions. In addition, we assume $u^h \neq u^a$ so that work-related factors can influence the utility of being attendant and of being absent with different sign and intensity.

With this at hand, we can derive the individual critical level of sickness, $\widetilde{\delta}$, at which the individual is indifferent between attendance or absence. Formally, this requires

[4]Since we are interested in explicitly deriving the individual critical level of sickness $\widetilde{\delta}$ (see below), we model the health state as an additive-separable argument in (5.1). The alternative approach – that is, using the implicit form $u^h(\delta)$ with $\partial u^h(\delta)/\partial \delta < 0$, makes it impossible to calculate $\widetilde{\delta}$ in an explicit form.

$U^h(\delta = \widetilde{\delta}) = U^a$. Using (5.1) and (5.2), we obtain:

$$\widetilde{\delta} = 1 - \frac{u^a(s, T, X)}{u^h(w, T - h, X)}, \tag{5.3}$$

where we assume that $0 \leq u^a(s, T, X) \leq u^h(w, T - h, X)$ holds in order to ensure $0 \leq \widetilde{\delta} \leq 1$. Intuitively, this condition should hold in any cases because otherwise the individual would never be attendant at the workplace and the contract would be thus misspecified. After the health state δ of the individual is revealed, she chooses to be attendant on this day if $\delta \leq \widetilde{\delta}$ holds; otherwise ($\delta > \widetilde{\delta}$), she chooses to be absent. Recall that this decision is made on a daily basis since the health shock takes place every day. Note also the individual critical level of sickness $\widetilde{\delta}$ (and thus her attendance-absence decision) depends on X, implying that it is influenced by work-related factors.

Since the individual knows her critical level of sickness $\widetilde{\delta}$ before the health state is revealed, it is possible to calculate the probability that the individual will be absent from the work-place on a given day. Formally, the probability of absence is given by $A = \Pr(\widetilde{\delta} < \delta < 1) = F(\widetilde{\delta} < \delta < 1)$, where $F(\delta)$ denotes the distribution function of δ. Using the simplifying assumption of a uniform distribution[5] $F(\delta) = \delta$, we obtain:

$$A = 1 - \widetilde{\delta}. \tag{5.4}$$

Eq. (5.4) shows that if the individual critical level of sickness increases (decreases), the probability of being absent on a given day decreases (increases). Of course, the probability of being attendant on a given day is simply given by $H = 1 - A$.

5.2.3 Presenteeism

So far, we have analysed the consequences of the health shock on the individual's utility and derived her absence/attendance decision. One conclusion is that in the case of a relatively high individual critical sickness level $\widetilde{\delta}$, it is possible that the individual chooses to be attendant at the workplace despite a relatively bad realization of the health shock – in other words, a high δ. Such a scenario is described by presenteeism in the literature, where individuals work despite the fact that they are sick (see Brown and Sessions, 2004; Chatterji and Tilley, 2002).

In this subsection, we use our model to give a formal definition of presenteeism which

[5]We use the uniform distribution in order to hold our model as simple as possible. Note that our qualitative results are not affected by this assumption. If we would use instead the general form of the distributional function $F(\delta)$, our qualitative findings would hold since we have $\partial F/\partial \delta > 0$.

is narrower than in Chapter 4. The crucial mechanism is that the health state of the individual also has an impact on the firm's profit situation. As we will show below, the firm's profit decreases in the level of the individual's sickness in the case of her attendance. This might be through the reduced productivity of the worker itself but also due to its effects on others – for example, team production or infection of co-workers. If the sickness level of the individual δ exceeds a certain threshold denoted by $\overline{\delta}$, it is profit-maximzing for the firm that the individual is absent. Hence, we call the threshold $\overline{\delta}$ firm critical level of sickness in the following. Importantly, this firm critical level of sickness depends on the work-related characteristics since the impact of sickness on profits differs between different jobs and is hence a function of the vector X.

To formally calculate $\overline{\delta}$, we have to specify the firm's profit function. We define Π^h as the firm's profit in the case of the individual's attendance, while Π^a stands for the profit in the case of the individual's absence. For both, we assume, respectively:

$$\Pi^h = (1 - \delta) \cdot \pi^h (h, w, X, Y) \geq 0, \tag{5.5}$$

$$\Pi^a = \pi^a(s, X, Y) > 0. \tag{5.6}$$

The variable $Y > 0$ stands for the profit which the firm earns through the employment of the other N workers – that is, without the consideration of individual i. The sub-profit functions π^h and π^a are concave in their arguments with $\partial\pi^h/\partial h > 0$, $\partial\pi^h/\partial w < 0$, $\partial\pi^h/\partial Y > 0$, $\partial\pi^a/\partial s < 0$ and $\partial\pi^a/\partial Y > 0$. The sign of the partial derivatives of X depends (as for the utility functions) on the specific work-related factor considered. We also assume $\pi^h \neq \pi^a$ to capture the fact that the same work-related factor might have a different impact on the firm's profit in the case of attendance than in the case of absence.

Importantly, Π^h is a negative function of the individual's sickness level δ. One explanation is that an increasing sickness level has a negative effect on the individuals's productivity – particularly in the future due to a lack of recuperation (cf. Bergström et al., 2009) – which in turn decreases the firm's profit. It can also be the case that the sickness of individual i creates negative externalities either through infection of other employees (Barmby and Larguem, 2009) or through production interdependencies (team production), which also reduces the firm's profit (Pauly et al., 2008). Note that the formulation in (5.5) pushes this argument to the extreme: If the individual

has the highest level of sickness, $\delta = 1$, the firm's profit drops to zero.[6]
With this at hand, we can compute the firm critical level of sickness $\overline{\delta}$ at which the firm is indifferent in regards to the individual's attendance or her absence. Formally, this requires $\Pi^h(\delta = \overline{\delta}) = \Pi^a$. Inserting (5.5) and (5.6) yields:

$$\overline{\delta} = 1 - \frac{\pi^a(s, X, Y)}{\pi^h(h, w, X, Y)}, \tag{5.7}$$

where we assume that $\pi^a(s, X, Y) \leq \pi^h(h, w, X, Y)$ holds to ensure that $0 < \overline{\delta} \leq 1$. There is also an economic justification for this condition, since an employment contract should be specified in a way that attendance increases profits if the employee is healthy ($\delta = 0$); otherwise, the contract would not have been concluded in the first place. Recall the interpretation of the firm critical level of sickness: If $\delta \leq \overline{\delta}$ holds, the attendance of the individual is desired; otherwise ($\delta > \overline{\delta}$), the firm prefers the absence of the individual. Note that the firm cannot observe δ due to our assumption that this is the individual's private information.
Given the individual critical level of sickness $\widetilde{\delta}$ and the firm critical level of sickness $\overline{\delta}$, we are able to give a formal definition of presenteeism. Suppose that $\widetilde{\delta} > \overline{\delta}$ holds and that the realized health state of the individual lies in the interval $\overline{\delta} < \delta < \widetilde{\delta}$. As a consequence, she chooses to be attendant at the workplace since δ is smaller than her critical level of sickness. From the firm's perspective, the individual is sufficiently sick and should therefore stay at home. We define this situation ($\overline{\delta} < \delta < \widetilde{\delta}$) as *presenteeism* of the individual. Recall that there is a daily health shock, implying that we measure presenteeism on a daily basis.
Similar to the absence/attendance decision, we can also compute the probability of presenteeism on a given day. In general, this is given by $P = \Pr(\overline{\delta} < \delta < \widetilde{\delta}) = F(\overline{\delta} < \delta < \widetilde{\delta})$. Again using $F(\delta) = \delta$, we obtain:

$$P = \widetilde{\delta} - \overline{\delta}. \tag{5.8}$$

Finally, suppose that instead $\widetilde{\delta} < \overline{\delta}$ holds. Then, a health shock realization of $\widetilde{\delta} < \delta < \overline{\delta}$ implies that the individual chooses to be absent, while she is not sufficiently sick from the firm's perspective and should therefore be attendant. We define this situation as *absenteeism* of the individual. Note, however, that in a situation where absenteeism is possible – that is $\widetilde{\delta} < \overline{\delta}$, there is no presenteeism by definition.

[6] An alternative modeling approach would be to assume that π^h depends directly on δ: $\partial \pi^h / \partial \delta < 0$. However, we then would not be able to find an explicit solution for $\overline{\delta}$. Thus, we use the formulation in (5.5) throughout.

5.2.4 Substitutes, complements or neither

Our model shows that the probabilities of absence and of presenteeism depend on the individual critical level of sickness $\widetilde{\delta}$ and on the firm critical level of sickness $\overline{\delta}$ [see (5.4) and (5.8)]. In turn, $\widetilde{\delta}$ and $\overline{\delta}$ are affected by variations in work-related factors which are summarized in the vector X [see (5.3) and (5.7)]. Hence, we can use our model to shed light on the following question: How does a variation in a work-related factor – holding everything else constant – influence *both* the probability of absence and the probability of presenteeism per day?

Suppose that one particular work-related factor included in the vector X changes and denote this factor as $x \in X$. In general, we can distinguish three cases. First, the variation of x implies a decrease (increase) in the absence probability, while the probability of presenteeism increases (decreases). Then, a change in x leads to a substitutive relationship between absence and presenteeism. Second, the change in x leads to an increase (or decrease) in both the absence and the presenteeism probability. Then, the change in x entails a complementary relationship between absence and presenteeism. Third, the variation in x is associated with a change (no change) in the probability of absence, while the probability of presenteeism remains constant (changes). Then, x leads neither to a substitutive nor a complementary relationship between presenteeism and absence.[7]

To determine under which conditions a change in work-related factor x leads to a substitutive, a complementary or no relationship between absence and presenteeism, recall first that variations of x influence $\widetilde{\delta}$ and $\overline{\delta}$. Using (5.4), we can show that the probability of absence increases (decreases) when $\widetilde{\delta}$ decreases (increases):

$$dA = \underbrace{\frac{\partial A}{\partial \widetilde{\delta}}}_{=-1} d\widetilde{\delta} > (\leq)\, 0 \Leftrightarrow d\widetilde{\delta} < (\geq)\, 0. \tag{5.9}$$

Regarding the probability of presenteeism, (5.8) indicates that changes in $\widetilde{\delta}$ and $\overline{\delta}$ influence P. If $d\widetilde{\delta} < 0$ (and thus $dA > 0$) holds, we get:

$$dP = \underbrace{\frac{\partial P}{\partial \widetilde{\delta}}}_{=1} \underbrace{d\widetilde{\delta}}_{<0} + \underbrace{\frac{\partial P}{\partial \overline{\delta}}}_{=-1} d\overline{\delta} < (\geq)\, 0 \Leftrightarrow d\overline{\delta} \geq 0 \text{ or } d\widetilde{\delta} < d\overline{\delta} < 0 \ (d\overline{\delta} \leq d\widetilde{\delta} < 0). \tag{5.10}$$

[7] Note that we use the statement "absence and presenteeism are substitutes (complements) with respect to the changing work-related factor" as a synonym for case 1 (2). In the third case, we also formulate that "absence and presenteeism are neither substitutes nor complements with respect to the changing work-related factor".

If $d\widetilde{\delta} \geq 0$ (and thus $dA \leq 0$) holds, we find:

$$dP = \underbrace{\frac{\partial P}{\partial \widetilde{\delta}}}_{=1} \underbrace{d\widetilde{\delta}}_{\geq 0} + \underbrace{\frac{\partial P}{\partial \overline{\delta}}}_{=-1} d\overline{\delta} > (\leq) 0 \Leftrightarrow d\overline{\delta} \leq 0 \text{ or } 0 < d\overline{\delta} < d\widetilde{\delta} \; (0 < d\widetilde{\delta} \leq d\overline{\delta}). \quad (5.11)$$

With these conditions at hand, we obtain the following propositions.

Proposition 1 *Presenteeism and absence are substitutes with respect to a work-related factor x (i) if the variations in $\widetilde{\delta}$ and $\overline{\delta}$ are oppositional or (ii) if the changes of $\widetilde{\delta}$ and $\overline{\delta}$ have the same sign but the (absolute) change in $\overline{\delta}$ is sufficiently weak.*

Proof. A substitutional relationship requires $dA > (<)0$ and $dP < (>)0$. From (5.9), we obtain $dA > (<)0 \Leftrightarrow d\widetilde{\delta} < (>)\, 0$. For $d\overline{\delta} \geq (\leq)0$, (5.10) and (5.11) show that $dP < (>)0$ holds, which proves part (i) of the proposition. Eqs. (5.10) and (5.11) indicate that $dP < (>)0$ also holds if the absolute change in $\overline{\delta}$ is lower than the absolute change in $\widetilde{\delta}$: $d\widetilde{\delta} < d\overline{\delta} < 0$ $(0 < d\overline{\delta} < d\widetilde{\delta})$. This proves part (ii) of the proposition. ■

Proposition 2 *Presenteeism and absence are complements with respect to a work-related factor x if the changes in $\widetilde{\delta}$ and $\overline{\delta}$ have the same sign and the (absolute) change in $\overline{\delta}$ is sufficiently strong.*

Proof. A complementary relationship requires $dA > (<)0$ and $dP > (<)0$. Eq. (5.9) implies that $dA > (<)0 \Leftrightarrow d\widetilde{\delta} < (>)\, 0$. Observing (5.10) and (5.11), we find that $dP > (<)0$ holds if the absolute change in $\overline{\delta}$ is higher than the absolute change in $\widetilde{\delta}$: $d\overline{\delta} < d\widetilde{\delta} < 0$ $(0 < d\widetilde{\delta} < d\overline{\delta})$. ■

Proposition 3 *Presenteeism and absence are neither substitutes nor complements with respect to a work-related factor x (i) if $\widetilde{\delta}$ remains constant while $\overline{\delta}$ changes or (ii) if the changes in $\widetilde{\delta}$ and $\overline{\delta}$ are identical.*

Proof. There is no relationship between absence and presenteeism if $dA = (\neq)0$ and $dP \neq (=)0$ holds. From (5.9), we obtain $dA = (\neq)0 \Leftrightarrow d\widetilde{\delta} = (\neq)\, 0$. Given $d\widetilde{\delta} = 0$, Eqs. (5.10) and (5.11) imply that $dP \neq 0 \Leftrightarrow d\overline{\delta} \neq 0$, which proves part (i) of the proposition. If $d\widetilde{\delta} \neq 0$ holds, we see from (5.10) and (5.11) that $d\widetilde{\delta} = d\overline{\delta}$ must hold in order to ensure $dP = 0$, which proves part (ii) of the proposition. ■

These findings are based on the assumption $\widetilde{\delta} > \overline{\delta}$. However, it can be the case that the reverse relation is true: $\widetilde{\delta} < \overline{\delta}$. As discussed in the previous subsection,

there is then no presenteeism by definition, and we normalize its probability to zero: $dP \equiv 0 \Leftrightarrow \widetilde{\delta} < \overline{\delta}$. Note that in this scenario, the probability of absenteeism is positive. Hence, we arrive at the following proposition:

Proposition 4 *Presenteeism and absence are neither substitutes nor complements with respect to a work-related factor x if $\widetilde{\delta} < \overline{\delta}$ holds.*

Summing up, there are three lessons from our model. First, the absence/attendance decision is solely determined by the individual critical level of sickness. Second, we find that presenteeism is determined by both the individual- *and* the firm critical level of sickness since the health state of an individual also affects the firm's profit. Third, we show analytically under which conditions a change in work-related factor x implies a substitutional, a complementary or no relationship between absence and presenteeism. This result is particularly interesting since the literature on presenteeism (implicitly) assumes that the relationship between both is substitutional (see Aronsson and Gustafsson, 2005; Bierla et al., 2013; Brown and Sessions, 2004; Johansson and Lundberg, 2004). In our theoretical analysis, we have shown that it is not obvious whether a change in a work-related factor implies a substitutional, a complementary or no relationship between absence and presenteeism. In the end, such a classification is primarily an empirical question, to which we turn in the following section.

5.3 Empirical analysis

5.3.1 Data and empirical strategy

To analyse the impact of work-related characteristics on the relationship between absence and presenteeism empirically, we use the fifth wave of the EWCS, a repeated cross-sectional survey on working conditions in Europe. The EWCS is conducted every five years by an agency of the European Union and profits from a single questionnaire guaranteeing consistent data across countries. In 2010, the EWCS covered for the first and only time an item on *sickness presenteeism* and is hence the first large-scale survey integrating information about sickness absence and presenteeism behaviour. It comprises the population aged 15 and above living in 34 European countries. In our investigation, we consider employees aged 18-65 years who have been employed during the last 12 months prior to the interview and who have been working at least 10 hours per week, excluding the self-employed, students, apprentices, and employees

without work contracts.[8]

As the dependent variable in both sickness dimensions, we prefer the annual duration over incidence or frequency measures for two reasons. First, the impact of sickness on productivity depends much more on the annual duration than on the incidence or frequency of the two sickness states. Second, the substitutive and complementary impact of a work-related characteristic on absence and presenteeism is mostly felt at the intensity of both sickness dimensions.

The sickness absence item reads as follows: *"Over the past 12 months how many days in total were you absent from work for reasons of health problems?"* The sickness presenteeism item asks: *"Over the past 12 months did you work when you were sick? a) Yes b) No. If yes, how many working days?"* These two items have major advantages compared to those which are widely used in the literature. On the one hand, asking for the number of sickness presenteeism and absence days in an open question is less prone to biased responses than offering predefined frequency categories as done by Johansson and Lundberg (2004). On the other hand, they fit well with our model where daily absence decisions can be explained. The annual number of days in our empirical investigation can be seen as the aggregated realization of daily absence decisions in the model. Since the aggregation has no influence on the decision of individuals per day due to the assumption of a daily health shock, we can use the derived proposition as the economic intuition behind our results from the empirical investigation.[9] Note that we disregard outliers – that is, those with either more than 50 sickness presenteeism or 100 absence days within 12 months, resulting in a loss of around 200 observations. However, the central results do not depend on this sample selection (see robustness checks). In total, the number of observations amounts to 18,447.

The descriptive statistics show that sickness absence and presenteeism is a widespread and quantitatively relevant phenomenon in Europe (Table 5.1). The average number of sickness presenteeism and absence days amounts to 2.4 and 5.3, respectively. The conditional means amount to almost seven presenteeism days and more than ten absence days. The distribution of the conditional sickness presenteeism and absence days is shown in Figure 1.

[8]The sample covers all 27 European Union member states, Albania, Croatia, Kosovo, Macedonia, Montenegro, Norway, and Turkey. Note further that we disregard employees unrealistically claiming to work more than 80 hours per week. The results are not sensitive to the exclusion of either those working less than 10 or more than 80 hours per week.

[9]One remark: In our model, presenteeism was defined by a situation where the individual chooses to be attendant despite the fact that her sickness level exceeds the firm critical level of sickness. If we adopt our model to the EWCS presenteeism item, "work when you were sick" means that the individual worked despite the fact that she was sufficiently sick from the firm's perspective.

[Figure 1 about here.]

Since we are interested in the relationship between work-related characteristics and absence/presenteeism, we have to select specific work-related characteristics and cover them empirically. In our cross-sectional model, this selection of explanatory variables is key and must be done as comprehensively as possible. Therefore, we guide our choice by the literature on sickness absence behaviour (Frick and Malo, 2008; Livanos and Zangelidis, 2013; Puhani and Sonderhof, 2010; Ziebarth and Karlsson, 2010), by the results from Chapter 4 and by the literature on sickness presenteeism (Aronsson et al., 2000; Aronsson and Gustafsson, 2005; Böckerman and Laukkanen, 2009, 2010; Hansen and Andersen, 2008; Leineweber et al., 2011; Preisendörfer, 2010).
Among the work-related variables, we include rather formal job characteristics such as supervisory and blue collar status, temporary contracts, tenure categories (1-2 years, 3-14 years, $\geq$ 15 years), weekly working hours, whether working in a second job and during evenings or weekends (unusual working time), net income (21 ordinal categories), firm size, industry (modified NACE-17 classification) and sector information (private sector). Additionally, we take the more subjective properties of a job into account such as work interdependence, work autonomy, job insecurity, satisfaction with working conditions, support by co-workers and the management, and time pressure (lack of time to get work done).[10] The corresponding descriptive statistics are provided in Table 5.1.

[Table 5.1 about here.]

Besides the work-related characteristics, we control for sociodemographic variables and health status. As sociodemographic variables, we include sex (female=1), having children, living with a partner, age categories (aged 18-24, 25-34, 35-44, 45-54, and 55-65 years), and educational status (primary, secondary and higher education status). The health status is taken into account by four subjective categories (very good, good, fair and, finally, bad and very bad in one category) and an objective index measuring the number of different kinds of health problems from which the respondent has suffered during the last 12 months.[11] Although the generosity of sick pay entitlements

[10]Work interdependence indicates whether work speed depends on other employees, and job insecurity measures the likelihood of loosing one's job within six months on a five point Likert scale. Work autonomy is captured by an index measuring the number of autonomy dimensions in which the employee has control – specifically, work order, methods and speed. The other subjective variables are measured on different Likert scales.

[11]Regarding the subjective measure, we integrated the two worst categories into one single category

is crucial for absence behaviour (Frick and Malo, 2008; Puhani and Sonderhof, 2010; Ziebarth and Karlsson, 2010), we prefer including country dummies, which is a better way to account for aggregated country differences (labour market institutions, social norms, health care and other country-specific effects) in cross-sectional data sets.

To find out whether a change of a work-related factor implies a substitutive, complementary or no relationship between sickness presenteeism and absence, we investigate separately how they are related to the number of presenteeism and absence days and classify them accordingly.

A substitutive relationship between presenteeism and absence days is given if a work-related factor leads to an opposite change in these two sickness states. For a complementary relationship between presenteeism and absence days, a work-related factor affects both sickness states at the same time either positively or negatively. Finally, if a work related factor is either significantly related to sickness presenteeism *or* absence, its relationship is neither substitutive nor complementary.

For that purpose, we investigate the relationship between the work-related characteristics and the number of presenteeism and absence days by estimating OLS regression models with cluster adjusted standard errors at the country level. Since there is no panel data on presenteeism available at the moment, we can offer only cross-sectional correlations which should be kept in mind when interpreting the ensuing results. Despite having a count data structure with excess zeros, we prefer OLS to count data models since they are less contingent on distributional assumptions and easier to interpret (for count data models, see Cameron and Trivedi, 1998, pp. 59ff.). Particularly, assuming an average linear relationship between independent and dependent variable, OLS models make it easier to draw a general picture with regards to a substitutive, a complementary or no relationship than count data models where there might be different effects at different points on the distribution. To be sure that our results do not depend on this simplifying assumption, we present a zero-inflated negative binomial regression model (ZINB) as a robustness check.

since only 0.2 percent of the sample claimed to have a very bad health status. The health problems include: hearing problems; skin problems; backache; muscular pain in shoulders, neck and/or upper limbs; muscular pain in lower limbs; headaches and eyestrain; stomach ache; respiratory difficulties; cardiovascular diseases; injuries; depression or anxiety; overall fatigue and insomnia or general sleeping problems. Using dummy variables for each of these health problems instead of the their number did not improve the fit of the model while leaving the main results unchanged and was hence discarded. The corresponding results are available upon request.

The econometric model reads as follows:

$$\begin{aligned}\text{absence/presenteeism days}_i = \alpha_0 + \mathbf{work\,characteristics}_i' \boldsymbol{\alpha_1} + \mathbf{health\,status}_i' \boldsymbol{\alpha_2} \\ + \mathbf{sociodemographics}_i' \boldsymbol{\alpha_3} + \mathbf{country}_i' \boldsymbol{\alpha_4} + \epsilon_i.\end{aligned}$$

Here, presenteeism/absence days$_i$ indicate the number of days either spent at work while being sick or absent during 12 months for individual i. $\mathbf{work\,characteristics}_i$, $\mathbf{health\,status}_i$ and $\mathbf{sociodemographics}_i$ represent the different vectors of independent variables. In order to account for country-specific effects, we include country dummies, and ϵ_i is the error term.

5.3.2 Predictions

Before we turn to the results of our empirical investigation, let us look at some expectations regarding the relationship between sickness presenteeism and absence with respect to the considered work-related characteristics. As stated above, the literature on sickness presenteeism often argues that changes in work-related factors lead to a substitutive relationship between presenteeism and absence (Aronsson and Gustafsson, 2005; Bierla et al., 2013; Brown and Sessions, 2004; Johansson and Lundberg, 2004). In an extreme interpretation of this, the choice between both sickness states is simply a zero-sum game. However, the results of our theoretical model (Propositions 1-4) are at odds with this view. There is clear theoretical evidence that, for example, a change in a work-related factor can also increase both sickness states at the same time. Whether the relationship is substitutive, complementary or simply non-existing depends on the relative changes of the individual critical level of sickness $\widetilde{\delta}$ and the firm critical level of sickness $\overline{\delta}$.

This conclusion establishes a second way to find predictions, which consists of two steps: (i) Derive expectations for the sign and the magnitude of changes in $\widetilde{\delta}$ and $\overline{\delta}$ for each covered work-related factor. (ii) Adopt the results summarized in Propositions 1-4 to formulate a prediction as to whether this variation is associated with a substitutive, a complementary or no relationship between absence and presenteeism. Concerning step 1, we make use of the fact that changes in the individual critical level $\widetilde{\delta}$ determine individuals' absence behaviour [see (5.4)]. Hence, the sign of changes in $\widetilde{\delta}$ can be deduced from the empirical literature on absence behaviour with regards to the considered work-related characteristics.[12] In contrast, changes in the firm critical

[12]We consulted Frick and Malo (2008) regarding firm size, private sector, and income; Puhani and Sonderhof (2010) regarding tenure, firm size, income and blue collar; Goerke and Pannenberg (2012) regarding work autonomy, firm size, blue collar and income; Störmer and Fahr (2012) regarding

level of sickness $\overline{\delta}$ are driven by the relation between the profit in the case of the employee's absence and the profit in the case of his or her attendance. According to the literature (Pauly et al., 2008; Nicholson et al., 2006), the cost of absence ($\pi^a - \pi^h$ in our model) depends on three characteristics: i) the degree of team-oriented production versus individual-oriented production, ii) costs and availability of substitutes and iii) the magnitude of penalty associated with output shortfalls. Following these criteria, we categorize the work-related factors as favourable (implying an increase in $\overline{\delta}$) or unfavourable (implying a decrease in $\overline{\delta}$) to the worker's attendance.[13] Unfortunately, the literature does not provide any indicators to derive the magnitude of the changes in $\widetilde{\delta}$ and $\overline{\delta}$. In addition, even the sign of these changes remains unclear in some cases. Table 5.2 summarizes our predictions.

[Table 5.2 about here.]

Without knowing the magnitude of the changes in $\widetilde{\delta}$ and $\overline{\delta}$, step 2 – the adoption of our model – implies that we cannot predict whether or not absence and presenteeism are complements with respect to the changing work-related factor. However, as stated in Proposition 1, it is nevertheless possible to predict a substitutive relationship. The sufficient condition for this is that the changes in $\widetilde{\delta}$ and $\overline{\delta}$ are oppositional, irrespective of their magnitude. Therefore, we expect a variation in job insecurity and temporary contracts to lead to a substitutive relationship between both sickness states.

5.3.3 Econometric results

The regression outcomes are depicted in Table 5.3, in which we present the determinants of absence and presenteeism days in columns (1) and (2), respectively. As our first result, we find that the supervisor is the *only* work-related variable that leads to a substitutive relationship, with more presenteeism days at the expense of absence days. This is a very remarkable finding because it is at odds with the common view in the literature that employees' choice between absence and presenteeism is a zero-sum game. Furthermore, it contradicts our expectations that sickness absence and presenteeism are substitutes with respect to perceived job security and temporary contracts.

firm size, tenure and temporary contract and Livanos and Zangelidis (2013) regarding second job. Finally, with regard to some work-related characteristics, we do not find a clear expectation from the literature. This is the case for tenure, work load (weekly hours and lack of time), social support, income, work interdependence and unusual working time.

[13] For some variables, these three dimensions point to counteracting effects with regard to the profit situation in the case of attendance (good working conditions, private sector, social support, firm size, blue collar and work autonomy), or their impact on profits is a priori not clear (weekly hours, tenure and second job).

What are the consequences of the observed lack of substitutive relationships between both sickness states with respect to work-related factors? To answer this question, we use our model presented in the previous section. On the one hand, we see from Proposition 1 that a substitutive relationship requires a sufficiently weak or no change in the firm critical level of sickness $\overline{\delta}$. On the other hand, we see from Propositions 2 and 3 that a complementary or no relationship crucially depends on the change in $\overline{\delta}$. If this variation is sufficiently strong, we obtain a complementary relationship. If this change is identical to the variation in the individual critical level of sickness $\widetilde{\delta}$, there is no relationship. This is also true if $\widetilde{\delta}$ remains constant while $\overline{\delta}$ changes.
Therefore, the combination of our model's results and the first empirical finding (only one substitutive relationship) suggests that the firm critical level of sickness plays an important role for the interdependence between sickness absence and presenteeism. This also implies that the idea of a fixed-sized number of unprodctive sickness days that can be differently shared between absence and presenteeism is too simple and that the definition of sickness itself can be influenced by work-related factors via the firm-critical level as well. The endogenous firm critical level of sickness is, thus, the major innovation of our model compared to that of Brown and Sessions (2004). Regarding the work-related factor of supervisor, our model allows another corollary: Proposition 1 in connection with the empirical result suggests that the difference between supervisors and non-supervisors with regards to their individual critical level of sickness $\widetilde{\delta}$ is positive and larger than that with regard to their firm critical levels $\overline{\delta}$. This implies that supervisors differ more strongly in their absence decision than in their impact on profits from non-supervisors.

[Table 5.3 about here.]

The second result of our empirical investigation is that only a few complementary relationships exist between absence and presenteeism days with respect to work-related factors.[14] To be more specific, working conditions and tenure are significantly related to both sickness categories in the same direction. Good working conditions reduce the number of absence and presenteeism days. In contrast, longer tenure is related to more days in both sickness states, with a stronger effect on absence days. We can interpret this finding by observing Proposition 2: Working conditions and tenure more strongly affect the impact of sickness on profitability ($\overline{\delta}$) than the individual absence decision ($\widetilde{\delta}$). So, they primarily change the effect of sickness for the

[14]This lack in substitutes and complements is not a specific result for the work-related characteristics but does hold also true for the sociodemographics. Here, only sex has a complementary relationship with absence and presenteeism. Health status is of course significantly related to both.

firm and less so for the employee. From a managerial perspective, these two results are particular interesting. On one hand, offering good working conditions does not lead to more presenteeism as one may have expected; it even is associated with less presenteeism and also reduces absence. On the other hand, experienced and trustful employees – that is, those with long tenure – are not only less often attendant but also more often inhibited in their productivity through sickness when attendant. Whether the productivity increasing experience effect of tenure or the negative sickness effect prevails is an open question for further research.

As shown in Table 5.3, the majority of the work-related factors has either an impact on sickness absence days or on presenteeism days while leaving the other unaffected. Let us first look at the case in which absence behaviour changes while presenteeism remains unaffected. Working under a temporary contract, in the private sector, in a larger plant or as a blue collar worker and being dependent on the work speed of one's coworkers (interdependence) are only significantly related to the number of absence days, while they are statistically insignificant in the presenteeism regression. Working under a temporary contract and in the private sector are associated with significantly less absence days, while working in a larger plant, as a blue collar worker and being dependent on the work speed of one's coworkers are positively related to the number of absence days.

Again, we can use our model to find an explanation for this result. There are two possible constellations: On the one hand, Proposition 3(ii) states that both the individual- and firm critical level of sickness must change by the same magnitude (and sign) in order to ensure that only absence varies with a change in a work-related factor. On the other hand, Proposition 4 shows that a variation in absence without a change in presenteeism is the result of a change in $\overline{\delta}$ if $\widetilde{\delta} < \overline{\delta}$ since then the probability of presenteeism is zero by definition. Note that in this situation, a health shock which lies in the interval $[\widetilde{\delta}, \overline{\delta}]$ implies that the individual chooses to be absent, while she is not sufficiently sick from the firm's perspective. We have defined this scenario as absenteeism where individuals absent themselves illegitimately from work. Since the latter case is more likely, we conclude that the above-mentioned work-related factors do not only leave presenteeism unaffected but might also be associated with a change in absenteeism behaviour.

For temporary contracts, employment in the private sector and in smaller firms, this conclusion fits very well with the literature that suggests that these factors make illegitimate absence more costly (probably due to less employment protection, cf. Riphahn, 2004; Ichino and Riphahn, 2005). Albeit reducing absence, these character-

istics do not come at the cost of increased presenteeism here. With data collected in 2010, the peak of the economic crisis in Europe with its increasing unemployment and general economic insecurity, this is a rather hard test since we would expect to find strong effects that might have appeared in this situation also at the cost of increased presenteeism.

Next, let us turn to the other case where presenteeism changes while absence is unaffected. As shown in Table 5.3, work load and autonomy are associated with more sickness presenteeism days, while support by colleagues and management is associated with less. Hence, there are no strong signs that those who are overworked try to cope with their work load by substituting absence with presenteeism. Proposition 3(i) shows that a simple change in the firm critical level ($\overline{\delta}$) and a constant individual critical level of sickness can explain this outcome. This suggests that the work load of an employee (lack of time, usually worked hours per week and second job), social support and work autonomy affect only the impact of sickness on the firm's profit situation while leaving the individual's utility trade off between absence and attendance unchanged.

5.3.4 Robustness checks

As robustness checks, we present in Table 5.4 count data models as well as OLS models in differently defined (sub)samples. Estimating zero-inflated negative binomial regression models largely confirms our results (columns 1 and 2). Unusual working times – such as working weekends or evenings, and working in two jobs – gain significance in the presenteeism model.

[Table 5.4 about here.]

Restricting our sample to EU member states which are characterized by a more homogeneous institutional setting (columns 3 and 4) does not alter our results, either. In fact, the results are quite similar to those obtained in the count data model. Accordingly, unusual working time and second job are significantly related to presenteeism in the EU sample as well. As a further robustness check, we restrict our sample to employees that have been sick during the last 12 months, since one can only substitute between sickness states when being sick at all (columns 5 and 6). Here, work autonomy turns out to also lead to a substitutive relationship between sickness absence and presenteeism, while the qualitative findings for the other controls remain mostly stable. Even here we find only two substitutes which – additionally – measure quite similar things. Hence, this is only a small caveat since supervisors are, among

others, characterized by more work autonomy.
Finally, including (some) of the outliers – that is, those with up to 150 absence or presenteeism days in 12 months, does not fundamentally change our results either (not shown in Table 5.4 but available upon request). The absence model is more affected than the presenteeism model, where the significance is reduced to the 10 percent level for the coefficients of the supervisor, job insecurity and work interdependence variables, while the only weakly significant second job effect becomes insignificant in the presenteeism model.

5.4 Conclusion

In this chapter, we ask whether certain work-related factors lead to a substitutive, a complementary or no relationship between the two sickness states of absence and presenteeism. Using cross-sectional data from the EWCS, we show in OLS regressions that only one out of 16 work-related factors, namely the supervisor status, implies a substitutive relationship between absence and presenteeism. This finding is at odds with the predominant view in the literature that presenteeism behaviour is simply the residuum of sickness absence. In addition, there are also only two work-related factors, namely working conditions and tenure, for which a complementary relationship between both sickness states can be observed. The bulk of work-related factors is only related to one of the sickness states while leaving the other unaffected. This finding shows that it is possible to reduce either absence or presenteeism without shifting the negative productivity effect of sickness to the other sickness state, hence raising the overall number of unimpaired working days. These results are remarkably robust against count data models and in differently defined subsamples.
In addition to our empirical investigation, we present a theoretical model which is able to explain the aforementioned results. Our theory shows that if a work-related factor changes only the individual's utility trade-off regarding their absence decisions, then we always obtain a substitutive relationship between absence and presenteeism. However, if a work-related factor also implies a change in the firm's profit, the firm critical level adjusts and – depending on the sign and magnitude of this change – there can also be a complementary or no relationship between both sickness states. Hence, the new endogenous firm critical level is crucial in so far as it allows us to obtain a non-substitutive relationship between absence and presenteeism, which is the dominant empirical finding. This also implies that the idea of a fixed-sized number of unproductive sickness days that can be differently shared between absence and

presenteeism is too simple and that the definition of sickness via the firm critical level can be influenced by work-related factors as well.

Although our results are based on cross-sectional correlations only, and hence causal interpretations should be taken cautiously, our investigation offers advantages in other dimensions. Particularly, we are able to identify situations which are associated with absenteeism – that is, illegitimate absence. This is the case for employees in the public sector, in larger firms and with open-ended contracts who are associated with more absence but not fewer presenteeism days.

5.5 Appendix

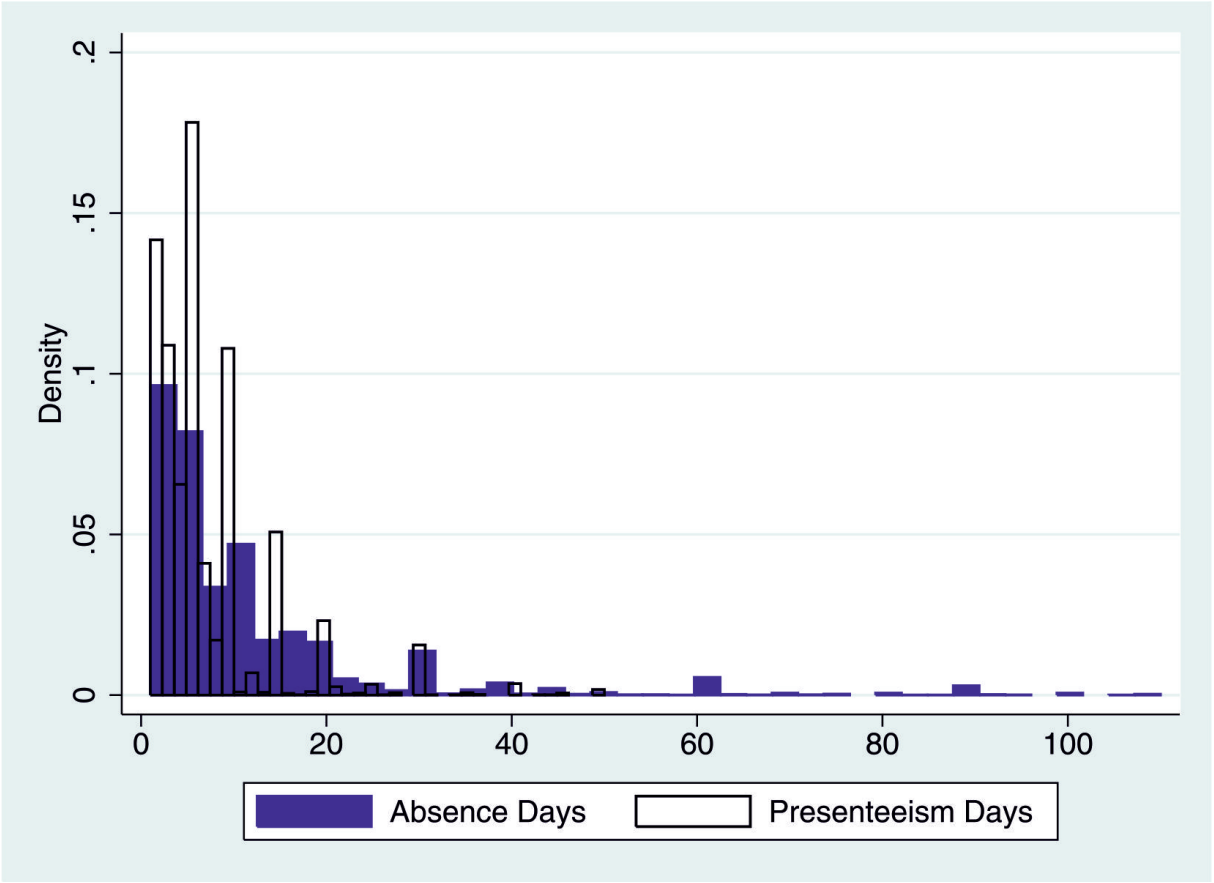

Figure 5.1: Distribution of sickness absence and presenteeism days conditional on absence and presenteeism. Observations with zero sickness absence and presenteeism days not shown but included in analysis (49 and 64 % of the full sample, respectively). Source: 2010-EWCS. Own calculations, survey weights used.

Table 5.1: Descriptive statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Sickness presenteeism days	18,447	2.37	4.9	0	50
Sickness absence days	18,447	5.30	4.9	0	100
		Work-related characteristics			
Tenure (<1 years)	18,447	0.08	0.27	0	1
Tenure (1-2 years)	18,447	0.17	0.38	0	1
Tenure (3-14 years)	18,447	0.20	0.5	0	1
Tenure ($\geq$ 15 years)	18,447	0.25	0.43	0	1
Work autonomy index	18,447	1.92	1.19	0	3
Supervisor	18,447	0.15	0.36	0	1
Usual weekly working hours	18,447	38.0	9.1	10	80
Lack of time to get work done	18,447	2.11	0.99	1	5
Unusual working time	18,447	0.58	0.49	0	1
Second job	18,447	0.07	0.26	0	1
Good working conditions	18,447	3.04	0.68	1	4
Social support	18,447	5.58	1.94	1	8
Job insecurity	18,447	2.18	1.19	1	5
Blue collar worker	18,447	0.34	0.47	0	1
Temporary contract	18,447	0.13	0.33	0	1
Net income category	18,447	11.37	3.84	1	21
Work interdependence	18,447	0.46	0.50	0	1
Size (<10 employees)	18,447	0.27	0.45	0	1
Size (10-49 employees)	18,447	0.34	0.47	0	1
Size (50-99 employees)	18,447	0.13	0.34	0	1
Size (100-249 employees)	18,447	0.11	0.31	0	1
Size ($\geq$250 employees)	18,447	0.15	0.36	0	1
Private sector	18,447	0.67	0.47	0	1
		Socio-demographic controls			
Sex (female=1)	18,447	0.46	0.50	0	1
Children	18,447	0.54	0.50	0	1
Partnership	18,447	0.74	0.44	0	1
Age (18-24 years)	18,447	0.07	0.26	0	1
Age (25-34 years)	18,447	0.26	0.44	0	1
Age (35-44 years)	18,447	0.29	0.46	0	1
Age (45-54 years)	18,447	0.26	0.44	0	1
Age (55-65 years)	18,447	0.11	0.32	0	1
Primary education	18,447	0.31	0.46	0	1
Secondary education	18,447	0.34	0.47	0	1
Higher education	18,447	0.36	0.48	0	1
		Health status			
Very good health	18,447	0.26	0.44	0	1
Good health	18,447	0.55	0.50	0	1
Fair health	18,447	0.18	0.39	0	1
Bad and very bad health	18,447	0.02	0.13	0	1
# of health problems	18,389	2.69	2.36	0	14

Source: 2010-EWCS. Own calculations, survey weights used.

Table 5.2: Predictions from the literature

Variable	$d\widetilde{\delta}$	$d\overline{\delta}$
Temporary contract	> 0	< 0
Job insecurity	> 0	< 0
Supervisor	> 0	> 0
Private sector	> 0	?
Good working conditions	> 0	?
Work autonomy index	> 0	?
Blue collar worker	< 0	?
Firm size	< 0	?
Second job	> 0	?
Lack of time to get work done	?	> 0
Unusual working time	?	> 0
Social support	?	?
Net income category	?	> 0
Work interdependence	?	> 0
Tenure	?	?
Usual weekly working hours	?	?

Table 5.3: Regression results

	(1) Absence		(2) Presenteeism	
		Substitutes		
Supervisor	-0.764***	(-3.15)	0.332***	(3.23)
		Complements		
Good working condit.	-0.527***	(-3.38)	-0.271***	(-3.09)
Tenure (<1 years)	(base)		(base)	
Tenure (1-2 years)	1.114***	(3.90)	0.696***	(4.57)
Tenure (3-14 years)	1.876***	(5.21)	0.776***	(5.31)
Tenure (≥ 15 years)	1.916***	(4.20)	1.093***	(6.66)
		Only absence		
Private sector	-1.305***	(-6.07)	-0.070	(-0.66)
Temporary contract	-1.106***	(-3.85)	0.010	(0.08)
Work interdependence	0.400**	(2.51)	0.026	(0.41)
Blue collar	0.635**	(2.47)	-0.089	(-1.18)
Size (<10 employees)	(base)		(base)	
Size (10-49 employees)	0.786***	(3.27)	0.111	(0.99)
Size (50-99 employees)	0.427	(1.54)	0.126	(1.06)
Size (100-249 employees)	1.114***	(3.20)	0.193	(1.16)
Size (>250 employees)	1.341***	(3.59)	0.084	(0.60)
		Only presenteeism		
Lack of time	-0.101	(-0.95)	0.168***	(2.90)
Usual weekly hours	-0.008	(-0.53)	0.027***	(3.98)
Work autonomy	-0.070	(-0.84)	0.205***	(3.85)
Second job	-0.429	(-1.53)	0.308*	(1.79)
Social support	-0.058	(-1.11)	-0.073***	(-2.90)
		Insignificant		
Net income	0.013	(0.30)	-0.021	(-0.96)
Job insecurity	0.111	(1.30)	0.021	(0.46)
Unusual working time	-0.136	(-0.96)	0.124	(1.55)
Control variables	Yes		Yes	
N	18447		18447	
R^2	0.11		0.14	

Source: 2010-EWCS, own calculations. Notes: Coefficient estimates are from OLS regressions. The dependent variables are the number of sickness absence days in column (1) and the number of sickness presenteeism days in column (2), both including those with zero days. All variables shown in the table except *good working conditions*, *lack of time*, *usual weekly hours*, *work autonomy*, *social support*, *net income* and *job insecurity* are dummies (see Table 5.1 for descriptive statistics). Sociodemographic and health variables as well as country and industry dummies (modified NACE 17) are included as control variables but are not shown. The sociodemographic controls comprise sex, having children, partnership status, age categories and educational status. The health status comprises a subjective and an objective measure of health measuring the number of different health problems during the last 12 months. T-statistics based on standard errors clustered on the country level are in parentheses. ** $p < 0.05$, *** $p < 0.01$.

Table 5.4: Robustness checks

	(1) Absence		(2) Presenteeism		(3) Absence		(4) Presenteeism		(5) Absence		(6) Presenteeism	
	Count data model				EU-27				Conditional on sickness			
Supervisor	-0.808***	(-3.43)	0.212**	(2.30)	-0.907***	(-3.60)	0.323**	(2.75)	-1.005***	(-2.76)	0.520***	(3.62)
Good working condit.	-0.476***	(-3.39)	-0.203***	(-2.87)	-0.602***	(-3.39)	-0.276***	(-2.87)	-0.408*	(-1.80)	-0.227*	(-1.85)
Tenure (<1 years)	(base)		(base)		(base)		(base)		(base)		(base)	
Tenure (1-2 years)	1.180***	(3.21)	0.667***	(4.08)	1.195***	(3.69)	0.721***	(4.16)	0.736	(1.43)	0.527**	(2.57)
Tenure (3-14 years)	1.953***	(4.43)	0.745***	(4.95)	2.073***	(5.25)	0.754***	(4.60)	1.613**	(2.56)	0.519**	(2.71)
Tenure (≥ 15 years)	1.933***	(3.70)	1.038***	(6.28)	2.215***	(4.60)	1.041***	(5.77)	1.284	(1.69)	0.890***	(3.79)
Private sector	-1.403***	(-6.41)	-0.097	(-0.97)	-1.285***	(-5.93)	-0.061	(-0.51)	-1.892***	(-6.71)	-0.042	(-0.30)
Temporary contract	-1.286***	(-3.89)	-0.026	(-0.21)	-0.943***	(-3.06)	-0.042	(-0.30)	-1.907***	(-4.62)	0.042	(0.20)
Work interdependence	0.332**	(2.02)	0.055	(0.98)	0.411**	(2.39)	0.011	(0.17)	0.433*	(1.72)	-0.041	(-0.49)
Blue collar	0.622**	(2.32)	-0.051	(-0.63)	0.720**	(2.42)	-0.074	(-0.94)	1.295***	(3.08)	-0.025	(-0.19)
Size (<10 employees)	(base)		(base)		(base)		(base)		(base)		(base)	
Size (10-49 employees)	0.683***	(2.91)	0.091	(0.83)	0.793***	(2.96)	0.223*	(1.97)	1.238***	(3.68)	0.152	(0.91)
Size (50-99 employees)	0.301	(1.10)	0.116	(0.93)	0.363	(1.25)	0.165	(1.24)	0.363	(0.97)	0.088	(0.52)
Size (100-249 employees)	0.741**	(2.32)	0.185	(1.13)	1.154***	(2.94)	0.254	(1.37)	1.312***	(2.85)	0.103	(0.46)
Size (>250 employees)	0.947**	(2.50)	0.055	(0.42)	1.363***	(3.38)	0.132	(0.92)	1.598***	(3.29)	-0.055	(-0.32)
Work autonomy	-0.067	(-0.68)	0.225***	(4.26)	-0.026	(-0.29)	0.262***	(5.22)	-0.261**	(-2.19)	0.282***	(4.34)
Lack of time	-0.017	(-0.16)	0.124**	(2.53)	-0.125	(-1.07)	0.158**	(2.49)	-0.223	(-1.53)	0.196***	(2.93)
Usual weekly hours	0.008	(0.53)	0.028***	(4.91)	-0.006	(-0.37)	0.028***	(3.76)	-0.021	(-0.97)	0.038***	(3.86)
Unusual working time	-0.186	(-1.48)	0.183**	(2.46)	-0.158	(-1.00)	0.182**	(2.22)	-0.391*	(-1.86)	0.100	(0.76)
Second job	-0.333	(-1.09)	0.284**	(2.23)	-0.246	(-0.88)	0.398**	(2.62)	-0.936***	(-2.87)	0.253	(1.18)
Social support	-0.009	(-0.20)	-0.059**	(-2.46)	-0.057	(-1.04)	-0.086***	(-3.29)	-0.039	(-0.60)	-0.095**	(-2.58)
Net income	-0.009	(-0.19)	-0.012	(-0.55)	0.016	(0.32)	-0.030	(-1.23)	-0.006	(-0.11)	-0.048	(-1.54)
Job Insecurity	0.056	(0.77)	0.031	(0.87)	0.140	(1.57)	0.046	(0.99)	0.161	(1.37)	0.033	(0.55)
Control variables	Yes		Yes		Yes		Yes		Yes		Yes	
N	18447		18447		16065		16065		11713		11713	
R^2					0.11		0.14		0.10		0.12	

Source: 2010-EWCS, own calculations. Notes: Average marginal effects from zero-inflated negative binomial regressions in Columns (1) and (2), coefficient estimates from OLS regressions in Columns (3)-(6). The dependent variables are the number of sickness absence days in columns (1), (3) and (5) and the number of sickness presenteeism days in column (2), (4) and (6), both including those with zero days. All variables shown in the table except *good working conditions*, *lack of time*, *usual weekly hours*, *work autonomy*, *social support*, *net income* and *job insecurity* are dummies (see Table 5.1 for descriptive statistics). Sociodemographic and health variables as well as country and industry dummies (modified NACE 17) are included as control variables but not shown. The first two estimations rely on the full sample of 18,447 observations. Columns (3) and (4) rely on the observations from the EU-27 countries, i.e. 16,065 observations, and columns (5) and (6) rely only on observations that have at least one sickness day, be it absence or presenteeism (11,713 observations). T-statistics based on standard errors clustered on the country level are in parentheses. ** $p < 0.05$, *** $p < 0.01$.

Chapter 6

Summary

This thesis contributes to the better understanding of sickness related issues in the labour market. In the first part, we are interested in sickness absence and labour market institutions. Specifically, in Chapter 2, we examine whether differences in the stringency of the social norm against benefit fraud, so-called *benefit morale*, can explain cross-country diversity in sick pay generosity. Our theoretical model reveals counter-acting effects of benefit morale on the politically determined level of sick pay entitlements along the following lines: As stricter benefit morale reduces absence behaviour in the population, we observe on the one hand a positive (price) effect, since this makes the insurance cheaper. On the other hand, as a stricter socially shared norm makes the median voter less likely to be absent herself, she prefers a reduced fee over more insurance (probability effect). Numerical simulations and an empirical investigation covering 31 developed countries from 1981 to 2010 show that the positive price effect dominates at low levels of benefit morale, while it is compensated for by the probability effect at higher levels turning it negative. Hence, we find a hump shaped relationship between benefit morale and sick pay generosity.

While the relationship between benefit morale and the institutions that insure against unemployment has already been investigated (Algan and Cahuc, 2009), we are the first to investigate benefit morale as a determinant of sick pay generosity. Transferring their idea to the insurance against income loss due to sickness delivers fruitful new insights. Particularly, the negative relationship in the upper part of the benefit morale distribution is a sick pay specific finding, since the social norm affects sickness absence in a more direct way than unemployment, where only the unemployed are affected through lower search effort. While a strict benefit morale is a social precondition for a generous insurance against unemployment (cf. Algan and Cahuc, 2009), in the case of sickness absence, benefit morale also functions as a substitute for the insurance since

it reduces the insurance case. In a next step it would be interesting to see whether this also holds true for other welfare programs, such as disability insurance. Finally, we contribute to the literature by combining, for the first time, positive theory, that is a political economy model, with real institutional data to investigate benefit morale as a determinant of welfare state generosity.

In Chapter 3, which is joint work with Tobias Brändle and Laszlo Goerke, we are interested in how a specific German labour market institution shapes absence behaviour. Specifically, we ask whether non-union workforce representation by works councils affects employees' absence behaviour and if so whether that causes problems for the firms. Using representative individual absence data (SOEP), we find that employees working in a plant with a works council are about three percentage points more likely to be absent at all during a calender year (absence incidence) and that they miss one day more per year compared to those working in a plant without a works council (annual duration). Linked employer-employee data (LIAB) additionally suggests that these higher absence rates in plants with works councils cause problems for the management. While works councils have been a fundamental part of the German industrial relations system in Western Germany well before 1990, they have been introduced in the eastern part of the country after re-unification in 1990 only. This is mirrored by a stronger relationship between works councils and all three absence indicators (incidence, annual duration and personnel problems due to absence) in western Germany. Additionally, the correlation can be interpreted causally for absence incidence in Western Germany where we find significant effects in a difference-in-differences approach.

Chapter 3 adds to the literature on work place representation and offers a new way in which works councils affect employee behaviour and firm performance. In the perspective of the seminal article by Freeman and Lazear (1995), our results can be seen as new evidence that works councils protect employees against their employers and thereby give them the opportunity to be absent more often (keeping individual health status constant). Our findings with regard to personnel problems suggest that higher absence rates in plants with works councils cannot be compensated for by better working conditions or an optimized work process potentially entailed by employment participation. An open question for future research is whether the higher absence rates in plants with works councils are brought about by less presenteeism or through more illegitimate absence. We were not able to address this important issue as the data available do not contain information on presenteeism.

The second part of this thesis deals with sickness presenteeism, particularly with its

determinants and its interrelation with sickness absence. In Chapter 4, we analyse the determinants of the annual duration of sickness presenteeism with a focus on work-related characteristics. Using cross-sectional EWCS data and controlling for health status, we find work autonomy, workload, tenure and the work environment to be the quantitatively most relevant work-related correlates of sickness presenteeism. While work autonomy, workload and tenure are positively related to the number of sickness presenteeism days, a good working environment is associated with less presenteeism. We present additionally a model excluding health controls, because the overall correlations between work-related factors and sickness presenteeism days, i.e. the direct and indirect health mediated channels taken together, are economically highly relevant as well. Here, the role of the working environment is particularly increased.
We are the first to investigate the annual duration of sickness presenteeism as dependent variable which is a better proxy for the productivity effects of sickness presenteeism than its incidence or its frequency. Furthermore, tenure and work autonomy are new findings with regard to sickness presenteeism. While tenure has, to the best of our knowledge, never been investigated in this regard before, the positive relationship between work autonomy and presenteeism days is in contrast to an insignificant finding for Denmark (Hansen and Andersen, 2008). Using the first large-scale dataset on presenteeism outside northern Europe, our results are more informative than previous studies. And, as our finding for work autonomy shows, northern European countries are different with regard to sickness presenteeism behaviour which underlines the necessity of studies outside northern Europe. From a policy and management perspective, our findings – albeit based on correlations only – suggest better working conditions and less work load per employee as potential means to reduce presenteeism. Finally, our findings mirror the dual nature of sickness presenteeism which is similarly related to good as well as bad job characteristics (work autonomy, time pressure). Accordingly, coming to work when being sick can, on the one hand, be facilitated by good working conditions, or on the other forced by obligations. The first case is rather commensurate with a situation in which coming to work is socially beneficial because negative health effects are limited. In contrast, the latter is more likely a situation in which the negative effects dominate over the positive effects. Accordingly, it will be one of the crucial questions for future research to distinguish between productivity and health improving forms of presenteeism and those that are not.
Finally, Chapter 5, which is joint work with Marco de Pinto, combines the analysis of sickness absence and presenteeism. Here, we ask how these two sickness states are interrelated, that is whether their determinants affect both sickness states at the

same time. More specifically, we investigate whether a change in a work-related characteristic leads to a substitutive (oppositional), complementary (same direction) or no change in both sickness states. In contrast to the literature which implicitly assumes that a factor which reduces sickness absence increases presenteeism for a given health status (and vice versa), our theoretical model shows that non-substitutive relationships are also possible. This result is due to the major innovation of our theoretical model, that is a definition of presenteeism which depends on work-related characteristics. Accordingly, the interrelation between sickness absence and presenteeism does not only depend on the employee's absence decision, but also on the effect sickness has on the firm's profitability which in turn defines presenteeism. Empirically, we find in European cross-sectional data that only one out of 16 work-related characteristics has a substitutive pattern with regard to sickness absence and presenteeism. Few have a complemantary relationship, while the large majority is only related to one of the two sickness states.

This chapter adds to the literature by explicitly and comprehensively investigating the interrelationship between sickness absence and presenteeism which has not been done before. Particularly, we offer a theoretical explanation for our empirical finding that most work-related characteristics *either* affect absence *or* presenteeism behaviour. Hence, we discard the simple idea that presenteeism is just the residuum of sickness absence. Moreover, our results show that sickness absence can be reduced without increasing presenteeism which is good news from a normative perspective. And, although our investigation is based on correlations only, we can interpret work-related characteristics as conducive to illegitimate absence when they are associated with more absence days but not less presenteeism. This is particularly the case for employees in the public sector, in larger firms and with open-ended contracts.

Chapter 7

German Summary - Deutsche Zusammenfassung

Diese Dissertation befasst sich aus einer ökonomischen Perspektive mit Krankheit von Arbeitnehmern. Krank zu sein reduziert nicht nur das Wohlbefinden sondern auch die Arbeitsproduktivität von Arbeitnehmern. Folglich hält Krankheit viele Arbeitnehmer davon ab, zur Arbeit zu kommen und ihre vertraglich vereinbarten Arbeitsstunden zu leisten, was zu erheblichen Produktionsausfällen führt. Entsprechend ist krankheitsbedingte Abwesenheit ein hoch relevantes Thema unter Arbeitsmarktökonomen und ist bereits intensiv erforscht worden (für einen Survey siehe Brown and Sessions, 1996). Die ökonomische Literatur betont besonders den freiwilligen Aspekt der Abwesenheitsentscheidung, lässt aber die negativen ökonomischen Effekte von Krankheit außer Acht, welche nicht alleine an der Abwesenheitsentscheidung des Arbeitsnehmers hängen. Krankheit reduziert die Produktivität unabhängig davon, ob der Arbeitnehmer an- oder abwesend ist. Neben dem klassischen Fall der krankheitsbedingten Abwesenheit, in dem der Arbeitnehmer arbeitsunfähig ist, gibt es auch den Fall des sogenannten Präsentismus, in dem der Arbeitnehmer zur Arbeit kommt, obwohl er oder sie krank ist. Die ökonomische Forschung zu Präsentismus steckt im Gegensatz zur Abwesenheitsforschung noch in ihren Anfängen.

Während die negativen, ökonomischen Effekte von krankheitsbedingter Abwesenheit auf der Hand liegen, ist die ökonomische Evaluation von Präsentismus komplexer, da diese nicht nur von der Art der Krankheit abhängt, sondern auch von der ausgeübten Tätigkeit (vgl. Schultz and Edington, 2007). Unter bestimmten Bedingungen kann Präsentismus sogar die Erholung und Rehabilitation eines kranken Arbeitnehmers befördern (vgl. Markussen et al., 2012), wohingegen in anderen Fällen die negativen Effekte des Präsentismus sogar schwerwiegender sein können, als der Abwesenheit

(Pauly et al., 2008)). Dies ist insbesondere dann der Fall i) wenn die Tätigkeit der Genesung des Arbeitnehmers abträglich ist, mit entsprechenden negativen Folgen für dessen Gesundheit (Bergström et al., 2009), was oft mit erhöhter Abwesenheit in der Zukunft einhergeht (Hansen and Andersen, 2009), ii) bei ansteckenden Krankheiten, die sich am Arbeitsplatz ausbreiten (Barmby and Larguem, 2009), iii) bei Produktivitätsinterdependenzen, z.B. durch Teamarbeit (Pauly et al., 2008). Zusammenfassend ist zu sagen, dass es im Allgemeinen unklar ist, ob krankheitsbedingte Abwesenheit höhere soziale Kosten verursacht als Präsentismus. Aus diesem Grund thematisiert diese Dissertation beide Fälle, also die krankheitsbedingte Abwesenheit und den Präsentismus und ist entsprechend in zwei thematische Teile gegliedert.
Im ersten Teil dieser Dissertation werden Arbeitsmarktinstitutionen und krankheitsbedingte Abwesenheit aus zwei verschiedenen Perspektiven beleuchtet. Nach dem einleitenden ersten Kapitel, wird in Kapitel 2 eine neue Erklärung für internationale Unterschiede in der Großzügigkeit der gesetzlichen Lohnfortzahlung im Krankheitsfall präsentiert, die wiederum das Abwesenheitsverhalten beeinflusst. Die Literatur hat bereits gezeigt, dass soziale Normen (individuelles) Abwesenheitsverhalten beeinflussen (Lindbeck and Persson, 2010; Ichino and Maggi, 2000), was wiederum politische Entscheidungen über die Großzügigkeit der Lohnfortzahlung beeinflussen könnte. In dieser Perspektive werden theoretische und empirische Belege geliefert, dass Unterschiede in sozialen Normen gegen Sozialleistungsbetrug (âBenefit moraleâ) internationale Unterschiede in der Großzügigkeit öffentlicher Versicherungsleistungen gegen Einkommensverlust durch Krankheit erklären können.
Kapitel 2 basiert auf Arnold (2013) und enthält ein polit-ökonomisches Modell, in dem eine striktere Norm die Abwesenheit in der Ökonomie reduziert, was zu gegenläufigen Effekten auf die politisch bestimmte Lohnersatzrate führt. Einerseits vergünstigt sich der Preis für die steuerfinanzierte Versicherung durch eine striktere soziale Norm, was zum üblichen Nachfrageeffekt führt und damit zu einer großzügigeren Ersatzrate. Andererseits macht die striktere Norm es gleichzeitig für die Wähler unwahrscheinlicher selbst abwesend zu sein, was eine reduzierte Gebühr gegenüber einer umfangreicheren Versicherung interessanter macht. Numerische Simulationen zeigen, dass der positive Preiseffekt für niedrige Werte der Benefit morale stärker ist, wohingegen der negative Wahrscheinlichkeitseffekt im oberen Wertebereich dominiert. Beide Effekte, die sich zu einem umgekehrt U-förmigen Zusammenhang zwischen der in einem Land herrschenden Benefit morale und der gesetzlichen Lohnfortzahlungsrate ergänzen, werden in einem Sample von 31 entwickelten Volkswirtschaften zwischen 1981 und 2010 empirisch dokumentiert. Diese Studie ist die erste, die positive Theorie mit institu-

tionellen Daten als abhängige Variable in der Erforschung von Benefit morale und der Großzügigkeit des Sozialstaats kombiniert. In Kapitel 3, das gemeinsam mit Tobias Brändle und Laszlo Goerke entstand, wird das Verhältnis zwischen der Existenz eines Betriebsrates in einem Betrieb und dem individuellen Abwesenheitsverhalten sowie den daraus resultierenden Personalproblemen für das Management untersucht. Mittels Individualdaten des Sozioökonomischen Panels (SOEP) werden positive Korrelationen zwischen der Existenz eines Betriebsrats und der Fehlzeiteninzidenz sowie der jährlichen Fehltage dokumentiert. In verbundenen Arbeitnehmer-Arbeitgeber Daten (LIAB) finden wir darüber hinaus eine positive Korrelation mit der Wahrscheinlichkeit, dass Manager Personalprobleme aufgrund erhöhter Abwesenheitsraten erwarten. Der statistische Zusammenhang zu allen drei Abwesenheitsindikatoren ist stärker in West- als in Ostdeutschland ausgeprägt, wo Betriebsräte erst 1990 mit der Wiedervereinigung eingeführt worden sind. Im Westen finden wir auch signifikante Effekte in Differenz-in-Differenzen Modellen, die kausal interpretiert werden können. Zusammengefasst suggerieren diese Ergebnisse, dass sich Arbeitnehmer durch mehr Fehltage â bei gleicher Gesundheit â durch Betriebsräte besser stellen können, was zu Lasten der Arbeitgeber geht.

Der zweite Teil der Dissertation enthält Studien zu Präsentismus. In Kapitel 4 wird empirisch untersucht, was Präsentismusverhalten determiniert. Der Fokus liegt dabei auf Eigenschaften des Arbeitsplatzes wie z.B. Vertragsart, Arbeitsbelastung und Arbeitsautonomie, da diese durch das Management leichter zu beeinflussen sind als andere Faktoren. Präsentismus wird hier als jährliche Anzahl der Tage, die ein Arbeitnehmer trotz Krankheit zur Arbeit geht, operationalisiert. Die jährliche Dauer ist bislang nicht untersucht worden obwohl sie ökonomisch relevanter für die Produktivitätseffekte von Präsentismus ist als die schon untersuchten Größen Inzidenz (Aronsson and Gustafsson, 2005) und Häufigkeit (Hansen and Andersen, 2008). Als Datengrundlage dient die Europäische Erhebung über die Arbeitsbedingungen (EWCS), der erste große Datensatz zu Präsentismusverhalten außerhalb Skandinaviens. Präsentismus ist in Europa weit verbreitet und wird von 35 Prozent der Arbeitnehmer innerhalb von 12 Monaten praktiziert und beläuft sich auf durchschnittlich 2,4 Tage pro Jahr. Arbeitsautonomie, Arbeitsbelastung, Beschäftigungsdauer und das Arbeitsumfeld sind in den Querschnittsdaten die quantitativ relevantesten Determinanten der jährlichen Präsentismusdauer, wenn der Gesundheitsstatus berücksichtigt wird. Autonomie, Arbeitsbelastung und Beschäftigungsdauer sind positiv mit der Präsentismusdauer korreliert, wohingegen ein gutes Arbeitsumfeld mit weniger Präsentismustagen korreliert. Wird der Gesundheitszustand nicht berücksichtigt, steigen die

Korrelationskoeffizienten aller relevanter Arbeitseigenschaften an, wobei das Arbeitsumfeld am meisten gewinnt und auch absolut führt. Entsprechend könnten diese Ergebnisse so gelesen werden, dass ein gutes Arbeitsumfeld ein besonders geeignetes Mittel gegen Präsentismus ist. Kapitel 5, das gemeinsam mit Marco de Pinto entstand, analysiert die Interdependenz zwischen krankheitsbedingter Abwesenheit und Präsentismus und geht der Frage nach, ob beide Krankheitszustände gemeinsame Determinanten haben, wobei der Fokus auf Eigenschaften des Arbeitsplatzes wie in Kapitel 4 liegt. Konkret wird untersucht, ob eine Veränderung einer Determinante Abwesenheit und Präsentismus gegenläufig (substitutiv), gleichgerichtet (komplementär) oder nur einen der beiden beeinflusst. Die Literatur nimmt implizit eine substitutive Beziehung an (vgl. Brown and Sessions, 2004; Johansson and Lundberg, 2004, obwohl diese weder explizit theoretisch hergeleitet wurde, noch systematisch empirisch belegt ist. Entsprechend liefert diese Studie eine umfassende Untersuchung der Interdependenz von Abwesenheits- und Präsentismusverhalten aus theoretischer und empirischer Perspektive.

Präsentismus ist in unserem theoretischen Modell enger als im 4. Kapitel definiert als eine Situation, in der die Abwesenheit des Arbeitnehmers aufgrund dessen Krankheit (z.B. durch niedrigere Produktivität, Ansteckung der Kollegen oder anderes) vorteilhafter für den Arbeitgeber ist als dessen Anwesenheit. Das Modell zeigt, dass nicht nur substitutive Beziehungen zwischen krankheitsbedingter Abwesenheit und Präsentismus denkbar sind, wie häufig in der Literatur angenommen. Dieses Resultat ist darauf zurückzuführen, dass die Determinanten nicht nur die An- bzw. Abwesenheitsentscheidung der Arbeitnehmer, sondern auch die Wirkung der Krankheit auf die Firmenprofite verändert, was wiederum Präsentismus beeinflusst (s.o.). Entsprechend gibt es zwei Kanäle über die beide Zustände unabhängig voneinander beeinflusst werden können. Als Datengrundlage der empirischen Untersuchung dient, wie in Kapitel 4, der EWCS, der auch Informationen über die Anzahl der krankheitsbedingten Fehltage enthält. Von den 16 untersuchten Arbeitseigenschaften ist nur eine substitutiv mit den beiden Krankheitszuständen verknüpft, namentlich der Vorgesetzten-Status. Weiterhin dokumentieren wir einige komplementäre Beziehungen, wohingegen die Mehrzahl der Determinanten entweder mit der Abwesenheits- oder mit der Präsentismusdauer korreliert. Das in dieser Arbeit entwickelte theoretische Modell eignet sich besonders gut um die empirischen Befunde im Hinblick auf das Verhältnis zwischen krankheitsbedingter Abwesenheit und Präsentismus zu erklären. Mithin führt die Untersuchung also zu Zweifeln an der in der Literatur vorherrschenden Vorstellung, dass Präsentismus lediglich das Residuum von krankheitsbedingter Abwesenheit ist.

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