NBER WORKING PAPER SERIES

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Working Paper 20305
http://www.nber.org/papers/w20305

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 2014

This research was supported by the U.S. Social Security Administration through grant # 1 DRC12000002-01-00 to the National Bureau of Economic Research as part of the SSA Disability Research Consortium. The findings and conclusions expressed are solely those of the authors and do not represent the views of SSA, any agency of the Federal Government or the NBER. Support from the Austrian National Research Network "Labor Economics and the Welfare State" is gratefully acknowledged. Böheim is also associated with CESifo, NBER, WIFO, and IZA. Christina Judmayr and Christian Thallinger provided excellent research assistance. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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NBER Working Paper No. 20305
July 2014
JEL No. H51,I18

ABSTRACT

In many countries, social security insures firms against their workers' sickness absences. The insurance may create a moral hazard for firms, leading to inefficient monitoring of absences or to an underinvestment in the prevention of absences. We exploit an administrative threshold in the Austrian social security that defined whether a firm had to pay a deductible for its blue-collar workers sicknesses or not. The quasi-experimental situation around the threshold provides causal evidence on the extent of moral hazard induced by the deductible. We apply a regression discontinuity design to estimate the differences in the incidences and durations of sicknesses for firms that faced the deductible and those who did not. We find that the deductible did not lead to different sickness outcomes and conclude that relatively low deductibles have little impact on forms' management of sicknesses.

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1 Introduction

Sickness absences are costly. In France and Germany, the cost of lost productivity due to influenza, which accounts for about 10 percent of all sickness absences, is in the range of USD 9.3 billion to 14.1 billion per year (OECD, 2011). Moreover, there is a clear link between temporary sick-leave and permanent disability (Wallman et al., 2009). Institutional settings and sick leave regulations influence the incidence and duration of sick leave (Fevang, Markussen and Røed, 2011; Johansson and Palme, 2005; Johansson, 1996; Puhani and Sonderhof, 2010; Westergaard-Nielsen and Pertold, 2012; Ziebarth and Karlsson, 2010). They also affect the monetary costs resulting from sick leave as well as the distribution of these costs between individual workers, employers and social insurance institutions. This paper contributes to our understanding of how firms respond to changes in sick leave costs by investigating an insurance scheme that covered firms in Austria until 2000.

Firms face direct and indirect costs caused by absences, but in most OECD countries they are, at least to some extent, insured against their workers' sicknesses, either because the amount or the period of sick pay is limited, or because firms are refunded for their costs. In Austria, sick workers continue to receive their wages from their employer for a duration of up to twelve weeks, depending on their tenure. Until September 2000, firms were insured in case they had to pay wages for their sick blue-collar workers. The insurance was compulsory and financed by employers' premiums based on their blue-collar workers' wages. If a firm's total monthly wage bill exceeded a threshold, it was considered a large firm and as such had to pay a deductible of 30 percent.

Small firms, in contrast, received the full amount of paid wages. We exploit this discontinuity using administrative social security data to identify the causal effect of the deductible on sickness absences in firms.

Earlier work has demonstrated that the abolition of this insurance reduced sickness absences, indicating a considerable moral hazard effect (Böheim and Leoni, 2011). By focusing on firms in the vicinity of the administrative threshold, we are able to investigate firms' reactions to higher absence costs as the workers' incentives were not affected by whether the firm was small or large. Because of the higher costs, we expect that in the vicinity of the threshold blue-collar workers in large firms were sick less often (and for shorter periods) than blue-collar workers in small firms. Detailed analyses show that small and large firms near the threshold do not differ in the composition of their workforces, their wage rates or their employment growth rates.

Our results show that, in contrast to our expectations, the deductible did not result in different sicknesses in small and large firms. We interpret our findings that the deductible was too moderate to induce management responses. Our results can be linked to earlier research on the efficacy of deductibles on health care outcomes, for example, Chiappori, Durand and Geoffard (1998). In general, a firm will become active to reduce the number of its workers' sickness absences only if the expected gains from activities such as increased monitoring and workplace health promotion are higher than the resulting costs. A relatively small deductible might be dominated by the direct costs for these activities as well as by other costs, for example, separations if the monitoring of absences is deemed unfair by workers.

To better assess the implications of our results based on Austrian data, we provide a comparison of sick leave regulations and absence rates in Austria and the United States in the Appendix. These two countries represent diverse, almost antithetic, approaches to health-related absences from the workplace. In Austria, insurance that protects workers against income risks associated with sickness absences is universal and its costs are shared by employers and social insurance agencies. In the United States, there is no minimum level of guaranteed paid sick leave and the system relies almost entirely on the voluntary provision of benefits by employers. The Austrian approach to sick leave is representative for the sick leave provisions that are in force in many other European countries, particularly Germany. These institutional differences are mirrored in marked differences in the absence rates. Insights coming from these countries may represent an informative benchmark for the United States, where we can currently observe a lively debate on the opportunity to introduce changes to the existing sick leave legislation, reflected in the fact that since 2006 several United States jurisdictions have passed local paid sick leave laws.

2 Background

In recent years, economic research gathered a large body of evidence on the distribution and causes of sick leave, with significant contributions coming from studies that use administrative social insurance data. In their investigation of the "anatomy of absenteeism" based on rich Norwegian data Markussen, Røed, Røgeberg and Gaure (2011) show that employee heterogeneity explains a large share of the variation in absenteeism that we observe at the cross-sectional level within a country. Part of this heterogeneity can be explained by observed characteristics: It is well-known, for instance, that women have a higher propensity than men to be absent from work because of their health (Bridges and Mumford, 2001; Ichino and Moretti, 2009; Paringer, 1983). Part of the heterogeneity is reflected in the unequal distribution of serious diseases with long absence periods, which remains largely unexplained even when large sets of explanatory variables are available.

Differences in absence levels across firms are however not driven only by worker heterogeneity, but also by workplace-specific effects. Drago and Wooden (1992) and Ichino and Maggi (2000) highlight the role of social norms and peer-group dynamics as determinants of sick leave and Markussen et al. (2011) confirm that a worker's absence behavior is affected by the characteristics of her colleagues. Barmby and Larguem (2009) find that with respect to infectious illnesses significant contagion effects can be observed at the workplace. Another strand of the literature has studied the impact of labor market conditions and employment security on workers' sickness absences. Both older and more recent studies show the existence of an inverse relationship between sickness absence and changes in the unemployment rate. Unemployment seems to work as a "disciplining device" which influences the absence behavior of employed workers (Askildsen, Bratberg and Nilsen, 2005; Leigh, 1985). Numerous other studies reach the conclusion that insecure job positions, such as temporary contracts or probation periods, induce workers to keep their absence levels low (Cristini, Origo and Pinoli, 2012; Ichino and Riphahn, 2005; Riphahn, 2004).

Institutional settings and social security regulations represent another set of sick leave determinants and are of particular relevance for the explanation of international differences in absence levels. So far, the economic literature has predominantly studied the effect of regulations and incentives on the behavior of employees. Worker insurance through sickness benefits has been found to generate moral hazard and to influence absenteeism. Johansson (1996), Johansson and Palme (2005) and Hall and Hartman (2010) find such a moral hazard for Swedish workers. Similarly, Ziebarth and Karlsson (2010) and Puhani and Sonderhof (2010) show that a reduction in the replacement rate for sick workers in Germany led to a substantial decrease in sick leave and a drop in hospitalization days. Ziebarth and Karlsson (2013) evaluate the repeal of this reform and come to the conclusion that increasing the generosity of the federally mandated sick pay scheme (from 80 percent to 100 percent) increased sick leave by at least one day per year and employee among the reform's target group. For the United States, where workers are not universally covered by sickness insurance, numerous studies investigate the moral hazard associated with worker compensation schemes (WC).[1] A higher level of replacement rate represents only a first step towards a moral hazard problem, with further important aspects concerning the assessment process of illness and the monitoring of absentees during a sickness spell.[2]

Only limited research is available on the behavior of firms with respect

[1]Krueger (1990) and Hirsch, Macpherson and Dumond (1997), among others, find that these insurance schemes have large incentive effects on workers' behavior, although more recently Bronchetti and McInerney (2012) challenge the prevailing wisdom that workers are highly responsive to changes in WC benefit levels.

[2]Markussen et al. (2011), for instance, show that physicians' certification practices have a significant impact on patients' absence behavior.

to their workers' sickness absences. Böheim and Leoni (2011) investigate Austrian firms' reactions to an exogenous increase in the cost of sickness absences and find that sickness absences decreased more in firms that had faced a larger increase in costs than in those with a more moderate increase in costs. Westergaard-Nielsen and Pertold (2012) analyze the behavior of Danish firms and find strong and robust evidence of moral hazard – substantially higher incidences of sickness absences – in firms which select to buy insurance against their workers' sickness absences. Such incentives have been explicitly recognized in the design of unemployment insurance systems, where experience rating is used to penalize employers for imposing a higher cost on the system (e.g., Anderson and Meyer, 2000). Fevang et al. (2011) analyze a Norwegian sick leave reform which exempted employers from refunding sick pay only for pregnancy-related absences. They show that this exemption led to approximately 5 percent more sickness absence spells of pregnant women.

3 Institutional settings

Austria belongs to the group of countries where all workers are insured against sicknesses with generous benefit schemes and high income replacement rates (Scheil-Adlung and Sandner, 2010). A two-stage system is in place, where employers are required to pay wages for an initial period of sick leave, after which the social insurance pays sick pay if the worker is still ill or disabled. Numerous European countries, e.g., Belgium, Denmark, Finland, Norway, Spain and Sweden, have similar institutional settings. The Austrian system bears a particularly strong resemblance with the German one, given that the two countries share similar sick leave regulations as well as related labor market institutions.

In Austria, a sick worker needs to see a medical doctor who certifies the sickness and informs the social security administration. Workers are required to inform their employer about the expected period of sickness leave. The duration of continued wage payment by the employer depends on work tenure. At the present time continued wage payment by the employer ranges from 6 weeks for tenures shorter than 5 years to a maximum of 12 weeks for tenures longer than 25 years. This regulation applies to both blue- and white-collar workers.[3] After that period, workers continue to receive their wages for another four weeks; however, during these four weeks, the wage is split equally between the firm and the social security. After these four weeks, the worker receives sick pay from the social security for up to one year, which is 50 percent of the wage for the first 42 days and 60 percent thereafter. In cases of prolonged or permanent inability to work, workers may apply for disability benefits.

With the exception of the short period between September 2000 and January 2002, social insurance in Austria has been treating small firms differ-

[3]Private sector workers in Austria are employed either as blue-collar or as white-collar workers depending on the types of tasks that they carry out. According to Austrian law, white-collar workers are employees who carry out commercial tasks (*kaufmännische Dienste*), non-commercial higher tasks (*höhere, nicht kaufmännische Dienste*) or clerical work (*Bürotätigkeiten*). Until 2000 labor law provisions were generally more favorable for white-collar workers than for blue-collar workers. In particular, white-collar workers were entitled to two weeks more continued wage payment than blue-collar workers (at each level of tenure). Since 2001, the sick pay legislation for blue-collar and white-collar workers are virtually the same, the only difference being that in case of multiple sickness spells within the same work year the entitlement to continued wage payment remains fixed for blue-collar workers, but not for white-collar workers. Other differences between the two groups are summarised in Table 8 in Appendix.

ently than large firms. Austria is not an exception in this respect, since in numerous countries, including the United States (see Appendix A), sick leave-related regulation is more favorable for small firms than for large firms. This differential treatment can be justified on the grounds of differing sick leave costs for small and large firms, as the amount of disruption caused by absences might be lower for larger firms (Weiss, 1985). Arguably, large firms face lower costs from an absence because they can redistribute the tasks of the absent worker more easily on the remaining workforce than small firms and need to hold a relatively smaller buffer stock of workers. Barmby and Stephan (2000) show that the cost advantage of larger firms over smaller ones increases with increasing absence rates.

We study a compulsory insurance scheme for firms that included different provisions for firms of different size and that was in place between 1974 and September 2000. During this period, firms received a refund for the wages they had to pay their sick blue-collar workers. Until 2000 small firms received a 100 percent and large firms received a 70 percent refund of the wages paid to sick blue-collar workers. In other words, larger firms had to pay a deductible of 30 percent, which small firms did not have to pay.

The insurance (*Entgeltfortzahlungsfond*) was compulsory and financed by employers' contributions of 2.1 percent of their blue-collar workers' wages. The fund was managed by the Austrian social security administration and the refund was paid automatically within three months. The amount of the refund depended on a firm's total wage bill from two months ago. If a firm's total wages in month $t-2$ exceeded a threshold, namely 180 times the maximum daily social security contribution, it was considered a large firm in month t. Although the refund compensated firms only for blue-collar workers' absences, the definition of firm size was based on the wages of both blue-collar and white-collar workers.

Although the insurance scheme was abolished altogether in 2000, since 2002 small firms receive a refund of the costs resulting from worker absences caused by workplace accidents, including accidents while commuting.[4]

[4]In 2005 a partial refund (for sick leaves of more than 10 days) was reintroduced for small firms only.

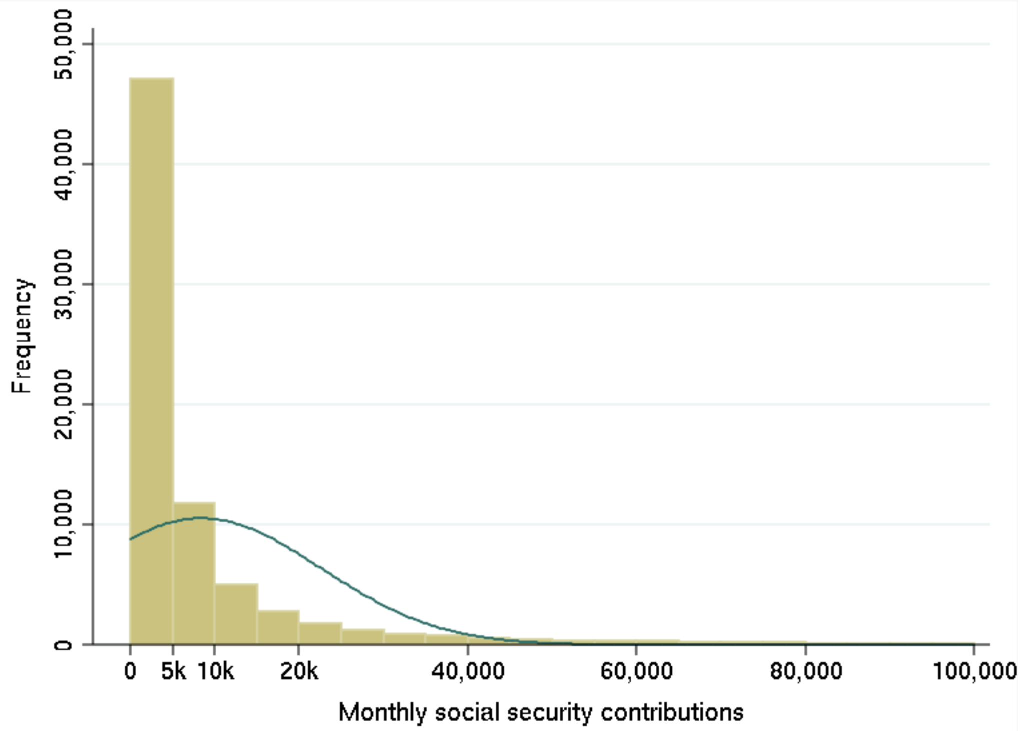
4 Empirical approach

4.1 Data and identification strategy

We use register data from the Austrian Social Security Database (ASSD; Zweimüller, Winter-Ebmer, Lalive, Kuhn, Wuellrich, Ruf and Büchi (2009)). The data are matched employer-employee data, augmented with information from the statutory health insurance for 1998 and 1999, which provide information on the days on paid sick leave. The data cover all workers in one large province, Upper Austria, which accounted for approximately 17.5 percent of workers and 18 percent of firms (NACE C-E) in Austria in 2000 (Statistik Austria, 2009). The data provide information on all employees in dependent employment but do not include the self-employed or civil servants and consist of 39,860 firms with monthly observations for January 1998 to December 1999. During this period, small firms received a full refund for the wage costs sustained for their sick blue-collar workers, whereas large firms had to pay a deductible of 30 percent.

In 1998 (1999), the threshold was €18,313.56 (€18,575.16), which corresponded to approximately 10 full-time blue-collar workers if they were paid the monthly median wage (€1,822). The regulation intentionally favored smaller firms because they were assumed to have more problems and higher costs covering sickness absences compared with larger firms. Figure 1 shows the distribution of firms by their monthly social security payments. There are relatively more small firms than large firms, the average firm has about 13 employees (median: 3) and the average social security payment (which is used to classify a firm as small or large) is €22,325 (median: €3,214).

Figure 1: **Distribution of firms, by monthly social security payments.**



Note: Observations are on the firm×month level. Threshold level in 1998: €18,313.56; 1999: €18,575.16.

We will estimate the causal effect of having to pay the deductible on sickness behavior using a regression discontinuity design. A regression discontinuity exploits that firms can only, if at all, imprecisely manipulate an assignment variable which determines treatment, in our case, the payment of a deductible, or no treatment. The variation in the vicinity of the threshold can be interpreted as if obtained from a randomized experiment (Imbens and Lemieux, 2008). The approach identifies a local treatment effect which may not apply to observations that are farther from the threshold.

We choose an interval of €1,500 on either side of the cut-off, this is somewhat greater than the mean blue-collar worker's wage (€1,350). This results in an estimating sample of 12,424 observations (firms × months).[5]

Firms in which the total wage sum of two months' earlier, the "assignment variable", exceeded the threshold were considered large firms. This discontinuity will identify the causal effect of co-payments on sicknesses for firms in the vicinity of the threshold. If there is no endogenous sorting of firms around the threshold, any difference in sicknesses between small and large firms can be attributed to the firms' reactions to the deductible.

The key identifying assumption for the causal interpretation of any difference in the vicinity of the threshold is that firms do not remain small to avoid the deductible. While the deductible is sizeable—30 percent of direct costs—we argue that firms have only imprecise control over the classification. The classification of being a small or a large firm depended on the threshold, which varied over time, and the firm's wage bill from two months earlier. Because a wage bill depends not only on the number of workers, but also on promotions, industry-wide wage bargaining, and on turnover, firms have only incomplete control over their classification.[6]

[5] Figure 10 in the Appendix provides a comparison of the number of observations (firms × months) in the vicinity of the threshold. Narrowing the interval from €1,500 on either side of the cut-off to €1,000 lowers the number of available observations to about 10,000.

[6] Industry-wide bargaining in Austria has a coverage rate of close to 100 percent, which is exceptionally high in international comparison (Visser, 2011); this reduces the scope for strategic (downward) wage flexibility considerably.

4.2 Endogenous sorting

Endogenous sorting of firms would result in relatively more firms just below the threshold than just above it, because the difference in the refund rate may create an incentive to remain below the threshold, creating a discontinuity in the density of the assignment variable. Figure 2 plots the density of the assignment variable around the threshold for an interval of €5,000 on each side of the threshold, with separate local polynomial regressions overlaid for each side of the threshold.[7] (We will restrict our analyses below to a more narrow interval and will be using observations within €1,500 of the threshold only.)

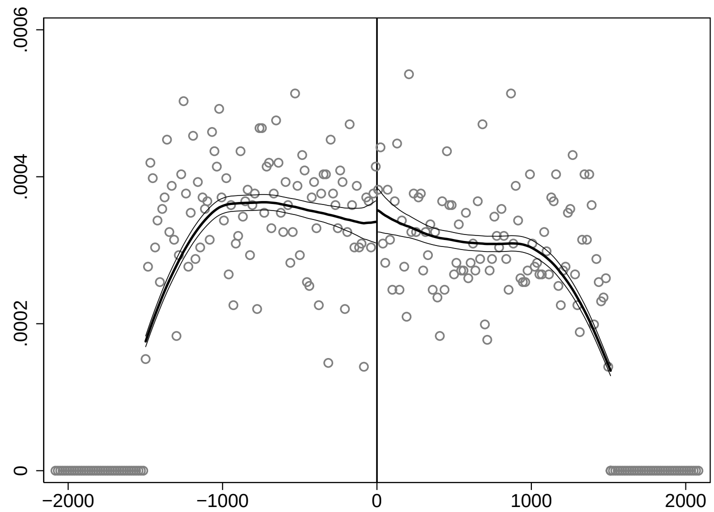
The graph indicates that there is no discontinuity in the assignment variable around the threshold. Lalive, Wuellrich and Zweimüller (2013) make similar arguments and find no evidence of sorting in their sample.[8] We believe that sorting is even less likely in our case because the wage bill is more difficult to target than the number of workers, e.g., because of separations or industry-wide collective bargaining.

In addition, if firms sorted below the threshold, we would observe these firms to grow more slowly than firms just above the threshold, in order to remain in the more beneficial region. Formal tests for differences in the growth rates show no statistically significant differences. A Wilcoxon-test for the equality of the monthly growth rates of blue-collar (all) workers has a

[7]We use Kovak's and McCrary's (2008) Stata program. Note that the continuous density of the assignment variable is neither necessary nor sufficient for identification except under auxiliary assumptions (McCrary, 2008).

[8]Lalive et al. (2013) consider a threshold of 25 workers that requires firms to hire a disabled worker (or pay a fine).

Figure 2: **Density distribution of firms around the cut-off.**

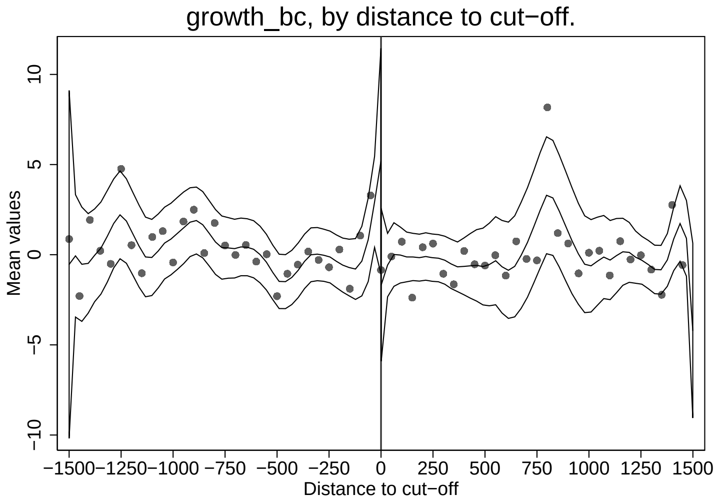


Note: Density of firms in the interval -1,500 and +1,500 around the threshold. The threshold was €18,313.56 in 1998 and €18,575.16 in 1999. Local polynomial regressions using a triangle kernel for each side of the cut-off (Kovak and McCrary, 2008).

p-value of 0.27 (0.21). The average growth rate of blue-collar workers in small firms was 0.39 percent (SD: 19.1 percent; N=5,012) and it was 0.05 percent (SD: 22.7 percent; N=4,489) in large firms. The relationship between the employment change of blue-collar workers in small and large firms around the threshold is plotted in Figure 3. The graph plots the month-on-month change in the number of blue-collar workers in percent, averaged for all firms in each €50 interval on either side of the threshold, as well as separate local polynomial regressions and their 95 percent confidence intervals. A graph that plots the changes in the employment rates of all workers provides a similar pattern, see Figure 11 in the Appendix.

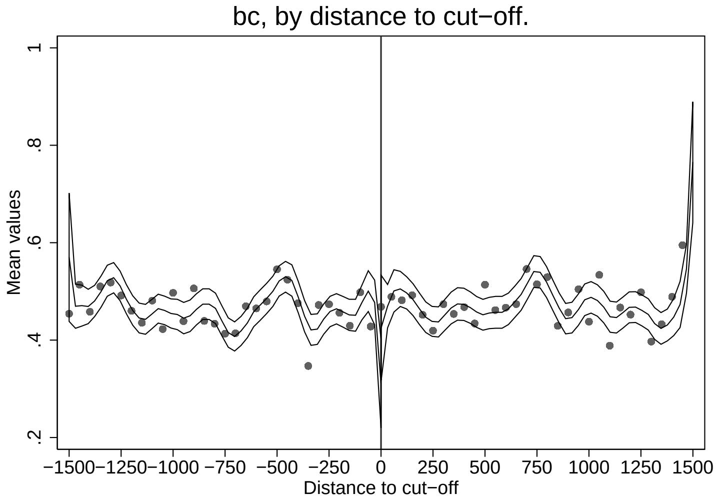
Because firms were refunded for their blue-collar sicknesses only, the frac-

Figure 3: **Changes in the number of blue-collar workers, by firm size.**



Note: Each dot represents the average percent change of blue-collar workers in all firms of each interval of €50 width. For each side of the cut-off, a local 4th-order polynomial regression and the 95 percent confidence interval is plotted. A Wilcoxon-test cannot reject the equality of the means on either side of the cut-off (p-value of 0.27).

Figure 4: **Fraction of blue-collar workers, by firm size.**

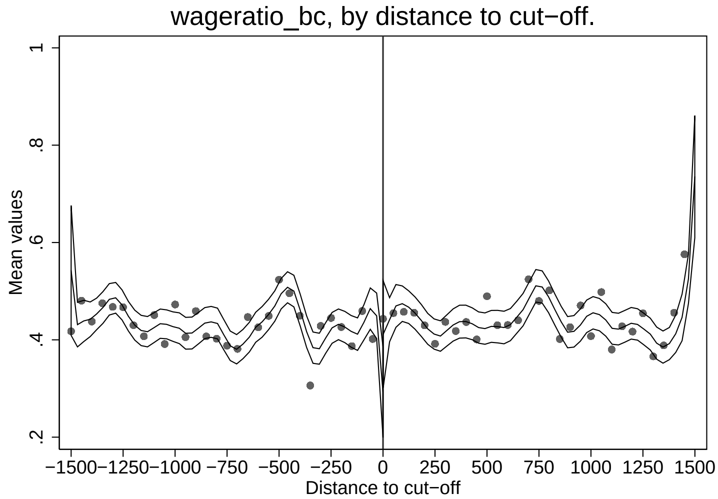


Note: Each dot represents the average fraction of blue-collar workers in all firms of each interval of €50 width. For each side of the cut-off, a local 4th-order polynomial regression and the 95 percent confidence interval is plotted. A Wilcoxon-test indicates that the mean is slightly greater for large firms (mean 0.47) than for small firms (mean 0.46; p-value of 0.28).

tion of blue-collar workers in small firms might be greater than in large firms. Figure 4 plots the average fractions in the vicinity of the threshold. The data indicate that the fraction of blue-collar workers was about the same in both small and large firms. The average fraction of blue-collar workers was 46.4 percent in small firms (SD: 35.4 percent; N=6,623) and 47.1 percent (SD: 35.3 percent; N=5,801) in large firms. A formal test cannot reject the equality of means (Wilcoxon p-value: 0.28).

Because firms get refunded for the wages paid to sick blue-collar workers, they are likely to base their strategies not on the number of blue-collar workers, but on the expected costs of sicknesses. The expected costs of sicknesses for small firms consist of all indirect costs of a sickness absence, for example,

Figure 5: **Blue-collar workers' wage share, by firm size.**



Note: Each dot represents the average of blue-collar workers' wage share in all firms of each interval of €50 width. For each side of the cut-off, a local 4th-order polynomial regression and the 95 percent confidence interval is plotted. A Wilcoxon-test indicates that the mean is slightly greater for large firms (mean 0.44) than for small firms (mean 0.43; p-value of 0.14).

the hiring of temporary substitutes. For large firms, it is the sum of all indirect costs plus the deductible, which is based on the number of sick days times the workers' wages. If firms react strategically to the threshold, we expect that blue-collar workers obtain a greater wage share in small than in large firms. The wage share is the fraction of wages that are paid to blue-collar workers of all wages paid by the firm. We plot the distribution of blue-collar workers' wage shares in Figure 5, for all firms that are at most €1,500 from the cut-off. The graph indicates no visible difference between small and large firms. A formal test indicates that the blue-collar workers' wage share is about the same in both small (mean: 0.432 (SD: 0.36; N=6,623)) and large firms (mean: 0.44 (SD: 0.36; N=5,801)), p-value of 0.14.

Overall, the empirical evidence suggests that small firms did not remain small strategically to avoid the deductible, nor did they hire strategically more, or more expensive, blue-collar workers than large firms.

Table 1 provides additional descriptive statistics of our estimating sample. The average values of all descriptive variables indicate that small and large firms in our sample do not differ.

Table 1: **Summary statistics.**

	Small firms		Large firms	
Indicators	Mean	SD	Mean	SD
Firm size	12.043	4.128	13.113	4.415
Mean age	36.128	4.739	35.716	4.410
Mean wage	1,767.271	549.724	1,753.339	499.317
Tenure (years)	9.985	4.999	9.875	5.018
Fraction of blue-collar workers	0.464	0.354	0.471	0.353
Fraction of female workers	0.411	0.292	0.414	0.288
Fraction of workers aged 15–24	0.141	0.247	0.153	0.121
Fraction of workers aged 55+	0.042	0.071	0.035	0.061
N	6,623		5,801	

Note: Time period from 1/1998–12/1999. Units of observation are firms×month. All observations are within €1,500 of the threshold. Wages are deflated using the HCPI 2005 monthly index (Statistik Austria, 2013).

4.3 Descriptive statistics

We tabulate indicators of sickness in Table 2. The sickness indicators are weighted by the blue-collar workers' wage shares to account for differences in the firms' workforce compositions and wages. The weighting procedure has the aim to reflect differences in the (potential) relevance of the refund scheme for the cost structure of firms.[9] In Section 5 we present estimation results using both weighted and unweighted data.

We consider incidences, i.e., the sum of spells, and durations, i.e., the sum of absent days, separately. We distinguish between a broad and a strict definition as it is not clear *a prior* whether firms react only to sickness days for which wages have to be paid (strict definition), or also to sickness days for which the workers receive sickness benefits from the social security (broad definition). Under the broad definition, although a firm does not incur direct costs through paid wages, greater indirect costs could result due to restructuring or the hiring of replacement workers. In addition, we take into consideration spells with different duration. Because four weeks was the minimum period of paid sick leave (for blue-collar workers with tenure of less than five years) we calculate a separate indicator for spells that lasted up to 28 days. Since the moral hazard might be larger in the case of short sick leave spells, whereas long absences are the result of severe illnesses or injuries and therefore difficult to influence, we provide a further indicator for spells that lasted up to 14 days.

Economic theory suggests that the deductible is an incentive for firms to reduce their workers' sickness absences and we expect to observe fewer or shorter sickness spells in large than in small firms. All indicators in Table 2 indicate that, in contrast to our expectations, larger firms have on average

[9]The intuition behind this approach is that the strength of the incentive for firms to influence their workers' sick leave is a function of their blue-collar workers' wage share. This becomes evident if we think of two firms that have exactly the same wage bill, but where one firm has only one blue-collar worker on its payroll whereas the other firm employs only blue-collar workers.

more and longer sicknesses.

Table 2: **Sickness indicators, by firm size.**

	Small firms		Large firms	
	Mean	SD	Mean	SD
Incidences				
Strict definition				
All spells	0.413	0.765	0.449	0.810
Spells < 14 days	0.328	0.654	0.349	0.693
Spells < 28 days	0.390	0.739	0.425	0.789
Broad definition				
All spells	0.490	0.886	0.535	0.931
Spells < 14 days	0.386	0.745	0.413	0.780
Spells < 28 days	0.460	0.846	0.502	0.898
Durations				
Strict definition				
All spells	4.112	9.7181	4.465	9.993
Spells < 14 days	1.988	4.291	2.084	4.405
Spells < 28 days	3.156	6.817	3.479	7.234
Broad definition				
All spells	5.160	13.258	5.598	12.653
Spells < 14 days	2.326	4.796	2.452	4.926
Spells < 28 days	3.699	7.648	4.107	8.140
N		6,623		5,801

Note: All values are for blue-collar workers' sicknesses only. Incidences are the sum of all blue-collar workers' sickness spells in a month in a firm, weighted by the blue-collar workers' wage share. Durations are the sum of all blue-collar workers' sickness days in a month in a firm, weighted by the blue-collar workers' wage share. The strict definition considers only sickness spells for which the firm has to pay continued wages and the broad definition also considers spells where social security pays sickness benefits. Time period from 1/1998–12/1999. Units of observation are firms×month. All observations within €1,500 of the threshold.

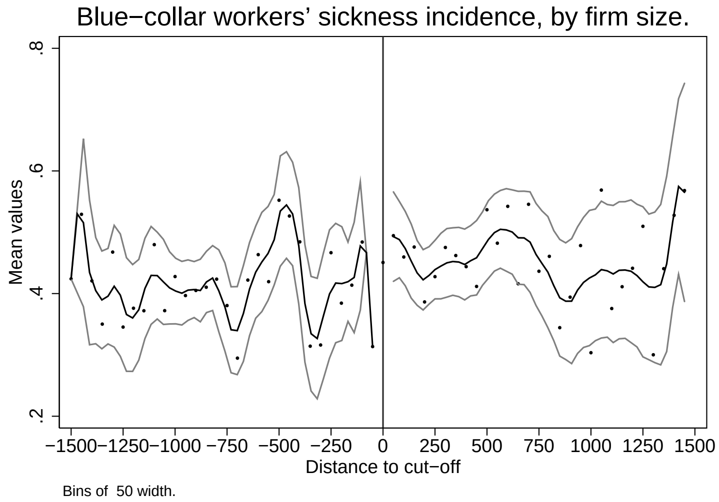
5 Results

Figures 6 and 7 plot the average incidences and durations in intervals for observations within €1,500 of the threshold. Only spells where firms pay wages while a worker is on sickness absence are considered and we do not impose an upper limit on the spells. The interval around the threshold is segmented into smaller intervals of €50 width, "bins", and the mean value for each bin is represented by a dot. For each side of the threshold, we plot a fourth-order polynomial and the 95 percent confidence interval. The figures indicate that there are no differences between small and large firms as there is considerable overlap of the CI at the threshold.

Local linear estimates (using a triangle kernel) for each side of the threshold confirm that small and large firms do not differ in their blue-collar workers' sickness incidences or durations. The estimates of the discontinuity are tabulated in Table 3 for different bandwidths and for different distances to the threshold. The optimal bandwidths are calculated according to Imbens and Kalyanaraman (2012) and differ for each interval and indicator. To gauge sensitivity to the choice of bandwidth, estimates using the optimal bandwidth, half the optimal bandwidth, and twice the optimal bandwidth are tabulated. Figures 8 and 9 plot estimated treatment effects and their 95 percent confidence intervals for a range of different bandwidths.

Most estimates are not statistically significant at conventional error levels; those that are statistically significant estimate that large firms, not small firms, had more and longer sickness absences. We estimate that the deductible causes about 4 more sickness days in large firms (however, this effect is imprecisely estimated) and does not lead to a different number of incidents.

Figure 6: **Sickness incidences, by firm size.**



Note: Each dot represents the average of blue-collar workers' sicknesses in all firms of each interval of €50. Strict definition of spells, i.e., only spells during which firms have to pay continued wages. For each side of the cut-off, a local 4th-order polynomial regression and the 95 percent confidence interval is plotted. For each firm, the number of sickness spells is weighted by the blue-collar workers' wage share.

Table 4 indicates that it is neither the chosen indicator nor the choice of weighting the indicator that leads to this result. The estimated treatment effects are similar to those described above, i.e., most are not statistically significant at conventional levels and indicate rather that large firms have more and longer absences than small firms.

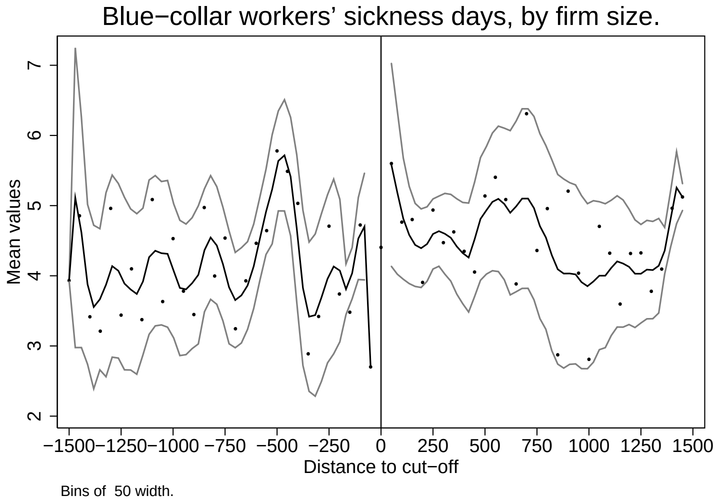
We interpret our findings that the deductible is too low to induce management responses. The deductible is based on the wages paid to sick workers. In firms included in our sample, blue-collar workers totalled about 7.5 sick

Table 3: **Estimated effect of the deductible on sickness absences.**

	Interval around the threshold					
	+/- 1500		+/- 1000		+/- 500	
	τ	(SE)	τ	(SE)	τ	(SE)
Spells						
Optimal bandwidth	0.489	(0.395)	0.444	(0.384)	0.423	(0.381)
Optimal bandwidth/2	2.182	(1.622)	1.568	(1.382)	1.349	(1.263)
Optimal bandwidth*2	0.470*	(0.263)	0.510**	(0.253)	0.528	(0.249)
Days						
Optimal bandwidth	4.877*	(2.522)	4.869*	(2.517)	4.865*	(2.515)
Optimal bandwidth/2	2.485	(3.323)	2.532	(3.311)	2.556	(3.304)
Optimal bandwidth*2	4.431**	(1.929)	4.433**	(1.917)	4.434**	(1.911)
N	12,424		8,335		4,174	

Note: τ indicates the estimated difference in the sickness indicator due to the change in treatment. Spells are all sickness absences of blue-collar workers in a firm in a month, weighted by the blue-collar workers' wage shares. Days are all blue-collar workers' sickness days in a firm in a month, weighted by the blue-collar workers' wage shares. Only spells are considered during which firms continued to pay their absent workers, without imposing an upper limit on the duration of a spell. Standard errors in parentheses. The optimal bandwidths are calculated according to Imbens and Kalyanaraman (2012). The kernel is a triangle kernel *** p<0.01, ** p<0.05, * p<0.1.

Figure 7: **Sickness durations, by firm size.**



Note: Each dot represents the average number of days blue-collar workers are on sickness leave, in all firms of each interval of €50. Strict definition of spells, i.e., only spells during which firms have to pay continued wages. For each side of the cut-off, a local 4th-order polynomial regression and the 95 percent confidence interval is plotted. For each firm, the number of sickness days is weighted by the blue-collar workers' wage share.

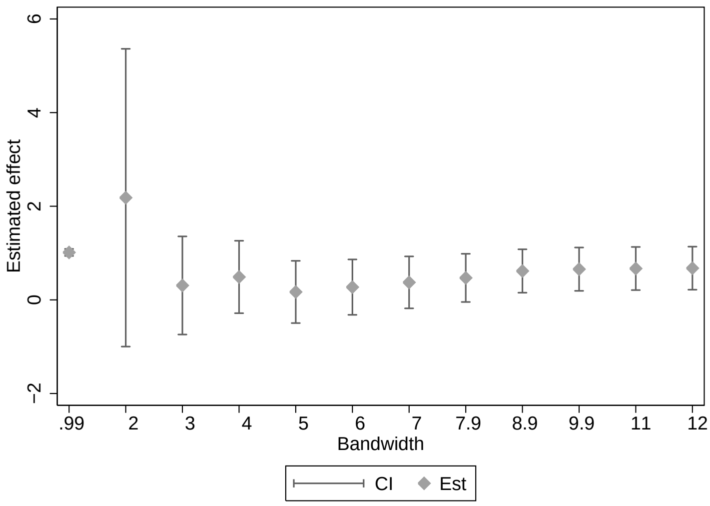
leave days per month (see Table 9 in Appendix), which corresponds to a volume of about 90 days per year. The average blue-collar worker's wage per day was, averaged over the two years for these firms, about €44.3. The deductible for the total yearly sickness costs, some €3,988, amounts to about €1,196. This corresponds to 7.4 percent of an average blue-collar worker's annual wage (12 × 1,347.78), or 1.1 percent of the average total blue-collar wage bill in a firm.

Table 4: **Robustness of estimated effects.**

	$\hat{\tau}$	(SE)
Spells		
Excluding social security payments, unweighted	-0.249	(0.921)
Excluding social security payments, weighted by number of blue-collar workers	-0.353	(0.498)
Excluding social security payment, spells shorter than 14 days, weighted by wage share	0.481	(0.406)
Including social security payments, weighted by wage share	0.506	(0.410)
Days		
Excluding social security payments, unweighted	4.147	(5.869)
Excluding social security payments, weighted by number of blue-collar workers	0.408	(0.788)
Excluding social security payment, spells shorter than 14 days, weighted by wage share	3.117	(1.907)
Including social security payments, weighted by wage share	5.156**	(2.452)
N		12,424

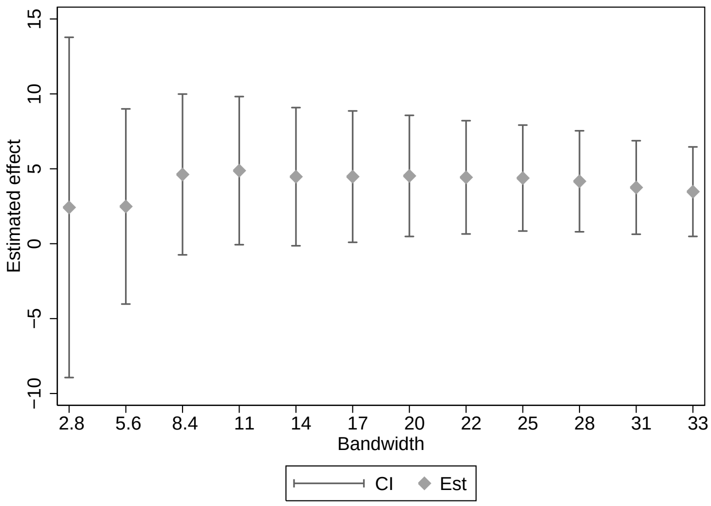
Note: $\hat{\tau}$ indicates the estimated difference in the sickness indicator due to the change in treatment, based on local estimates using a triangle kernel. All observations within €1,500 of the threshold. Estimates obtained from a choice of the optimal bandwidths (Imbens and Kalyanaraman, 2012). Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Figure 8: **Estimated treatment on sickness incidences, by choice of bandwidth.**



Note: Each dot indicates the estimated treatment effect on the number of sickness spells in a firm within €1,500 of the thresholds. The bars indicate the 95 percent confidence intervals. Spells are all sickness absences of blue-collar workers in a firm in a month, weighted by the blue-collar workers' wage shares. Only spells are considered during which firms continued to pay their absent workers, without imposing an upper limit on the duration of a spell.

Figure 9: **Estimated treatment on sickness durations, by choice of bandwidth.**



Note: Each dot indicates the estimated treatment effect on the number of sickness spells in a firm within €1,500 of the thresholds. The bars indicate the 95 percent confidence intervals. Days are all blue-collar workers' sickness days in a firm in a month, weighted by the blue-collar workers' wage shares. Only spells are considered during which firms continued to pay their absent workers, without imposing an upper limit on the duration of a spell.

6 Summary and Conclusion

Using detailed administrative data for Austria, we examined the effect of a deductible on the sickness incidences and durations in firms near an administrative threshold. Austria is representative for other European countries which have universal social security and provides an instructive benchmark for the design of sick leave insurance. Compulsory social insurance insured firms for the wages they were required to pay their blue-collar workers in case of sickness. Based on an administrative threshold, small firms received all of the paid wages, while large firms were required to pay a deductible of 30 percent. Under the assumption that firms near the threshold have only imperfect control over whether they are regarded as a small or a large firm, our empirical approach allows us to detect causal changes in sicknesses due to a change in the deductible.

Detailed empirical analyses indicate that small firms did neither hire relatively more blue-collar workers than large firms, nor do we detect any differences in firms' growth rates by whether they are large or small. In addition, all other characteristics, for example, the number of female workers or the fraction of workers who were older than 55, do not systematically differ by firm size.

Our empirical results do not indicate any causal effect of the deductible on the sickness absences. This finding is robust to different indicators of sickness, i.e., the number of spells and the number of sickness days, and to the distinction whether a firm had to continue to pay wages or not. We interpret our findings that the deductible is too moderate to induce management responses. The deductible is based on the wages paid to sick workers and, for the firms in our sample, amounts to 1.1 percent of the average total blue-collar wage bill in a firm. A different interpretation of our results is that, because workers have to undergo a medical check to examine their sickness, there is very little room for moral hazard. We reject this explanation, because Böheim and Leoni (2011) show that once the insurance was removed, sickness incidences (and days on paid sick leave) were reduced.

Our results can be linked to earlier research on the effect of insurance deductibles on health care utilization. Aron-Dine, Einav and Finkelstein (2013), in a re-appraisal of the RAND insurance experiment, stress that perhaps the single robust finding of this landmark experiment is to show that the design of health insurance contracts impacts medical spending. The price elasticity of demand for health care and therefore the magnitude of the moral hazard effect of insurance is however an unsettled empirical question. Chiappori et al. (1998), for example, find that the introduction of a small copayment rate in France did not lead to fewer GP office consultations.[10] Evidence on the moral hazard effects of deductibles is however mixed (Gerfin and Schellhorn, 2006).

In our case, the deductible must be contrasted with the total costs resulting from work loss due to absence, which might be substantially larger than the wage (Pauly et al., 2002). Finally, the relatively small deductible might be dominated by other costs a firm might face if it were to (aggressively) lower sickness absences, such as increased monitoring costs and possible negative

[10] Although they do estimate a small negative effect on the number of GP home visits.

effects on worker motivation. In a laboratory experiment, Duersch, Oechssler and Vadovic (2012) show that workers reciprocate generous sick pay with higher effort.

Before drawing policy conclusions, it has to be kept in mind that our results are based on a comparison of firms within a narrow range of the threshold, firms that lie outside this range might exhibit different reactions to the deductible. (However, given the small monetary amounts involved, we consider this unlikely.) Moreover, we must be careful when generalizing findings to other countries as different sick leave regulations and institutional complementarities might lead to different responses by both firms and workers.

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A Comparison Austria - USA

A.1 Institutional differences

Austria and the United States have substantially different regulations of employees' sick leaves. The United States are one of the few OECD countries without nation-wide legal requirements for paid sick leave (Heymann, Rho, Schmitt and Earle, 2010).[11] In recent years, a handful of jurisdictions in the United States passed local paid sick time laws.[12] In addition, five of the 50 States passed temporary disability legislation that ensures pay during absences only for long-term illnesses (i.e., in cases where workers need to address serious health conditions that require lengthier treatment and recovery periods). There are however no federal legal requirements for paid sick leave. Unlike Austria, in the United States it is essentially the employer's decision to provide workers with paid sick leave provisions.

This fundamental difference determines a large gap in worker benefit coverage rates between Austria and United States. Whereas in Austria virtually all workers are entitled to continued wage payment and sick pay, paid sick leave coverage in the US is limited and varies greatly depending on firm and worker characteristics.

In 2012, 66 percent of civilian workers (61 percent of private and 89 percent of state and local government workers) were covered by paid sick leave (Bureau of Labor Statistics, 2012).[13] High-skilled, full-time, and unionized workers as well as those working in large establishments are much more likely than other types of workers to receive compensation while on sick leave. Whereas almost 90 percent of workers in managerial or professional occupations are covered by paid sick leave, the share drops to 54 percent for production workers and 47 percent of service workers. Only 25 percent of part-time workers are entitled to paid sick leave, against 79 percent of full-time workers. These differences are mirrored in a strong gradient along the wage distribution: 90 percent of workers in the top decile, but only 20 percent in the bottom decile of the wage distribution are entitled to paid sick leave.

Moreover, there is considerable heterogeneity in the type of sick leave pro-

[11] According to Scheil-Adlung and Sandner (2010) as many as 145 countries provide for paid sick leave.

[12] San Francisco, Washington D.C., Portland, Seattle, and recently New York passed paid sick leave ordinances at the city level. Connecticut has the only statewide paid sick leave policy, although the Connecticut law applies only to employers with at least 50 employees and eligibility is restricted to service workers.

[13] Data from the National Compensation Survey (NCS).

visions. Most entitled workers participate in paid sick leave plans in which a fixed number of days of paid sick leave are provided each year. These workers typically receive 5 to 9 days of sick leave per year. About one fifth of workers with paid sick leave receive this benefit through a "consolidated leave plan"[14], whereas a minority of workers (10 percent) receive paid sick leave on an as-needed basis, in plans that do not specify the maximum number of sick days that could be taken (Barthold and Ford, 2012). In Austria, the only differences in sick pay entitlement arise from different tenures. Until 2000, blue-collar workers were entitled to two weeks less continued wage payment than white-collar workers at each level of tenure (see Section 4). Since 2001, the sick pay legislation for blue-collar and white-collar workers are virtually the same, the only difference being that the overall number of sick days in a given calender year is fixed for blue-collar workers, but not for white-collar workers.

Part of the American workforce is covered by federal provisions that allow for unpaid health-related leave periods. The most important legislation in this respect is the Family and Medical Leave Act (FMLA) of 1993. Under the FMLA, eligible workers can take unpaid leave to recover from a serious illness. Employees are eligible to take FMLA leave if they have worked full-time for their employer for at least 12 months, and work at a location where at least 50 employees are employed by the employer within 75 miles. According to survey information from the year 2012, close to 60 percent of all employees are eligible for the Act (Klerman, Daley and Pozniak, 2012). The Americans with Disability Act (ADA) of 1990 (amended 2008), requires covered employers to provide reasonable accommodations to qualified individuals with disabilities. Reasonable accommodations may include unpaid leave, as employers may have to allow disabled employees to take more unpaid leave than is provided by their leave policy. The ADA is applicable to employers with 15 or more employees.

Interestingly, in spite of all the differences there exist some parallels in the treatment of sick leave in Austria and the USA, particularly when we look at strategies to differentiate the impact of negative effects from sickness absence across firms of different size. Both in the United States and in Austria sick leave regulations tend to be more favorable for small than for large employers. In Austria this differential treatment is expressed by the fact that since 1974 (and with exception of the short period between September 2000 and January 2002), small firms receive a preferential treatment in the reimbursement of costs sustained for sick employees.

[14] In which multiple forms of leave are combined into one plan and workers can allocate days between various uses as they choose.

In the United States, small employers are exempted from both FMLA and ADA. In addition, employees in small firms are significantly less likely to be eligible for paid sick days and paid sick leave coverage increases with firm size. The variation of paid sick pay coverage with firm size can be seen in Table 5. The coverage rate in firms with 500 or more workers is about 86 percent and exceeds that for small firms (less than 50 workers) by 35 percentage points. The difference is more pronounced in the private sector than in the public sector. As a general rule, access to employer-provided benefits is greater in medium and large private firms than in small establishments (see for instance Diaz and Wallick 2009), but the availability of paid sick leave varies more over firm size than the availability of other benefits such as paid holidays and paid vacation.[15]

Table 5: **Paid sick leave coverage by firm size in the United States.**

Number of workers	Civilian	Private industry[a]	State and local government
1–49	51	50	70
50–99	57	55	90
100–499	69	66	87
500+	86	82	91

Note: National Compensation Survey, March 2011. [a] Includes workers in the private non-farm economy except those in private households, and workers in the public sector, except the federal government.

A.2 Sick leave rates in Austria and the United States

In spite of the economic relevance of health-related absenteeism, there is no standardized definition for the measurement of sickness absences and internationally comparable data are scarce. Existing evidence for industrialized countries suggests that sickness absence rates in the United States tend to be low by international standards, although the exact ranking between countries can vary considerably depending on the data source (Bonato and Lusinyan,

[15] Paid vacation and paid holidays are available to 67 percent of workers in small and 78 percent (paid vacation) and 82 percent (paid holidays) in large establishments. Source: National Compensation Survey, March 2011.

2007; Osterkamp and Roehn, 2007; Rae, 2005; Scheil-Adlung and Sandner, 2010; Ziebarth and Karlsson, 2010). Austria is usually found in the middle of international rankings, whereas Scandinavian countries such as Sweden and Norway as well as some Eastern European countries such as the Czech Republic typically display the highest absence rates.

We compare official statistics from the Bureau of Labor Statistics (BLS) with equivalent data for the Austrian workforce to provide a first glance on how institutions might shape sickness absences. The BLS publishes regularly Labor Force Statistics from the Current Population Survey (CPS) that contain information on different types of absence from work. One of these categories is related to absences due to illness, injury, and medical problems and can be interpreted as synthetic measure for health-related absences. The BLS provides two indicators, the absence rate and the lost worktime rate, which serve to indicate the extent of sickness related absences. The absence rate is the ratio of workers with absences to total full-time wage and salary employees and indicates the incidence of health-related absences in a reference week. The lost worktime rate is the number of hours absent as a percentage of hours usually worked. This is a measure for the total volume of absences. Following the definitions provided by the BLS, we have constructed analogous indicators for Austria using micro-data from the Austrian Labor Force Survey (AKE).

The results of our calculations are tabulated and compared to the BLS data in Tables 6 and 7. Please note however that the surveys provide only partial information on the total volume of sick leave because the data is right-censored: absences that began in the reference week but continued in the following week enter the statistic only with the fraction of worktime lost in the reference week.

As we can see from the Tables, health-related absences are more frequent in Austria than in the United States. In particular, over the period 2006–2012 the absence rate of the total workforce aged 16 years+ in Austria has risen from about 2.3 percent to about 2.8 percent, while it has been falling in the US from 2.3 percent to 2.1 percent. Confirming findings from previous research, we can observe that in both countries women are sick more often than men and workers in the public sector more often than those in the private sector.

However, the difference between the two countries is more pronounced when we consider the volume of hours lost due to absences. The data indicate that, depending on the year, two to three times as many working hours were lost due to sickness absences in Austria than in the US. Similarly to the absence rate, the lost worktime rates has increased in Austria and decreased in the US during 2006–2012. This divergent development over time could be related to a number of factors, such as differences in business cycle or changes in workforce composition, but we do not have enough elements to verify these possible explanations.

Several studies have documented that the availability and level of sick pay benefits have an impact on sick leave incidences and durations. For a recent survey of the literature on this issue see Ziebarth and Karlsson (2010), who come to the conclusion that "all [of the aforementioned studies] find that employees adapt their absence behavior to increases and decreases in benefit levels" (p.1108). In this respect, the difference in sick leave that we observe according to Labor Force Statistics falls in line with expectations.

For the purpose of our research, it would be particularly interesting to compare differences in absence rates across firm size in the two countries, but no data on sickness absences by firm size are published by an official source for either the United States or Austria. For Austria, our own calculations (see Table 2) do however show that absence rates are substantially lower in small firms than in large firms (i.e., sickness absences are inversely related to firm size). This finding corroborates the expectations from economic theory as well as previous empirical findings for Austria (Böheim and Leoni, 2011) and other countries (e.g., Winkelmann 1999, Ercolani 2006, Barmby, Ercolani and Treble 2002). Evidence for the United States by Vistnes (1997) shows that men and women in firms of less than 10 employees were significantly less likely to miss work than workers in firms with more than 500 workers.

Table 6: **Sick leave absence rates in Austria and United States, 2006–2012.**

Worker category	2006	2007	2008	2009	2010	2011	2012
Austria							
Men, 25 to 54 years	2.2	2.5	2.3	2.6	2.6	2.7	2.5
Women, 25 to 54 years	2.4	2.5	2.7	2.6	2.8	3.2	3.1
Total, 25 to 54 years	2.3	2.5	2.5	2.6	2.6	2.9	2.7
Private sector, 16 years+	2.2	2.2	2.3	2.5	2.5	2.7	2.5
Public sector, 16 years+	3.1	3.6	3.3	3.2	3.8	3.7	3.7
Total, 16 years+	2.3	2.4	2.4	2.6	2.7	2.8	2.7
US							
Men, 25 to 54 years	1.7	1.6	1.7	1.7	1.7	1.6	1.5
Women, 25 to 54 years	2.8	2.7	2.6	2.8	2.7	2.6	2.6
Total, 25 to 54 years	2.2	2.1	2.1	2.2	2.1	2.0	2.0
Private sector, 16 years+	2.1	2.0	2.1	2.2	2.1	2.1	2.0
Public sector, 16 years+	3.0	2.8	2.8	2.9	2.8	2.7	2.8
Total, 16 years+	2.3	2.2	2.2	2.3	2.2	2.2	2.1

Note: Absence rates due to illness or injury. Based on full-time workers only. Absences are defined as instances when persons who usually work 35 or more hours per week (full-time) worked fewer than 35 hours during the reference week because of own illness, injury or medical problems. For multiple jobholders, absence data refer only to work missed at their main jobs. The absence rate is the ratio of workers with absences to total full-time wage and salary employment and expresses the incidence of sickness absence in the reference week. Data for USA: CPS, BLS calculations; data for Austria: AKE, WIFO calculations.

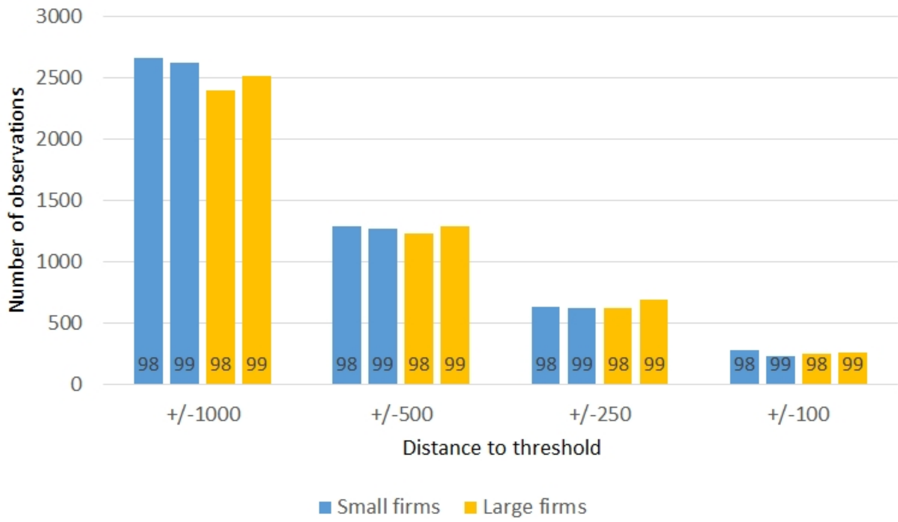
Table 7: **Lost worktime rates in Austria and United States, 2006–2012.**

Worker category	2006	2007	2008	2009	2010	2011	2012
Austria							
Men, 25 to 54 years	2.0	2.2	2.0	2.2	2.3	2.3	2.1
Women, 25 to 54 years	2.1	2.2	2.4	2.2	2.5	2.8	2.6
Total, 25 to 54 years	2.0	2.2	2.2	2.2	2.4	2.5	2.3
Private sector, 16 years+	2.0	2.0	2.0	2.1	2.2	2.3	2.1
Public sector, 16 years+	3.1	3.6	3.3	3.2	3.8	3.7	3.7
Total, 16 years+	2.8	3.1	2.9	2.9	3.5	3.2	3.4
US							
Men, 25 to 54 years	0.9	0.9	0.9	0.9	0.9	0.8	0.8
Women, 25 to 54 years	1.5	1.4	1.3	1.3	1.4	1.2	1.2
Total, 25 to 54 years	1.2	1.1	1.1	1.0	1.1	1.0	1.0
Private sector, 16 years+	1.2	1.1	1.1	1.0	1.1	1.0	1.0
Public sector, 16 years+	1.5	1.4	1.4	1.4	1.5	1.3	1.4
Total, 16 years+	1.2	1.2	1.2	1.1	1.2	1.1	1.0

Note: The lost work time rate expresses hours absent as a percentage of hours usually worked. Based on full-time workers only. Absences are defined as instances when persons who usually work 35 or more hours per week (full-time) worked fewer than 35 hours during the reference week because of own illness, injury or medical problems. For multiple jobholders, absence data refer only to work missed at their main jobs. Data for USA: CPS, BLS calculations; data for Austria: AKE, WIFO calculations.

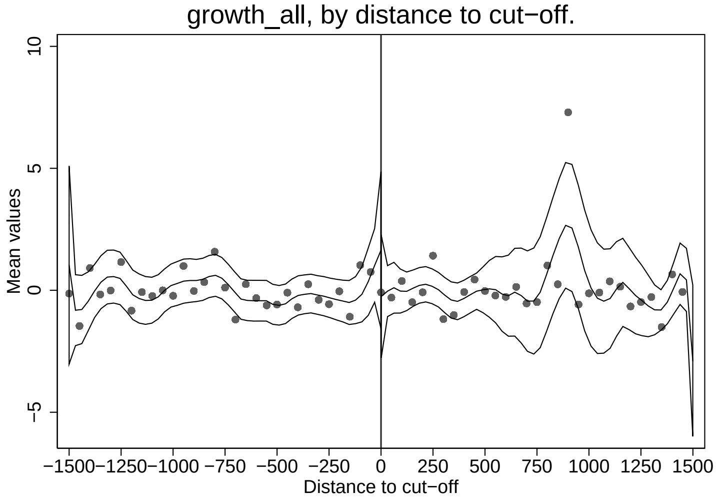
B Additional Figures and Tables

Figure 10: **Distribution of firms within certain intervals around the threshold.**



Note: Observations are on the firm×month level. Intervals in €. Threshold level in 1998: €18,313.56; 1999: €18,575.16.

Figure 11: **Changes in the number of workers, around the cut-off.**



Note: Firms' percent changes in the number of employees within €1,500 of the cut-off. Changes are averaged over all firms in each interval of €50. A Wilcoxon-test cannot reject the equality of the means on either side of the cut-off (p-value of 0.61).

Table 8: **Legal differences between blue- and white-collar workers.**

	Until year 2000	
	Blue-collar	White-collar
Health insurance contributions		
Employers:	3.95	3.40
Workers:	3.95	3.50
Minimum period of notice	1 day	6 weeks
Maximum duration of wage payments in case of sickness (weeks)		
At tenure:		
< 5 years	4	6
5–15 years	6	8
15–25 years	8	10
≥ 25 years	10	12
Within work year	fixed	not fixed

Note: Health insurance contributions: expressed as percentage of gross wage (salary). Period of notice: minimum period may be extended by collective bargaining. Maximum period of wage payment within a calendar year: For blue-collar workers it is fixed, regardless of how many times a worker falls ill; white-collar workers may claim longer periods of wage payments within a calendar year if they fall ill repeatedly. (Böheim and Leoni, 2011)

Table 9: **Additional summary statistics.**

Indicators	All firms Mean	SD
Blue-collar workers		
Mean wage	1,347.78	457.33
Number of workers	6.43	5.74
Sick leave days (strict)	7.49	13.87
Sick leave days (broad)	9.39	18.30
N	12,424	

Note: Time period from 1/1998–12/1999. Units of observation are firms×month. All observations are within €1,500 of the threshold. Wages are deflated using the HCPI 2005 monthly index (Statistik Austria, 2013).