Strike activity and unemployment in Europe:

do Europeans strike more in bad economic times?

Bachelor Thesis

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Abstract

Many European countries have experienced high levels of unemployment and strike activity in recent years. However, in the literature on strike activity it is generally accepted that strike activity is procyclical, meaning that higher unemployment rates go together with less strike activity. This result was mainly obtained with North-American data. This paper therefore studies the relationship between strike activity and unemployment in Europe. A possible explanation for why this relationship might be different in Europe is the existence of general strikes; strikes directed at the government. Through an analysis of the existing literature, it is expected that economic and general strikes are related to the unemployment rate in different ways. The estimation of a regression model with panel data of 26 European countries over 30 years shows that the relationship between strike activity and unemployment is sensitive to how strike activity is measured. The relationship does appear to be different for both types of strike activity.

Keywords: strike activity, economic strikes, general strikes, unemployment, procyclicality.

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1. Introduction:

Air France, Lufthansa, the Dutch police force, the Belgian and German train companies and the harbour of Rotterdam do not seem to have a lot in common at first. However, they all had to cope with personnel on strike in 2015[1]. In addition, since the beginning of the financial crisis, European countries such as Greece and Spain have experienced increasing unemployment and many work stoppages in almost all sectors of the economy (Bloomberg, 2010). However, in the economic literature, strikes are often considered to be procyclical, linking an economic downturn and higher unemployment rates to less strikes (Ashenfelter & Johnson, 1969). This relationship has been proven several times with American data (see e.g. Card, 1990; Cramton & Tracy, 1992; Vroman, 1989). The experience of the economic crisis in Europe and the protests and strikes that came as a reaction in many countries raises the question whether the procyclicality of strikes also holds in Europe. Are there really less strikes now that we are in an economic downturn as the theory would suggest? Or do Europeans strike more when the economic conditions worsen to protest job and income loss?

The recent European experience suggests that strikes might be countercyclical instead of procyclical. In general, strikes are very disruptive and very costly. For example, the last strike at Deutsche Bahn, the German train company, was estimated to have cost 750 million euros in lost activity (BBC news, 2015). Another example comes from a study of Becker and Olson (1986), who show that shareholder equity is substantially affected by strikes (Becker & Olson, 1986). If it were true that strikes are countercyclical, rather than procyclical, this could potentially make the business cycle more volatile. In addition to firms already struggling to generate income due to an economic downturn or crisis, the countercyclicality suggests an increase in strike activity causing even more production and income to be lost. If this is how labour unions behave, they might be hurting the economy even more in times that are already difficult. This is why it is important, also for policy-making purposes, to examine whether strikes truly are countercyclical in Europe.

Most studies investigating the relationship between the unemployment rate and strike activity used North-American data (Card, 1990). Based on these data, evidence has been found that strike activity reduces as the unemployment rate increases. It was thus found that strikes are, in line with theoretical models, procyclical (see e.g., Vroman, 1989; McConnell, 1990; Cramton & Tracy, 1992). The closest studies on the relationship between strike activity and unemployment ever came to European data were studies of data from the United Kingdom. These studies found mixed evidence for the procyclicality of strikes in the UK data, with strike activity even being countercyclical in some periods (Devereux & Hart, 2011; Ingram, Metcalf, & Wadsworth, 1993). This provides an extra reason to investigate the relationship between strike activity and unemployment also in continental Europe, since the United Kingdom might be more related to continental Europe than North-America and the North-American results therefore might not directly apply to Europe. This paper will therefore investigate European data.

In addition, this paper makes a distinction between two types of strikes: general strikes and economic strikes. The latter are directed against employers, whereas the former are directed against the government. Theories of striking, however, mostly consider economic strikes. And although the number of economic strikes has decreased over the last few years, the number of general strikes in Europe has increased (Hamann, Johnston, & Kelly, 2013). It therefore seems important to make a distinction between the two, because it could be that they are not related to the economic conditions and the unemployment rate in the same way.

[1] See: Air France, 2015; Agence France Presse, 2015; Leupen, 2015; Financieel dagblad, 2015; BBC news, 2015; Duursma, 2016.

Although Hamann et al. (2013) also use European data, they only focus on general strike activity. This paper therefore examines the relationship between strike activity and the unemployment rate separately for both economic and general strikes.

This leads to the following research question:

What is the relationship between strike activity (divided into economic and general strike activity) and the unemployment rate in Europe?

The results indicate that the relationship between strike activity and the unemployment rate depends on the measure of strike activity used. Economic strike activity is procyclical or countercyclical depending on how it is measured. For general strike activity, there is either no significant relationship with the unemployment rate or the number of general strikes decreased when the unemployment rate increased, implying procyclicality.

This paper is organized as follows. The theoretical framework gives an overview of the existing theoretical and empirical literature on economic and general strikes. From this literature review, two hypotheses on the relationship between strike activity and the unemployment rate will be formulated, one for each type of strike activity. The third section of this paper gives a description of the data used to test the hypotheses. The methodology used in this paper will be explained in the fourth section. Then, the results for economic strikes are presented, followed by the general strike results. The last section presents a conclusion and suggestions for further research.

2. Theoretical framework:

This theoretical framework summarizes the existing theoretical literature to establish a link between strike activity and the unemployment rate. First, the extensive literature on models of economic strikes will be discussed. Then, the theory on general strikes and the difference between the two types is presented. After a discussion of the main empirical results, the theoretical framework concludes with the formulation of two hypotheses on the relationship between strike activity and unemployment.

Literature review of theory:

Economic strikes: three categories of models:

Strike theory started in 1932 with John Hicks, who stated that strikes are accidents, because they are not Pareto-optimal. Especially when both parties have good information about the costs and the outcome of the strike, the occurrence of a strike could not be the result of rational behaviour (Hicks, 1932; Hayes, 1984). A strike always results in an agreement of some sort, like a new contract. However, if the agreement that will be reached after the strike was anticipated correctly by both parties, the cost of the strike could have been avoided. Both parties would then have been better off, which is why strikes are called Pareto-inferior. Only if one or both parties in this setting, disregarding whether they are rational or not, would be poorly informed or misperceives the bargaining process and the potential outcome, a strike could occur (Ingram et al., 1993). Therefore, according to Hicks, strikes are the result of faulty negotiations (Hicks, 1932).

Within the literature on the theory of economic strikes, three main categories exist: the Ashenfelter & Johnson (1969) model, the joint-cost hypothesis and the asymmetric information models. The last category combines elements from the first two (Card, 1990). All these theories were developed as a reaction to the traditional micro-economic approach of Hicks, which states that strikes are mistakes or accidents. The three different categories can all be used to establish a link between economic strike activity and the unemployment rate and will now be discussed separately.

Ashenfelter & Johnson model:

Ashenfelter & Johnson (1969) were the first to use the concepts of asymmetric and imperfect information to develop an empirically testable model[2]. Their model includes three parties, instead of the two in traditional bargaining models. These three parties are the firm, the union and the workers. The most important suggestion that Ashenfelter and Johnson (1969) made is that a union's wage demands are based on its perception about the firm's profitability. However, in a situation of asymmetric information, this perception will not necessarily be equal to the actual profitability and the union might demand a wage that the firm is unable to meet. The fact that a strike occurs allows the union to learn more about the actual profitability, which will probably lead to an (downward) adjustment of its demands (Ashenfelter & Johnson, 1969). Strikes thus serve the purpose to alleviate the information asymmetry distortion between the firm and the union.

There is one more dimension to this problem due to the separation of the union and the workers into two separate parties. Strikes can also occur because the expectations of the workforce are not aligned with the firm's willingness to pay. Instead of making a low wage demand and having dissatisfied members who expect more, the union leaders might prefer to demand a high wage and incur a strike. This strike then serves to convince the workers that a higher wage is truly impossible (Cramton & Tracy, 1992; Ashenfelter & Johnson, 1969).

Although the Ashenfelter & Johnson (1969) model is originally about the relationship between strike activity and wages, it also has implications for the way unemployment is related to strike activity. In their model, strike activity depends positively on wage increases. These wage increases in turn depend negatively on the unemployment rate due to the existence of higher-pay outside options in times of low unemployment. If costs of moving are substantial, workers will first try to raise their wage in their current job, causing larger wage increases when unemployment is lower (Ashenfelter & Johnson, 1969). Based on the positive relationship between strike activity and wages and the negative relationship between wages and unemployment, the number of strikes is expected to depend negatively on the unemployment rate, implying procyclicality. Flaherty (1983) shows that the probability of strike incidence in the Ashenfelter-Johnson (1969) model is indeed negatively related to the unemployment rate (Flaherty, 1983).

Joint-cost hypothesis:

The proponents of the joint-cost hypothesis claim that even if strikes are only mistakes, like Hicks (1932) suggested, strike activity should still decrease when the combined or joint total costs of a strike to the parties involved increase (Reder & Neumann, 1980; Kennan, 1980; Ingram et al., 1993). These costs provide the link between strike activity and the unemployment rate in this category of models.

According to Kennan (1980), the total costs of a strike include all costs and revenues that would not have occurred if a strike would not have taken place. For example, the firm might be able to rent out some of their equipment during the strike. The revenues that accrue from this activity serve to reduce the total costs of the strike to the firm (Kennan, 1980). Another example involves income for workers from a temporary job during a strike. This temporary income can (at least partially) offset the costs of a strike to workers (Kennan, 1980; Farber, 1978).

[2] Although the Ashenfelter and Johnson model (1969) is essentially also an asymmetric information model, this paper follows the distinction as made by Card (1990), who treats it as a separate category.

Moreover, the last example provides a theoretical link between the costs of a strike (and thus strike activity) and the unemployment rate. The costs to the workers increase with unemployment, because temporary replacement employment is negatively related to the unemployment rate (Farber, 1978). Therefore, the theory expects that strike activity varies inversely with unemployment (McConnell, 1990). With this reasoning, strike activity can also be linked to the cyclical movements of the economy. Near a cyclical peak, many temporary employment options will be available, reducing the costs of striking and thereby increasing strike activity (Farber, 1978). Strike activity is thus expected to be procyclical.

Asymmetric information models (signalling or learning models):

The third category of economic strike theory evolves around asymmetric information models, namely signalling or learning models. The economists who developed this category interpreted the idea of Hicks that strikes are the result of mistakes as a consequence of the existence of asymmetric information (Schnell & Gramm, 1987). There are two reasons why such mistakes can occur. Firstly, at least one of the parties can miscalculate the costs of the strike and thus may wrongly decide to go on strike (Mauro, 1982). Secondly, mistakes may occur due to inexperience by the negotiators (Reder & Neumann, 1980).

All asymmetric information models have in common that they assume that at least one party has private information. The costs of the strike can then be seen as costs of gaining information about the content of the other parties' private information, like the actual state of the world or the actual profitability of the firm (Kennan, 2008). Moreover, the costs of the strike provide an incentive to all parties to learn from their mistakes in order to prevent another strike from happening (Schnell & Gramm, 1987). The latter result was confirmed by Mauro (1982)[3]. He argued that from this perspective a strike is not a sign of inefficiency, but rather a method to learn more about the position of one's opponent. If a strike is less costly than other methods of gaining information, a strike would occur (Mauro, 1982).

Following the reasoning of Mauro (1982) in that strikes are not necessarily irrational and (Pareto)-inefficient, Hayes (1984) developed a model that shows that strikes can indeed be the outcome of rational behaviour. In this model, the firm has more information about the so-called state of the world, which can differ from the firm's profitability, than the union it is negotiating with (Hayes, 1984). In this classic case of asymmetric information, the union makes a wage offer and the firm only rejects or accepts this offer. Since the fact that a strike occurs, tells the union that their wage demand was too high, the occurrence of a strike enables the union to learn more about the real profitability of the firm (Hayes, 1984). Although the union cannot observe the specific conditions the firm is facing, they can observe the general state of the world. This is the reason that strikes will occur procyclically (Hayes, 1984). Whenever the general state is good, the union may reasonably expect a higher profitability for the firm. If the general state of the world is better than the conditions the firm is facing, the firm cannot meet the union's demands and thus a higher probability of a strike occurring exists (Hayes, 1984). Since a good state of the economy implies low unemployment, it follows that a higher probability of a strike occurring goes together with lower unemployment rates. This argument combines asymmetric information models and the joint-cost hypothesis, because the higher profitability is considered as a mechanism that lowers the costs of a strike to the firm and thereby increases strike activity.

[3] Mauro (1982) found that if a strike had taken place during a negotiation round, it was less likely that a strike would occur again during the next round. This indicates that indeed strikes serve as a learning process (Mauro, 1982)

In the private information model of Cramton & Tracy (1992), strikes serve as a signal about a firm's willingness to pay, which is only known to the firm. Through their willingness to endure a strike, firms communicate their willingness to pay (Cramton & Tracy, 1992). Firms with high willingness to pay for example prefer to settle the conflict at a high wage and avoid a strike. Low willingness to pay firms however prefer to endure a strike to enable them to pay a lower wage after the strike has ended (Cramton & Tracy, 1992). The Cramton & Tracy (1992) model predicts that strike activity will be higher after a drop in real wages, a decline in the unemployment rate or an increase in the firm's profitability. The decline in the unemployment rate leads to higher strike activity because it increases the worker's reservation wage, which is assumed to be paid to the workers during a strike (Cramton & Tracy, 1992). The lower unemployment rate and the higher reservation wage serve to increase the income workers receive during a strike and thus reduce the cost of a strike to these workers. Hence, this model also combines asymmetric information with the joint-cost hypothesis.

General strikes:

While the literature on economic strikes is extensive, as can be seen from the discussion above, very little has been written about general strikes.

The difference between both types of strike activity becomes clear when looking at their definitions. Economic strikes are defined as: "a suspension of production while workers and their employer argue about how to divide the surplus from their relationship" (Kennan, 2008, p. 1). General strikes on the other hand are defined as: "a temporary, national stoppage of work by workers from many industries, directed against the executive or legislative arms of government, to enforce a demand or give voice to a grievance" (Hamann et al., 2013, p. 1033). In short, economic strikes are directed against employers, while general strikes are directed against the government.

General strikes usually extend beyond industry borders. Large parts of the population are usually involved, often also non-union members (Hamann et al., 2013). Hamann et al. (2013) hypothesize that general strikes are more related to the general state of a country's economy than economic strikes. They also hypothesize that a bad state of the economy (controlled for using GDP and unemployment) leads to more general strikes (Hamann et al., 2013). High general strike activity and high unemployment rates then go together, which implies countercyclicality.

Literature review of empirical results

Besides the development of theories of strike activity, many papers investigate the relationship between strike activity and the unemployment rate empirically.

Economic strikes:

As mentioned before in the introduction, most research on the topic of strike activity and unemployment uses data from North-America (Card, 1990). In his survey of the empirical results to date, Card (1990) states that they almost unambiguously find evidence that strike activity decreases as the unemployment rate increases. These results thus show that strikes are a procyclical phenomenon, at least in the USA and Canada (see e.g., Ashenfelter & Johnson, 1969; Vroman, 1989). When unemployment decreases, which implies better economic conditions, the business cycle is on its upside and the number of strikes is also increasing, suggesting that the two move in the same direction.

While testing other theories of striking, some researchers, again using North-American data, came to the same conclusions. McConnell (1990) found a negative relationship between the unemployment rate and the probability of a strike occurring. Her data was also consistent with the joint-cost hypothesis (McConnell, 1990). Within that theory, it is the total costs of a strike to the firm and the union that together determine whether the strike will occur or not. On the one hand, the costs of the

firm increase when demand for its product is increasing. On the other hand, the costs of the union increase with unemployment, since there will be less outside work options to the workers on strike. This relates to the finding that outside work options and unemployment are negatively related (McConnell, 1990; Ingram et al., 1993; Farber, 1978). In her research, McConnell found that industries that were relatively depressed compared to the rest of the economy had the highest strike activity. If there is less demand for their product, a strike is less costly to the firm and will therefore occur more often. At the same time, strike activity also appeared to be the highest in areas and industries with low unemployment. This lowers the costs to the union, which will consequently lead to a higher number of strikes (McConnell, 1990; Tracy, 1986; Tracy, 1987).

Using asymmetric information models to explain the occurrence of strikes, Cramton & Tracy (1992) also come to the conclusion that strikes in North-America are procyclical, since their data indicates that strikes are more likely to occur after a drop in unemployment (Cramton & Tracy, 1992). Other studies have used a similar micro-economic approach. In a cross-industry study, Mauro (1982) reached the conclusion that the probability of a strike occurring varied inversely with the unemployment rate (Mauro, 1982). However, with a more elaborate dataset confined to one industry (U.S. manufacturing), Gramm (1986) couldn't find an independent effect of the unemployment rate on the probability of a strike occurring (Gramm, 1986).

Overall, the conclusion of the North-American data is almost unambiguously that strikes are procyclical. Unemployment is thus inversely related to strike activity. This paper will focus on the relationship between unemployment and strike activity in Europe. For the continent of Europe no conclusive answer about the direction of the relationship has yet been reached. Devereux & Hart (2011) and Ingram et al. (1993) made a first step towards Europe by examining data from the United Kingdom. The former only find weak evidence for procyclical strikes in the United Kingdom (Devereux & Hart, 2011), whereas the latter even find that strikes are countercyclical in some time periods (Ingram et al., 1993). It thus seems that it is not necessarily true that the relationship between economic strike activity and unemployment is the same in Europe as in North-America.

General strikes:

In the introduction it was stated that it appears as if strike activity in Europe became higher after the outburst of the economic crisis. This is contradictory to what most of the empirical results on economic strikes have found. The existence of general strikes might provide an explanation for this contradiction. Unfortunately, not much empirical research on the relationship between general strike activity and the unemployment rate has been done.

Over the last few years, the number of economic strikes has decreased, while the number of general strikes in Europe has increased (Hamann et al., 2013). The most important result with respect to general strike activity and unemployment is that more general strike activity is associated with higher unemployment rates. Hamann et al. (2013) empirically establish a negative link between general strike activity and the state of the economy (Hamann et al., 2013). A high level of general strike activity thus goes together with a bad state of the economy, which includes high unemployment rates. This implies that general strike activity is countercyclical.

Hypotheses:

The literature review has shown that most theories predict a negative relationship between the unemployment rate and strike activity when it comes to economic strikes. This amounts to saying that economic strikes are procyclical. Together with the literature review of empirical results, which shows that the unemployment rate and economic strike activity are procyclically related in North-America, this leads to the following hypothesis:

Hypothesis 1: Economic strike activity in Europe is procyclical.

Apart from the difference between Europe and North-America, this paper also examines the difference between economic and general strikes. The relationship between strike activity and the unemployment rate is expected to be different for both types of strikes. As mentioned in the literature review on general strikes, the number of general strikes is expected to increase as the unemployment rate increases. This leads to the expectation of countercyclicality.

Hypothesis 2: General strike activity in Europe is countercyclical.

These hypotheses will be tested in the remainder of this paper. Before doing so, the data and methodology used are described in the next two sections.

3. Data:

This paper studies the relationship between strike activity and unemployment with data of 26 European countries[4] from 1983 until 2014.

Strike activity is measured in two ways by either the number of strikes or the number of days on strike (number of days not worked due to strike activity). The International Labour Organization (ILO) has data on both measures for many countries worldwide, including European countries. This data is available for many countries from 1983 until 2014. To control for differences in population size, the measure of strike activity is divided by the labour force or the labour force is added as a control variable in the regression analysis. The data on labour force statistics also comes from the ILO.

The data will be split into economic and general strikes according to the different sectors measured by the ILO (see appendix 1). This leads to a loss of observations, due to some countries not providing number of days on strike data per sector in certain time periods. In addition, number of strikes data per sector was not available for France. The regression analysis with the number of strikes as dependent variable thus contains only 25 countries.

Eurostat has data on unemployment rates for all countries of the European Union, plus countries like Norway and Turkey. For some countries, this data goes back until 1983. However, it is available from 2000 onwards for the majority of countries. The Eurostat database was supplemented with data from the ILO, which uses the same definition and measurement methodology as Eurostat.

A first glance at the data of the dependent variable and the main independent variable is provided in table 1.

[4] The dataset includes the following countries: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, The Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Turkey and the United Kingdom.

	Number of days on strike (economic)	Number of days on strike (general)	Number of strikes (economic)	Number of strikes (general)	Unemployment rate (%)
Mean	485,145	192,317	186	94	8.64
Median	51,190	4,460	31	5	7.90
Maximum	26,178,000	15,094,165	1,861	12,699	27.5
Minimum	0	0	0	0	0.7
Standard deviation	1,614,181	864,053	310.80	680.49	4.24
Number of observations	614	609	522	522	732

Table 1: descriptive statistics of main variables

It stands out that the number of days on general strike was, on average, lower than the number of days on economic strike. The high number of 26 million days on strike was reached in the United Kingdom in 1984. The number of strikes data shows a similar pattern. The high value of 12,699 general strikes was measured in Poland in 2008. Furthermore, it is worth to notice that the unemployment rate is very concentrated at its mean with a few high outliers. These outliers come from Spain and Greece in the years after the outburst of the financial crisis. The maximum of 27.5% was measured in 2013 in Greece.

The model is supplemented with several control variables. Descriptive statistics of these variables can be found in appendix 2 (table A2A) together with the data sources (table A2B). Ashenfelter and Johnson (1969) show that strike activity depends positively on wage increases, while wage increases also depend negatively on unemployment (Ashenfelter & Johnson, 1969). Annual net earnings is therefore included as a measure for wages[5]. During periods of inflation, more strike activity is expected, because inflation decreases real wages (Cramton & Tracy, 1992). Inflation can also measure how strongly a government is pushing austerity measures. This provides a second reason to include inflation as a control variable. Austerity measures may also form a reason why people go on strike, especially general strikes. Times of austerity may also go together with more unemployment. Government budget deficit is also included as an extra measure for austerity measure. Lastly, strike activity may depend on institutional features and on how strong unions are. The latter can be proxied by union membership, which is measured by the percentage of working people who are a member of an union. A high level of union membership is expected to correlate with more strike activity. Institutional features are included through two control variables. Firstly, the collective bargaining coverage rate, which is the number of workers covered by a collective agreement, provides a measure for how centralized bargaining is in a country and can provide another measure for how much influence unions have. Stronger unions may go on strike more often and may also influence the unemployment rate. Secondly, the employment protection legislation index measures the intensity of employment protection laws, for example how easily workers can be fired. If many of these laws are present, more economic strikes may occur since workers have less fear of losing their job when demanding higher wages.

[5] Minimum wages were considered as a possible seventh control variable. However, the correlation between minimum wages and annual net earnings turned out to be very high ($\rho = 0.96$). Therefore, only annual net earnings is included in the regression models.

4. Methodology:

This section discusses the methodology used to test the hypotheses on the relationship between strike activity and unemployment.

Firstly, a measure for strike activity needs to be defined. As mentioned before, strike activity is measured in two ways: number of strikes or number of days on strike. In addition, it seems plausible that where more people work and more people are available to work, there will be more strikes on average. Larger countries with a larger labour force thus have more strikes and more days on strike just because of their size. There are two methods to account for this issue. In the first method, the measure of strike activity is divided by the labour force, while in the second method labour force is added as a control variable in the regression analysis. In this paper both methods are analysed to provide a robustness check of the results.

Secondly, the unemployment rate is the main independent variable of interest. The unemployment rate can serve as a proxy for the business cycle (see e.g. Devereux & Hart, 2011; McConnell, 1990; Vroman, 1989). It can thus be used to test the hypotheses of this paper about the procyclicality or countercyclicality of economic and general strikes.

In order to establish the relationship between strike activity and the unemployment rate, a regression model is estimated. Two models, one for each measure of strike activity, are estimated twice, once for economic strikes and once for general strikes. Each of these models comes in four forms; two different corrections for country size and two different forms of the dependent variable (level or natural logarithm) together give four options. The conversion to a natural logarithm can solve the problem of outliers in the dataset influencing the results. In addition, six control variables, discussed in the previous section, are included in the regression analysis. Furthermore, as this paper studies data about 26 countries during a time period of 30 years, it deals with panel data. Therefore, the regression models include both cross-section and time series fixed effects to control for unobserved heterogeneity among different countries and to account for shocks that are common to all countries.

5. Results:

This section discusses the results from the estimation of the models introduced in the previous section. The two models have been estimated twice, once for each type of strike. First, the results for economic strike activity are discussed. A conclusion about hypothesis one can then be drawn. Subsequently, the results for general strike activity are discussed to come to a conclusion about hypothesis two. In all models, a negative coefficient on unemployment implies that strikes are procyclical, whereas a positive coefficient implies countercyclical strikes.

Economic strikes:

The first hypothesis of this paper is that economic strike activity is procyclical, which means that a negative coefficient on unemployment is expected. In the first series of estimations, the dependent variable is strike activity measured by the number of days on strike (table 2).

When country size is controlled for by dividing the dependent variable by the labour force, the model shows an insignificant coefficient on unemployment, both in the simple model and in the model with control variables. In the model with all control variables, only annual earnings, inflation and the employment protection legislation index are significant. Estimating a model with these controls leaves the coefficient on unemployment insignificant. Annual earnings ($p= 0.0319$) and the EPL-index ($p=0.0630$) are significant however, with higher earnings leading to more days on strike and more protective legislation leading to less days on strike. The latter contradicts the expectation that more protective legislation will lead to more strikes due to less fear of losing one's job.

The effect of annual earnings is in line with the predictions from the Ashenfelter and Johnson (1969) model, which predicts that wage increases correlate with increases in strike activity (Ashenfelter & Johnson, 1969).

	Days on strike/labour force			**Ln(days on strike/labour force)**		
C	0.1930*** (3.571)	-1.4026 (-0.900)	-1.2632*** (-3.351)	-5.1945*** (-14.827)	-14.7041*** (-2.930)	-12.7925*** (-8.045)
Unemployment	-0.0077 (-1.277)	-0.0058 (-0.252)	0.0014 (0.158)	0.1023*** (2.645)	-0.0823 (-1.105)	0.1017** (2.237)
Annual earnings		-0.00008** (2.181)	0.00006*** (6.190)		0.0003** (2.087)	0.0002*** (5.039)
Inflation		0.0742* (1.983)	0.0005 (0.064)		-0.0220 (-0.182)	
CBC_rate		0.0033 (0.165)			-0.0620 (-0.959)	
Union membership		0.0166 (0.470)			0.1763 (1.582)	
EPL_index		-0.7493* (-1.884)	-0.2607** (-2.037)		1.1918 (0.751)	
Government deficit		0.0320 (1.612)			0.0742 (1.151)	
R-squared	0.314	0.646	0.459	0.471	0.783	0.521
Number of observations	549	120	314	492	111	297
	Days on strike			**Ln(days on strike)**		
C	1984572** (2.522)	-789259.50 (-0.154)	4080111*** (2.879)	14.3085*** (13.861)	8.3411 (1.353)	18.5695*** (15.192)
Unemployment	-47978.58* (-1.655)	-34014.39 (0.590)	-41416.38 (-1.072)	0.0783** (2.048)	-0.0522 (-0.704)	0.0826** (2.210)
Labour force	-0.1046 (-1.453)	-0.3101 (-1.125)	-0.2194** (-2.209)	-3.80e^-7*** (-4.109)	-7.05e^-7** (-2.070)	-4.72e^-7*** (-5.174)
Annual earnings		88.4850 (0.781)			0.0001 (0.820)	
Inflation		136864.6 (1.469)			-0.0255 (-0.215)	
CBC_rate		-7724.22 (-0.151)			-0.0813 (-1.271)	
Union membership		173616.9* (1.682)	9053.25 (0.430)		0.3170** (2.493)	-0.0630*** (-3.244)
EPL_index		-1025673 (-1.031)			1.5537 (0.993)	
Government deficit		89187.24* (1.799)	71903.29** (2.152)		0.0656 (1.036)	
R-squared	0.189	0.623	0.238	0.487	0.691	0.526
Number of observations	549	120	334	492	111	416

*Table 2: Economic strikes. Measure of strike activity: days on strike. Significant on: * 10% level, ** 5% level, *** 1% level. T-statistics in brackets. Cross-section and time fixed effects included.*

Converting the dependent variable to a natural logarithm improves the fit of the model, as measured by the R-squared, substantially. Since the data includes large outliers, the conversion to a natural logarithm can make the model's estimations more reliable. In the simple model the coefficient on unemployment is highly significant (p=0.0085) and positive, which implies countercyclical economic strike activity. However, the coefficient on unemployment ceases to be significant after adding control variables. This can be due to the large loss of observations. After re-estimating the model controlling for annual earnings only, the significant control variable in the full model, the coefficient on unemployment is significant on a 5% level and positive. A 1% increase in the unemployment rate seems to imply a 10% increase in the amount of days on strike per member of the labour force, which implies countercyclical economic strike activity. Again, higher earnings correlate with more days on economic strike.

To check the robustness of these results, country size is also corrected for through adding labour force as a control variable in the regression analysis (table 2). In the simple model the coefficient on unemployment is significant on a 10% level (p=0.0985) and negative, implying procyclical economic strike activity. However, when control variables are added, this result disappears. When the dependent variable is converted to a natural logarithm to make the results less sensitive to outliers, the coefficient on unemployment is significant on a 5% level (p= 0.0411) and positive, implying countercyclical economic strikes. The insignificance of the unemployment coefficient in the full model is due to a lack of observations. Union membership is the only significant control variable in the full model and estimating a model which controls for union membership only again shows countercyclical economic strike activity with a positive and significant (p=0.0277) coefficient on unemployment. The negative coefficient on union membership contradicts the expectation that higher membership levels correlate with more strike activity. The results with days on strike as the measure of strike activity are not in line with hypothesis 1.

	Number of strikes/labour force			**Ln(number of strikes/labour force)**		
C	0.00006*** (6.839)	0.0001 (1.275)		-11.1692*** (-87.776)	-16.5138*** (-4.925)	-11.0522*** (-72.361)
Unemployment	0.000003*** (-3.023)	-3.57e^-8 (-0.038)		-0.0463*** (-3.163)	0.0160 (0.523)	-0.0629*** (-4.113)
Annual earnings		-2.60e^-10 (-0.145)			-0.000002 (0.0329)	
Inflation		-1.22e^-7 (-0.083)			-0.0637 (-1.251)	
CBC_rate		2.49e^-7 (0.556)			0.0032 (0.239)	
Union membership		1.93e^-7 (0.154)			0.0140 (0.360)	
EPL_index		-0.00004 (-1.447)			1.6624 (1.328)	
Government deficit		-1.94e^-7 (-0.244)			-0.0456* (-1.835)	-0.0071 (-0.511)
R-squared	0.484	0.750		0.845	0.927	0.862
Number of observations	517	121		463	112	325
	Number of strikes			**Ln(number of strikes)**		
C	306.6722*** (3.531)	-435.2870 (-1.156)	-369.8584* (-1.890)	4.2650*** (10.659)	-0.1419 (-0.041)	3.9149*** (7.662)
Unemployment	-4.5740 (-1.401)	5.5313 (1.356)	-7.1197** (-2.146)	-0.0518*** (-3.495)	0.0316 (0.974)	-0.0685*** (-4.501)
Labour force	-0.000009 (-1.044)	0.00003** (2.439)	0.00001 (1.294)	7.02e^-9 (0.190)	-8.00e^-8 (-0.787)	7.94e^-8** (2.128)
Annual earnings		0.0133 (1.656)			-0.000009 (-0.162)	
Inflation		-14.5084** (-2.371)	0.1474 (0.487)		-0.0588 (-1.161)	
CBC_rate		2.0264 (1.081)			0.0013 (0.098)	
Union membership		3.9761 (0.738)			0.0251 (0.622)	
EPL_index		-211.1943* (-1.696)	205.6977*** (3.824)		1.8569 (1.458)	
Government deficit		-1.6672 (-0.502)			-0.0448* (-1.820)	-0.0065 (-0.480)
R-squared	0.681	0.937	0.756	0.858	0.952	0.873
Number of observations	517	121	402	463	112	325

*Table 3: Economic strikes. Measure of strike activity: number of strikes. Significant on: * 10% level, ** 5% level, *** 1% level. T-statistics in brackets. Cross-section and time fixed effects included*

In a second series of estimations, strike activity is measured by the number of strikes(table 3). Firstly, the number of strikes is divided by the labour force to correct for country size. In the simple model then, the coefficient on unemployment is highly significant (p=0.0026) and positive, which implies countercyclical strikes, rejecting hypothesis 1. However, after including control variables the coefficient on unemployment ceases to be significant. This could be due to a large loss of observations. Because of the existence of large outliers in the dataset, the dependent variable is converted to a natural logarithm. The coefficient on unemployment in this model is highly significant (p= 0.0017) and negative, implying procyclical economic strike activity. This is in line with hypothesis 1. When all control variables are added, the coefficient is no longer significant, again due to a huge loss of observations. In addition, just one control variable is significant, namely government deficit. The negative coefficient on government deficit means that a larger deficit correlates with less economic strikes. If we assume that a country with a larger government deficit has a bad state of the economy and high unemployment, this result also points towards the procyclicality of economic strikes. Controlling only for government deficit, the model shows a negative, highly significant coefficient on unemployment (p=0.0001). A 1% increase in the unemployment rate leads to approximately 6% more economic strikes per member of the labour force. This is again in line with hypothesis 1.

When country size is corrected for by including labour force as a control variable to check the robustness of the results, the coefficient on unemployment is not significant at first (table 3). In a model with labour force, inflation and the EPL-index as control variables, the coefficient on unemployment is negative and significant on a 5%-level (p=0.0326). The coefficient on inflation is positive. This is in line with the expectation that more strike activity is expected in periods of inflation (Cramton & Tracy, 1992). Converting the dependent variable to a natural logarithm, the coefficient on unemployment is highly significant and negative in the simple model. When all control variables are including, all coefficients are insignificant except the negative coefficient on government deficit. Estimating the model controlling only for government deficit again shows a negative and highly significant coefficient on unemployment.

In conclusion, for both measures of strike activity the models with the natural logarithm are more reliable, because of the presence of large outliers in the dataset. Looking at the results from the natural logarithm models, the relationship between economic strike activity and the unemployment rate seems to depend on how strike activity is measured. Strike activity measured by the number of days on strike is countercyclically related to the unemployment rate. An increase of 1% in the unemployment rate goes together with approximately 10% more days on strike per member of the labour force. This result is not in line with hypothesis 1. In contrast, when economic strike activity is measured as the number of strikes, economic strike activity is procyclically related to the unemployment rate. A 1% increase in the unemployment rate leads to a 4-6% decrease in the number of economic strikes per member of the labour force. This result is in line with hypothesis 1.

General strikes:

The second hypothesis of this paper concerns general strike activity. It states that general strike activity in Europe is countercyclical, which means that a positive coefficient on unemployment is expected. As with economic strikes, the model is first estimated with the number of days on strike as the measure of strike activity (table 4).

	Days on strike/labour force		Ln(days on strike/labour force)		
C	0.0513	-1.5385	-5.9697***	-32.1426***	-15.4374***
Unemployment	0.0003	-0.0021	0.0136	-0.0756	0.0727
Annual earnings		0.00004		0.0006***	0.0003***
Inflation		0.0429		0.1293	
CBC_rate		0.0103		0.1243	
Union membership		-0.0024		-0.0605	
EPL_index		-0.01481		1.8604	
Government deficit		-0.0060		0.2087**	0.0117
R-squared	0.287	0.465	0.4142	0.695	0.536
Number of observations	544	120	443	101	204
	Days on strike		**Ln(days on strike)**		
C	747942*	-3578660	14.2446***	-8.0339	14.1107***
Unemployment	1520.887	9291.231	-0.0084	-0.0481	0.1081*
Labour force	-0.0564	-0.0542	-4.47e^-7***	-7.77e^-7	-7.42e^-7***
Annual earnings		96.3970		0.0004*	0.0002*
Inflation		107054.1		0.1318	
CBC_rate		28234.67		0.1075	
Union membership		-16091.81		0.0973	
EPL_index		-17447.52		2.0713	
Government deficit		-15784.67		0.2028*	0.0263
R-squared	0.301	0.453	0.442	0.640	0.528
Number of observations	544	120	443	101	204

*Table 4: General strikes. Measure of strike activity: days on strike. Significant on: * 10% level, ** 5% level, *** 1% level. T-statistics in brackets. Cross-section and time fixed effects included.*

Country size is first corrected by dividing the number of days on strike by the labour force. Independent from the form of the dependent variable (level or natural logarithm), the coefficient on unemployment is insignificant. When the natural logarithm of days on strike divided by labour force is the dependent variable, two control variables are significant on a 10%-level in the full model; annual earnings and government deficit. Annual earnings has a positive coefficient, which means that higher earnings correlate with more days on general strike. This is in line with the expectations and a similar result was shown with economic strikes (days on economic strike) and annual earnings. However, the coefficient on government deficit has a positive sign in the model with general strikes as opposed to a negative sign in the economic strikes model. A 1% increase in the government deficit leads to approximately 20% more days on strike per member of the labour force. This is in line with the expectation that austerity measures form a reason to go on strike, especially on general strike. Of course, this expectation depends on the assumption that countries with a large deficit have to implement austerity measures. As a robustness check, the labour force is added as a control variable to correct for country size. Again, the coefficient on unemployment is not significant. Only in the last model with the natural logarithm of days on general strike as dependent variable is the coefficient on unemployment significant on a 10%-level and positive.

This implies countercyclical general strike activity and is in line with hypothesis 2. Only annual earnings and government deficit are included in this model, since they are the only control variables that are significant in the full model. Again, the coefficient on both control variables is positive.

	Number of strikes/labour force		Ln(number of strikes/labour force)	
C	0.00002***	0.00006	-12.1615***	-12.9137**
Unemployment	-0.000001*	3.25e^-7	-0.0718***	0.0084
Annual earnings		-6.17e^-10		-0.00007
Inflation		-6.33e^-8		0.7012
CBC_rate		3.59e^-8		0.0094
Union membership		-2.71e^-7		0.0037
EPL_index		-0.00002		0.4657
Government deficit		-8.27e^-8		-0.0609
R-squared	0.187	0.457	0.663	0.603
Number of observations	517	121	417	103
	Number of strikes		**Ln(number of strikes)**	
C	292.1459	396.4555	3.3112***	3.0138
Unemployment	-14.4709	5.1328	-0.0766***	0.0176
Labour force	-0.000008	0.000002	-7.46e^-10	-1.75e^-8
Annual earnings		-0.0006		-0.00007
Inflation		-3.7955		0.0764
CBC_rate		-0.4342		0.0084
Union membership		-2.0611		0.0088
EPL_index		-121.6230		0.4534
Government deficit		0.0446		-0.0599
R-squared	0.177	0.480	0.713	0.831
Number of observations	517	121	417	103

*Table 5: General strikes. Measure of strike activity: number of strikes. Significant on: * 10% level, ** 5% level, *** 1% level. T-statistics in brackets. Cross-section and time fixed effects included.*

A second series of estimations uses the number of strikes as the measure of strike activity (table 5). When country size is corrected by dividing the dependent variable by the labour force, the coefficient on unemployment is significant on a 10%-level (p=0.0645) and negative. Due to the existence of large outliers in the dataset, it seems better to convert the dependent variable to a natural logarithm. In this model, the coefficient on unemployment is also significant (p=0.0007) and negative. This implies procyclical general strike activity, which rejects hypothesis 2. A 1% increase in the unemployment rate leads to a 7% decrease in the amount of general strikes. In both models with this type of country size correction, control variables are not significant. This can be due to the lack of observations in these models. When country size is corrected by adding labour force as a control variable, unemployment is not significant in the simple model nor when control variables are added. However, the influence of outliers is present again. Therefore, the dependent variable is converted to a natural logarithm. After this conversion, the coefficient on unemployment is highly significant and negative in the simple model, implying procyclical general strike activity. These results are not in line with hypothesis 2.

In conclusion, the models with a natural logarithm are more reliable for both measures of strike activity due to the existence of outliers. Looking at those models with days on strike as dependent variable, general strike activity is insignificant in all models, except for one. In the model that corrects for country size by adding labour force as control, the coefficient on unemployment is positive implying countercyclical general strikes. No conclusion about hypothesis two can be drawn from these results. There appears to be a hint of countercyclicality, but not enough to say that the results are in line with hypothesis two.

However, when strike activity is measured by the number of general strikes, all results point towards procyclical general strike activity. These results are thus not in line with hypothesis two.

6. Conclusion

The observation that European countries have been experiencing a high level of unemployment together with a large amount of strike activity was the starting point for this paper. This observation seemed to contradict the existing literature, which states that strike activity is procyclical. However, the distinction between economic and general strikes might provide an explanation. The literature on economic strikes is extensive, whereas very little has been written about general strikes. The three types of models of economic strike activity; Ashenfelter & Johnson (1969) model, joint-cost hypothesis and asymmetric information models, all predict and empirically show that economic strikes are procyclical in North-America. This paper therefore studies whether the relationship between strike activity and unemployment is similar in Europe. The second part of the research question concerns the distinction between economic and general strikes. The tendency that the amount of general strikes has increased over the last few years, while the number of economic strikes decreased, leads to the expectation that the relationship with unemployment is different for both types of strikes. In addition, Hamann et al. (2013) hypothesize that a bad state of the economy, including high unemployment rates, goes together with high general strike activity (Hamann et al., 2013). This leads to the expectation that general strike activity is countercyclical.

Strike activity is measured in two ways, namely by the number of strikes or by the number of days on strike. Two regression models, one for each measure of strike activity, were then estimated twice, once for economic strikes and once for general strikes. The results are sensitive to how strike activity is measured for both types of strikes. The number of days on economic strike increased, while the number of economic strikes decreased when the unemployment rate increased. This implies that economic strike activity is either procyclical or countercyclical depending on how strike activity is measured. It appears to be the case that economic strike activity is not unambiguously always procyclical as was expected in hypothesis one. These results are therefore not in line with hypothesis one. For general strike activity, there is either no significant relationship with the unemployment rate or the number of general strikes decreased when the unemployment rate increased. The latter result implies that general strikes are procyclical, which is not in line with hypothesis two. A similar result is found with economic strikes, implying that the relationship with unemployment does not depend on the type of strike activity. However, a conclusive answer on this matter cannot be given, since the insignificant relationship does hint to a difference in how the two strike activity types are related to unemployment.

The research question: "*What is the relationship between strike activity (divided into economic and general strikes) and the unemployment rate in Europe?"* can now be answered with these results. The relationship depends on which type of strikes is considered and how strike activity is measured. Economic strike activity is procyclical or countercyclical depending on how it is measured. It seems thus not unambiguously true that economic strikes are procyclical in Europe, an idea that is well-established in the literature on economic strikes (see e.g. Ashenfelter & Johnson, 1969; Cramton & Tracy, 1992; McConnell, 1990; Vroman, 1989).

On the one hand, general strike activity does not seem to be related to the unemployment rate, while on the other hand there appears to be a negative relationship, implying procyclical general strike activity. It therefore does seem important to keep in mind that different types of strike activity exist since the relationship with unemployment is not exactly the same for both types.

In addition, the relationship between strike activity and the unemployment rate in Europe is not as clear as in North-America. The contradiction in the results from Devereux and Hart (2011) and Ingram et al. (1993), who found procyclical and countercyclical strike activity respectively, is confirmed with this paper's results (Devereux & Hart, 2011; Ingram et al., 1993). Moreover, it is not necessarily the case that the relationship in Europe is the same as in North-America as economic strikes can be either procyclical or countercyclical in Europe.

The results from this paper have some implications. The result that strike activity is procyclical is generally accepted in the field of economics. However, this paper shows that this established idea does not unambiguously apply to economic strikes. For general strikes, the relationship is either insignificant or negative, implying that they might be procyclical too. In addition, the possibility that strikes in Europe might be countercyclical was stated in the introduction. The results from this paper show that this could be true for both types of strikes. Economic strike activity as measured by the number of days on strike is found to be countercyclical. The issues for individual firms might therefore be quite large, because economic strikes are possibly countercyclical and thus further harm the struggling firms during economic downturns. This implies that policymakers might need to pay more attention to keeping strike activity under control to not further distress a struggling economy. Another interesting result from this paper that might be important to policymakers concerns the relationship between strike activity and government deficit. The size of a country's government deficit appears to have a different effect depending on the type of strike activity. A larger government deficit is found to decrease the amount of economic strike activity, whereas it increases the amount of general strike activity.

This paper has some limitations that could be improved in further research. The first two limitations concern the dataset. Firstly, the time periods in which data on the different control variables was available varied per variable. This lead to a loss of observations in models with multiple control variables. The problem is due to the fact that the data on control variables comes from several different databases. This research should therefore be repeated with a more balanced dataset with respect to the control variables to limit the loss of observations. In addition, observations were lost in the models with a natural logarithm as dependent variable. The dataset includes several zero observations, because some countries experienced zero strikes or zero days on strike in some years. These observations were lost when a natural logarithm of strike activity was taken. Another limitation of this paper is that it only tells how strike activity and the unemployment rate move together. In order to establish a causal effect on strike activity more research is needed using more sophisticated methods like instrumental variables.

Further research could start at this paper's first limitation and re-estimate the regression models with more data on the control variables. A more conclusive answer about the relationship between unemployment and strike activity, and especially about a possible difference in the relationship for both types of strike activity, could then possibly be given. Another suggestion for further research starts at this paper's last limitation and would try to establish what causes strikes. Research on the determinants of economic strikes does exist (see e.g. Ashenfelter & Johnson, 1969; Flaherty, 1983; Gramm, 1986), but this is not the case for general strikes. This paper's results show that the relationship between strike activity and unemployment is possibly not exactly the same for both types of strikes. If the relationship is different, the determinants of general strike activity might also be different from those of economic strike activity. Therefore, more research into the determinants of general strikes is needed. Especially because both types of strike activity play a role in Europe, it seems important to know what causes them and whether their determinants are different.

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Appendices:

Appendix 1:

Economic strikes	General strikes
Arts and entertainment	Education
Financial and insurance services	Health care
Transportation[1]	Activities of extraterritorial bodies[2]
Administrative services	Public administration
Real estate	Water supply[3]
Manufacturing	Electricity[3]
Mining	Community services
Fishing	
Agriculture	
Wholesale	
Construction	
Hotels and restaurants	

Table A1: Types of strike activity and sectors.

1. Transportation concerns goods transportation and not public transport, which is why it is included in economic strikes.
2. Extraterritorial bodies are organisations like the United Nations and embassies. Since these are government organisations, strike activity at these bodies is included in general strikes.
3. Because water supply and electricity provision is a public service in most countries in the dataset, strike activity in these sectors is included in general strikes.

Appendix 2:

	Annual earnings (euros)	Inflation(%)	CBC-rate(%)	Union membership(%)	EPL-index	Government deficit(%)
Mean	29,357	10.23	61.2	37.1	2.47	-3.01
Median	32,286	2.96	70	33.1	2.37	-2.90
Maximum	55,792	555.4	98.2	83.9	5.0	6.2
Minimum	5,471	-4.48	5.4	5.7	1.1	-32.3
Standard deviation	13,289	34.4	29.1	20.9	0.70	3.29
Number of observations	*465*	*758*	*329*	*602*	*557*	*528*

Table A2A: Descriptive statistics of control variables.

Control variable	Data source
Annual net earnings	Eurostat
Inflation	World Bank
Collective bargaining coverage rate	ILO
Union membership	OECD
Employment protection legislation index	OECD
Government deficit	Eurostat

Table A2B: Data sources of control variables