

Timme, Florian

Conference Paper

The Painful External Costs of Bargaining - Evidence from a Railway Strike

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2018: Digitale Wirtschaft - Session: Labor and Unemployment III, No. C21-V2

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Timme, Florian (2018) : The Painful External Costs of Bargaining - Evidence from a Railway Strike, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2018: Digitale Wirtschaft - Session: Labor and Unemployment III, No. C21-V2, ZBW - Leibniz-Informationszentrum Wirtschaft, Kiel, Hamburg

This Version is available at:

<https://hdl.handle.net/10419/181535>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

The Painful External Costs of Bargaining - Evidence from a Railway Strike[☆]

Florian Timme^a

^a *Otto-von-Guericke-University Magdeburg, Universitätsplatz 2, 39106 Magdeburg*

Abstract

Evidence is presented that the number of traffic deaths and traffic injuries increased significantly due to a railway strike in Germany. While the number of slightly and seriously injured people increased on all road types, the number of fatally injured people increased only on roads out of town. The data suggest that the timing of a strike plays a crucial role in the effect on traffic injuries. Effects are stronger on weekends (Friday to Sunday) than on weekdays. *JEL Codes: J45, J52, R41.*

[☆]Thanks to Joachim Weimann, Benedikt Mihm and seminar participants at FU Berlin for providing insightful feedback.

Email address: `florian.timme@ovgu.de` (Florian Timme)

1. Introduction

Can bargaining injure uninvolved people or even cause their death? I analyse a series of strikes during a collective bargaining process in the railway sector. During strikes, railway passengers must use other means of transportation. I present evidence from a data set on daily traffic in-juries and analyse the effect of increased traffic due to the strike on traffic injuries. In a two-year observation period, there were 26 strike days. In order to obtain robust results, three different regression models are used. The results suggest an increase in the number of slight, serious and fatal injuries of more than 10%. The estimation depends on the time of the week, especially when comparing weekends with weekdays.

Policy makers have excluded railway workers from the right to strike in some countries, for example in Switzerland. New York City prohibits strikes for transit workers under the Taylor Law¹. This article provides evidence on the question of whether such strict measures are justified by the data.

Unions use labour strikes in collective bargaining situations. They are costly for companies and unions. Decision makers of the union and the employer optimize their bargaining strategies by considering costs incurred to either of them. I refer to this type of costs as internalized costs. In the case of a railway strike, these are, for example, fewer customers during and after the strike, worsened quality of the service during the strike and lost reputation. Unions pay strike money for the length of the strike. Internalized costs are not a problem from a welfare perspective, because the number of strikes is optimal when these costs are given and all bargaining partners act rationally.

There are, however, potential cost types that are not internalized. One example is extended traffic congestion due to the strike. Neither the union nor the railway company bear the costs of longer car rides. The example that this article discusses is the increased costs due to more road accidents during the strike. This is especially true if people who do not use the railway are injured as well. I will refer to these costs as external costs. External costs are more problematic than internalized costs. Decision makers of the bargaining parties do not take these into account and therefore the strikes might be greater in number and/or longer than is optimal.

The first aim of this article is to show the existence of external effects in collective bargaining in the railway sector. The second aim is to quantify the effects. External effects are measured by an increase in the number of slightly, seriously or fatally injured people. The rationale behind this lies in the assumption that due to the strike most railway customers have to use other means of transportation. A significant number of them will add to the traffic on the roads by using cars or buses. More cars on the road result in a higher traffic density,

¹Taylor Law refers to the Public Employees Fair Employment Act.

which leads to two possible effects. First, there will be more traffic congestion, because roads are overloaded. Second, more cars on the road may mean that there will be more traffic accidents. The number of accidents may increase in both situations, with and without more traffic congestion on the road. Traffic congestion matters when it comes to the expected seriousness of the injury as it is plausible that accidents will result in less severe injuries when cars are slower.

This study is the first to measure traffic accidents due to public transport strikes on a nationwide level. An increase in traffic injuries on the strike day is an external cost of the bargaining process. There is a growing experimental literature about external costs in bargaining situations in the context of norms. Falk and Szech (2013)² implement morals in an experiment by having external costs assigned to the bargaining process. In their study, subjects decided to “receive no money and save the life of a mouse, or to earn the money and accept the killing of the mouse”. Sutter et al. (2016) design their experiment in such a way that a measles vaccination in Southeast Asia was not provided if two subjects reached an agreement on how to divide up 21.40 euros. While the externalities are artificial, the underlying research question about the role of morals is important for real life externalities.

Gruber and Kleiner (2012) analyse a series of hospital strikes in New York State. They show that a strike decreases all the relevant quality parameters in a hospital. As long as the stakeholders watch the outcomes closely, a reduction in quality is mostly an internalized cost. Another example of an internalized cost is the forced search for substitutes by customers. If a strike occurs, customers will potentially find other ways to obtain the product or service. Lacrom et al. (2017) study a subway strike in London. Commuters were forced to use a new route during the strike. The authors show that 5% of London’s commuters changed their preferred commuting route after a strike. Consumer change can also result in the use of other transport companies. Beestermöller (2017) analyses the same railway strike in Germany as this article does. He shows that customers migrated permanently from railway to intercity buses.

Anderson (2013) examines the external effects of strikes. He shows that traffic slowed down by 12 seconds per mile when the Los Angeles subway was on strike. He estimates the appertaining costs to this strike at \$5.7 million per day. Closest to this article is an analysis of a series of subway strikes in five big cities by Bauernschuster et al. (2017). Among other health analyses, they find an increase in the number of slightly injured people on strike days in the cities concerned. They do not find an increase in the number of seriously or fatally injured people. Since they concentrated on metropolitan areas, they found that strikes reduced speed significantly. Therefore, it is not surprising that major injuries did not increase. In contrast to Bauernschuster et al., I analyze the effect on a whole country and, therefore, also in non-metropolitan areas.

²see Breyer and Weimann (2015) for a broader disussion

The structure of the remainder of the paper is as follows. The next section provides an institutional background about the railway sector in Germany. Section 3 gives an overview of the data structure and data sources. Section 4 shows the estimation strategy and the results, followed by a discussion of these results in Section 5. Section 6 concludes.

2. Background

The company Deutsche Bahn (DB), owned by the government, is by far the most powerful railway company in Germany, although its market share declined from 94% in 2005 to 78% in 2015. DB transports 2.2 billion passengers per year. This is more than 6 million passengers per day. As a comparison, Amtrak, the biggest US railway company, transports about 31 million passengers per year. These passenger data show that railway plays an important role in the transportation system in Germany. DB operates both long-distance trains and short-distance trains. Typically, DB does not provide transportation within a city, or does so only with limitations.

Although, the government is the sole owner of DB, the company is a stock corporation. This is why the government does not employ railway workers directly. DB negotiates working conditions and salaries with labour unions. Two of them dominate the railway sector in Germany, with the “German Train Drivers’ Union” (GDL) representing train drivers and the “Railway and Transport Union” (EVG) representing the interests of other staff members. It is important to note that 68% of all train drivers are members of the GDL. For this reason, the threat of an effective strike is credible.

Until the early 2000s, the government employed railway workers directly. Consequently, workers were not allowed to strike. The first major strike of DB was in October 2007. The strike of interest for this article was in 2014-2015. As Beestermöller (2017) points out, the 2014-2015 negotiation between DB and GDL was the most severe in the history of DB. The negotiation was less about money and more about future bargaining power. In particular, GDL wanted to be able to negotiate not just for train drivers, but for other staff members (represented by EVG) as well.

3. Data

3.1. Strike Data

The strike of interest is a railway strike in Germany between September 2014 and May 2015. In total, there were 28 days that included at least a part strike of the railway. Figure 1 shows the timeline of the data. The duration between the first and the last strike day is 263 days. During this period an uncertainty existed about the reliability of railway services. The time span before and after the strike period is 233 days and 234, respectively. The total time of interest



Figure 1: Timeline

cumulates to two years³. Accident data is sensitive to the seasons of the year and therefore the preferred time span of two years keeps the number of observations per season constant.

The study of strike effects on a national level makes it impossible to have a suitable counterfactual. Nevertheless, the German railway strike has a number of advantages that make it particularly suitable for a systematic analysis. First, the strike occurred over several seasons of the year. Second, the strikes are equally distributed over the course of a week⁴. This is an important characteristic of the data because the day of the week is a predictor of the number of injuries. Third, the union implemented the strikes shortly after their announcement. In most cases, the announcement was made on the same day. Railway customers were limited in their ability to choose another day for travelling. They could only adapt to the strike situation by using other means of transportation. Hence, strike days are exogenous to the number of traffic injuries.

3.2. Data on Traffic Injuries

The injury data of this study comes from the Federal Statistical Office of Germany (Destatis). The data is organized as a time series with daily sequences. There are three types of possible traffic injuries. First, a slightly injured person is somebody who goes to a hospital but is released within 24 hours. Second, a seriously injured person needs to be in the hospital for more than 24 hours. Third, a fatally injured person dies in consequence of the accident within 30 days. The data is also subdivided into injuries on a motorway (autobahn), on a road out of town or on a road in a town. Table 1 gives an overview of the data for total injured people. On average there are 862 slightly injured people, 179 seriously injured people and 9.17 fatally injured people. One characteristic of data on traffic injuries is the considerably high standard deviation. Thus, it is important to find the main dependent variables for a regression.

³Qualitative results are robust to variations of this time span.

⁴ χ^2 -Test cannot reject the null hypothesis that strike days are equally distributed over the week.

Table 1: Data on injuries

	Average	Min	Max	SD
Slight injuries	862	292	1557	222
Serious injuries	179	56	339	47
Fatal injuries	9.17	0	29	3.68

Table 2: Average injuries

	Non-Strike day	Strike day	Increase absolute
	(Std.Dev.)	(Std.Dev.)	(in %)
Slightly injured	856.92 (223.36)	988.07 (134.81)	131.15 (15.30%)
Seriously injured	178.23 (46.87)	201.64 (33.88)	23.41 (13.13%)
Fatally injured	9.12 (3.69)	10.36 (3.29)	1.24 (13.60%)

4. Results

This section presents the main results of the study. Section 4.1 shows the descriptive statistics; Section 4.2 describes the estimation strategy; Section 4.3 provides the main regression results; Section 4.4 gives some robustness checks on these results, while Section 4.5 analyses a deeper influence of the timing of the strike on the main effect.

4.1. Descriptive Statistics

The data is based on all German roads and all days between 11 January 2014 and 10 January 2016. Table 2 shows the average injuries on strike days and on non-strike days. Column III reports absolute and relative differences. On strike days, there is an increase in the number of slightly injured people of 15.30% (131.15 people). The number of seriously injured people goes up by 13.13% (23.41) when compared to a non-strike day. There are 13.60% (1.24) more fatally injured people on a strike day. To summarize, average injuries go up by more than 13% for all measures.

In all cases, the standard deviations are considerably high. Two main factors determine the absolute number of injuries on a given day: month of the year and day of the week. Figure 2 shows the number of seriously injured people

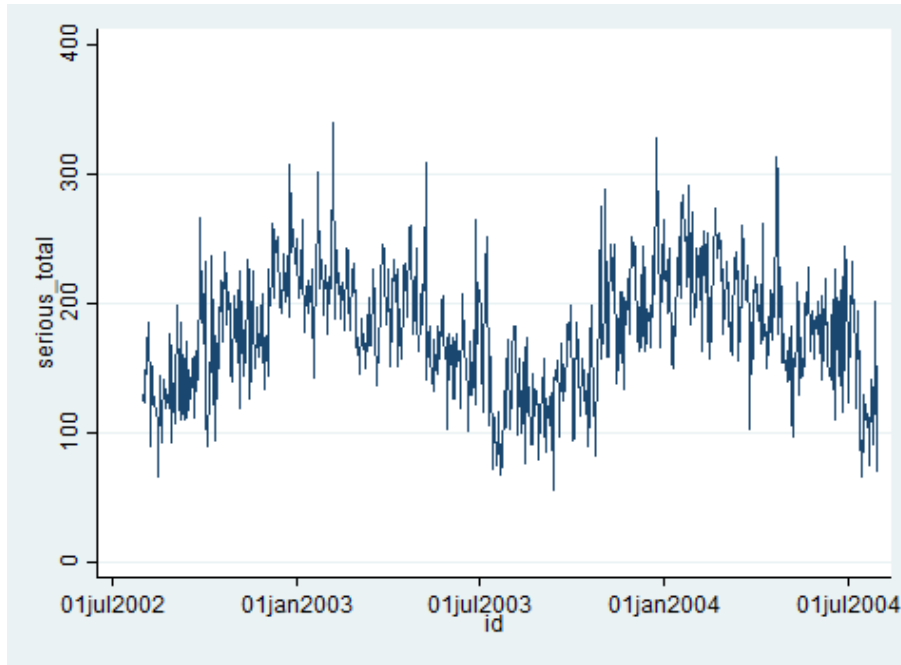


Figure 2: Average serious injuries

per day for the sample period. While injuries fluctuate a lot, there is a clear pattern over the year. More serious injuries occur in the summer and fewer in the winter. The number of slightly and fatally injured people follows the same pattern, though it is less pronounced for fatally injured people.

Figure 3 displays the average number of seriously injured people per day of the week. Friday is the day with the highest number of seriously injured people as a result of higher traffic density on the roads. More people go on weekend trips or they work away from home and come home for the weekend. On the other hand, Sunday is the day with the lowest number of seriously injured people. In Germany, almost all trucks are banned from roads on Sundays. Furthermore, with a few exceptions, shops and businesses are closed on Sundays. That is why there are fewer reasons to use a car and this results in fewer accidents and fewer serious injuries. The data looks similar for slightly injured people.

Figure 4 shows the number of fatally injured people for each day. The first column of each day displays the number of total average fatalities. The second column shows how many of them were in a town and the last column shows the number of fatalities out of town. While fatalities in towns decrease on weekends and on Sundays in particular, the number of fatalities out of town does not

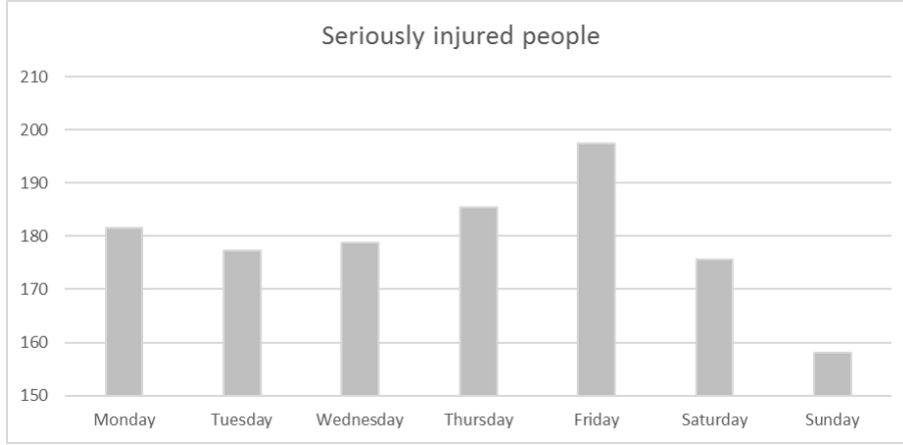


Figure 3: Weekday of serious injuries

decrease on weekends and stays as high as on Fridays. Any regression should take the influence of the day of the week into account. Section 4.5 will deal with the special effects on weekends.

4.2. Estimation Strategy

When estimating a nationwide effect, one has to deal with the lack of a counterfactual. Therefore, the analysis is based on a set of ordinary least squares regressions with suitable explanatory variables. The OLS model is of the following form:

$$I_t^g = \alpha_g + \beta(strike_t) + \gamma(\delta_m) + \tau(\vartheta_y) + \omega(\varphi_d) + \epsilon_t \quad (1)$$

Here, I_t^g is the number of injured people of grade g on day t . There are three grades of injuries: slight, serious and fatal. Strike is a binary variable that equals unity if there is a strike on day t and zero if there is no strike. Furthermore, there is a full set of controls for month fixed effects δ_m , year fixed effects ϑ_y and weekday fixed effects φ_d . Injury fixed effects for each grade g are included in α_g . Also, ϵ_t measures the error term, while β measures the strike effect. The fixed effects of month, year and weekday are measured by γ , τ and, respectively. This model is run for the number of slightly, seriously and fatally injured people. An F-test is used to test the influence of the strike on all three regression models. This procedure is identical to the use of a seemingly unrelated regression.

Labour unions call for strikes at short notice. Thus, strikes are exogenous to traffic injuries in this model. As Bauernschuster et al. (2017) point out, it might be possible that strike days are chosen to maximize disruption. It is worth noticing that this model controls for month fixed effects and weekday fixed effects.

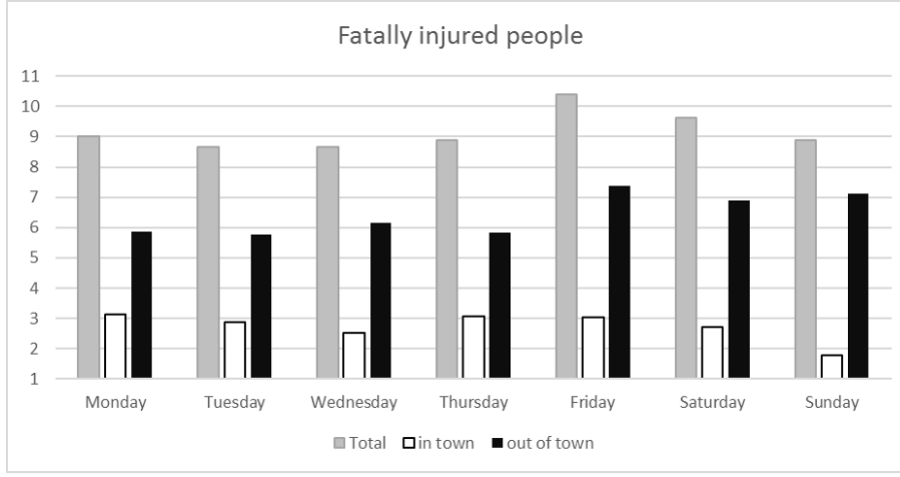


Figure 4: Fatal injuries per weekday

4.3. Main Regression Results

As Bauernschuster et al. find, a subway strike increases the number of slightly injured people. The first aim of this section is to add evidence to this finding. Consequently, hypothesis one follows the results from Bauernschuster et al.: there are more slightly but not more fatally injured people due to traffic accidents in towns on strike days compared to non-strike days. There tends to be more traffic on the streets within cities and towns. Therefore, it is more likely that drivers need to reduce their speed significantly when there are more cars on the road. Even though the chances of having an accident might increase, the number of fatally injured people because of these accidents should not increase. The lower speed increases the chances of surviving an accident.

For hypothesis one, I regress on accidents with injuries in towns. This includes all cities and towns. Table 3 displays the result of all three regressions. Column 1 shows that the binary variable strike is highly significant on slightly injured people on a strike day. The coefficient suggests that there are 64.81 more slightly injured people on a strike day than on a non-strike day. As shown in column 3, there is no significant increase in the number of fatally injured people. Columns 1 and 3 confirm hypothesis one and, therefore, the results of Bauernschuster et al. In contrast to their findings, however, there is a highly significant increase in the number of seriously injured people on a strike day. The point estimator puts the additional count of seriously injured people at 11.78. This difference can be plausibly explained by the city selection of the data. This data set also contains smaller cities. Bauernschuster et al. analyse the five biggest German cities. Smaller cities and towns are less vulnerable to traffic congestion. This results in a higher speed average and that is why we see more injuries that are serious in this data set.

Table 3: Regression Analysis for accidents in cities

Dependent	Slightly injured			Seriously injured			Fatally injured		
	Coef.	SE	p	Coef.	SE	P	Coef.	SE	p
Strike	64.81	20.32	.000***	11.78	4.08	.004***	0.39	0.34	.245
Constant	512.27	17.37	.000***	76.23	3.49	.000***	2.94	0.29	.000***
Year		Yes			Yes			Yes	
Month		Yes			Yes			Yes	
Weekday		Yes			Yes			Yes	
"R ² "		.68			.50			.10	

*p < .1 **p < .05 ***p < .01

On highways, the number of additional cars might not be enough to reduce the speed of cars significantly. Since we can expect a roughly stable probability of being fatally injured due to a car accident, more cars on the road will result in a higher total number of fatally injured people. Hypothesis two states the main research question. In order to answer the question concerning an increase in all kinds of injuries because of a strike day, the regression is run on all 730 days. The dependent variable is the number of slightly (seriously, fatally) injured people in total. This adds all accidents outside of towns to the data set used to test hypothesis one. Table 4 shows the regression results. We see a highly significant increase of 74.38 in slightly injured people on a strike day. Column 2 reports a significant increase of 14.67 in seriously injured people. Finally, in the last column there is weakly significant increase in the number of fatally injured people of 1.26 per strike day. An F-Test confirms that the variable strike has a highly significant influence on the number of injured people ($p < 0.05$). Because of this, the null hypothesis, a strike has no influence on injuries, must be rejected and hypothesis two can be accepted. A strike does affect the number of slightly, seriously and fatally injured people significantly.

4.4. Robustness

Empirical results can be sensitive to the preferred estimation model. This section will show that all qualitative results are robust to the most common alternative models. Accident data is not continuous. Therefore, a count data model might be appropriate. A negative binominal model is preferred to a Poisson model because the data is over-dispersed. Table 5 summarizes the result of this model for all three kinds of injury. As in the main analysis, all coefficients of strike remain positive. While significance remains unchanged for

Table 4: Regression Analysis for total accidents

Dependent	Slightly injured			Seriously injured			Fatally injured		
	Coef.	SE	p	Coef.	SE	P	Coef.	SE	p
Strike	74.38	27.15	.006***	14.67	6.75	.030**	1.26	0.68	.063*
Constant	757.20	23.20	.000***	132.26	5.77	.000***	6.61	0.58	.000***
Year	Yes			Yes			Yes		
Month	Yes			Yes			Yes		
Weekday	Yes			Yes			Yes		
"R ² "	.63			.48			.16		

*p < .1 **p < .05 ***p < .01

serious and fatal injuries, the increase in the number of slightly injured people changed from highly significant to significant. In total, the results support the OLS regression.

By nature, data on traffic is a time series. The following autoregressive model addresses this:

$$I_t^g = \alpha_g + \mu(I_{t-7}^g + \beta(strike_t) + \epsilon_t \quad (2)$$

where μ estimates the effects of injuries of grade g on day $t - 7$. Typically, time series observations depend on $t - 1$. The day of the week is so important when it comes to traffic data that the best predictor for the number of injuries this Friday is the number of injuries last Friday. Table 6 displays the regression results for all three grades of injuries. The coefficients for strike are all positive and the p-values are comparable to the OLS-results

The third robustness test does not deal with the estimation model, but with the definition of a strike. A typical strike begins at 9 p.m. one day and lasts until 4 a.m. another day. It is plausible that 3 hours of strike are too short to have any major impact on traffic and, therefore, accidents on the first day. DB claims that they have to deal with problems even after a strike ends. This is because trains are at the wrong stations. DB needs to either reallocate trains or take other measures to fix strike-related problems. Nevertheless, to be cautious one might not want to deal with the last strike day as a normal strike day. Therefore, I run a regression without this kind of first and last strike days. Applying this strategy results in a reduction of strike days from 28 days to 21 days; hence seven strike days started at 9 p.m. or ended at 4 a.m. Table 7 shows the results

Table 5: Negative Binominal Regression

Dependent	Slightly injured			Seriously injured			Fatally injured		
	Coef.	SE	p	Coef.	SE	P	Coef.	SE	p
Strike	.086	0.33	.011**	.080	.039	.039**	0.128	.070	.069*
Year		Yes			Yes			Yes	
Month		Yes			Yes			Yes	
Weekday		Yes			Yes			Yes	
Pseudo - R ²		.074			.062			.16	

* $p < .1$ ** $p < .05$ *** $p < .01$

Table 6: AR Analysis for accidents

Dependent	Slightly injured			Seriously injured			Fatally injured		
	Coef.	SE	p	Coef.	SE	P	Coef.	SE	p
Strike	93.59	26.59	.000***	17.17	7.18	.017**	1.29	0.75	.085*
Constant	852.52	17.97	.000***	177.76	3.00	.000***	9.11	0.17	.000***
ar L7	.66	.028	.000***	.49	.03	.000***	.15	.04	.000***

* $p < .1$ ** $p < .05$ *** $p < .01$

Table 7: Regression Analysis for accidents on full strike days

Dependent	Slightly injured			Seriously injured			Fatally injured		
	Coef.	SE	p	Coef.	SE	P	Coef.	SE	p
Strike	66.34	30.91	.032**	15.20	7.68	.048**	1.61	0.77	.036**
Constant	757.95	23.25	.000***	132.45	5.78	.000***	6.64	0.58	.000***
Year	Yes			Yes			Yes		
Month	Yes			Yes			Yes		
Weekday	Yes			Yes			Yes		
"R ² "	.63			.48			.16		

* $p < .1$ ** $p < .05$ *** $p < .01$

for all three kinds of injury. Again, we see a significant increase in the number of slightly, seriously and fatally injured people on strike days compared to non-strike days. Compared to Table 2 the results are a little bit weaker, but it shows that the results do not depend on the preferred definition of a strike day.

4.5. Findings on the Timing of the Strike

Data on traffic injuries is sensitive to the days of the week. Hypothesis three acknowledges that: the numbers of all kinds of injury will significantly increase in the time from Friday to Sunday but not from Monday to Thursday. There are two reasons why strikes could be more harmful on weekends. The results should be especially pronounced if either there is already a lot of traffic on the road or many people have to use a car on a strike day. On a non-strike day, Friday is the day with the most accident-related injuries in a week. Every extra car on the road on a Friday strike will particularly exacerbate the traffic situation.

During a railway strike, passengers seek alternatives. For short-distance trains there are often public transport alternatives, such as subways or other trains. During a strike, about 40% of all short-distance trains are still in operation. In comparison, there are only 20% of the long-distance trains still operating. Since the time intervals between long-distance trains are significantly large, there are no good alternatives for passengers on a strike day. According to DB, the days with the highest number of long-distance passengers are Friday and Sunday.

Therefore, the data is divided into two groups, one for Monday to Thursday and a second group for Friday to Sunday. The German railway strike provides a useful characteristic for this analysis. Out of 28 strike days, 18 (64%) were on a day between Monday and Thursday (57% of the week) and 10 on another day.

Table 8: Regression Analysis for total accidents (Monday - Thursday)

Dependent	Slightly injured			Seriously injured			Fatally injured		
	Coef.	SE	p	Coef.	SE	P	Coef.	SE	p
Strike	28.65	36.25	.429	7.16	7.75	.356	0.54	0.679	.494
Constant	758.11	30.20	.000***	138.31	6.46	.000***	6.10	0.66	.000***
Year	Yes			Yes			Yes		
Month	Yes			Yes			Yes		
Weekday	Yes			Yes			Yes		
"R ² "	.36			.44			.16		

* $p < .1$ ** $p < .05$ *** $p < .01$

It seems that there are no systematic choices of the day of the strike by the union.

Table 8 shows the regression results for all the strikes that accrued between Mondays and Thursdays. While the coefficients of strike for slight, serious and fatal injuries remain positive, none of them are significant. It cannot be stated that a strike leads to changes of any injury count. Table 9 displays the regression result for strikes from Friday to Sunday. Column 1 shows a positive and highly significant increase in slight injuries of 145.62. There are also significant effects of strikes on seriously (27.88 people) and fatally (2.54) injured people. Hypothesis three can be accepted.

5. Discussion

This article presents evidence that the number of traffic injuries and deaths increases on strike days. The results of this article potentially underestimate the real effect of a strike on traffic injuries. This is caused by the uncertainty of the actual day of a strike or the length of a strike. For example, an individual might go on a multi-day trip. There is a threat of a railway strike on the day of return; therefore, the individual might decide to use a car instead of the railway. The same reasoning is true when the strike is on the departure day. In both cases, railway strikes lead to more cars and, therefore, more accidents and injuries on non-strike days. Since this article only accounts for differences between strike and non-strike days, the real effect might be underestimated.

According to the results, collective bargaining in Germany's railway sector is a real-life example for bargaining with external costs. The existence of external

Table 9: Regression Analysis for total accidents (Friday - Sunday)

Dependent	Slightly injured			Seriously injured			Fatally injured		
	Coef.	SE	p	Coef.	SE	P	Coef.	SE	p
Strike	145.62	40.04	.000***	27.88	2.35	.019**	2.54	1.17	.030**
Constant	807.08	28.18	.000***	140.62	8.35	.000***	8.64	0.83	.000***
Year	Yes			Yes			Yes		
Month	Yes			Yes			Yes		
Weekday	Yes			Yes			Yes		
"R ² "	.75			.55			.21		

* $p < .1$ ** $p < .05$ *** $p < .01$

costs leads to an excessive number of strikes. In theory, one would internalize negative external effects with a Pigouvian tax. But as Bénabou and Tirole (2010) point out, this attempt may fail when the policy makers lack information or when a lobby group has influence on them.

If a Pigouvian tax is not suitable, policy makers could use laws such as the NYC Taylor Law to forbid railway workers to strike. Restricting the right to strike is a drastic policy tool. In 2008, the European Court for Human Rights stated in a decision that the right to strike is a human right. For the German railway sector, the data reveals another approach that does not restrict the right to strike, but that limits the effect of the strike on traffic injuries. This article suggests that strikes between Friday and Sunday increase the number of traffic injuries and fatalities, but strikes between Monday and Thursday do not. If bargaining partners consider these results, a norm that there are no strikes or fewer strikes on Friday to Sunday could be developed. The labour union has shown that they consider such norms. They declared in 2014 and 2017 that they will not go on strike during the Christmas period. A similar norm for weekend strikes could reduce the number of traffic injuries and fatalities.

6. Conclusion

This article provides evidence of an increase in traffic injuries and fatalities due to a series of railway strikes in Germany. In towns, the number of slightly and seriously injured people increased, but the number of fatally injured people did not. This result adds further support to the findings of Bauernschuster et al. A novel finding is the result that the number of fatalities and injuries increases when measured nationwide. The data reveals that the negative external effects

are especially pronounced between Fridays and Sundays. While it is possible to exclude railway workers from the right to strike, a behavioural approach is suggested. Being aware of strike effects could enable bargaining partners to develop a norm that reduces strikes between Fridays and Sundays.

- [1] Andersen, Steffen, Seda Ertac, Uri Gneezy, Moshe Hoffman and John List (2011): "Stakes Matter in Ultimatum Games", *American Economic Review* 101 (7), 3427-39
- [2] Bauernschuster, Stefan, Timo Herner and Helmut Rainer (2017): "When Labor Disputes Bring Cities to a Standstill: The Impact of Public Transit Strikes on Traffic, Accidents, Air Pollution, and Health", *American Economic Journal: Economic Policy* 2017, 9(1): 1-37
- [3] Beestermöller, Matthias (2017): "Striking Evidence! Demand Persistence for Interurban Buses from German Railway Strikes." Munich Discussion Paper No. 2017-2
- [4] Bénabou, Roland and Jean Tirole (2010): "Individual and corporate social responsibility." *Economica* 77, 1-19
- [5] Breyer, Friedrich and Joachim Weimann (2015): "Of morals, markets and mice: Be careful drawing policy conclusions from experimental findings!", *European Journal of Political Economy* 40, 387-390
- [6] Falk, Armin and Nora Szech (2013): "Morals and Markets", *Science* 340(6133), 707-711
- [7] Gruber, Jonathan and Samuel A. Kleiner (2012): Do Strikes Kill? Evidence from New York State." *American Economic Journal: Economic Policy* 4 (1): 127-57
- [8] Lacrom, Shaun, Ferdinand Rauch and Tim Willems (2017): "The Benefits of Forced Experimentation: Striking Evidence from the London Underground Network." *The Quarterly Journal of Economics* 132 (4), 2019-2055
- [9] Quddus, Mohammed (2008): "Time series count data models: An empirical application to traffic accidents." *Accident Analysis and Prevention* 40, 1732-1741
- [10] Sutter, Matthias, Jürgen Huber, Michael Kirchler and Matthias Stefan (2016): "Where to Look for the Morals in Markets?" CESifo Working Paper Series 6022