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Virtual vs. Standard Strike :

An Experiment

June 2009

Virtual vs. Standard Strike:
an Experiment

by

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Abstract

In this paper we compare - in the laboratory - stoppage and virtual strike. Our experiment confirms that higher wages offered by an employer lead to considerably more costly effort provision. The number of strikes, the level of efforts and average total payoffs are higher under virtual strike than under standard strike. However, when standard strike is associated with reciprocal externalities, it induces higher effort levels, higher payoffs and an extremely reduced number of strikes than virtual strike. It is unclear whether this behavior reflects reciprocity or other forms of social preferences. However our results might explain why standard strikes rather than virtual ones are generally adopted by workers.

Keywords: virtual strike, cooperation, reciprocity, fairness, experiments

JEL: C91, D74, D78, J52, K31, M55

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1. Introduction

In this paper we compare - in the laboratory - stoppage and virtual strike. A virtual or nonstoppage strike has been defined (Ayres and Nalebuff, 2006) as the case where the workers keep working as usual and the firm keeps producing as usual, but neither side gets paid. Workers lose their wages and and employer loses its profits during a strike. So during a virtual strike the workers would work for nothing and the employer would give up its revenues.

Bernstein (1961) first attempted to formulate the rule governing virtual strike in public services: employee union would be free to declare a nonstoppage strike after all other bargaining procedures failed to produce a settlement. Employees would be obliged to continue to work full time but would forego a portion of their take-home pay. This money would be paid by the employer directly into a special fund and in addition to paying the equivalent of regular wages, the employer would also put into the fund an extra amount equal to what the employees have given up.

The economic rationale for virtual strike relies on the idea of producing for bargaining parties the same result as standard stoppage strike, without generating social costs to third parties. Thus, from an aggregate welfare perspective, it seems that virtual strike always dominates standard strike. However, virtual strikes are the exception rather than the rule governing employer-employees bargaining.

As Nicita and Rizzolli (2009) argue, one of the reason for the extremely infrequent case of virtual strike could be that, especially in public services, workers are often induced to recur to hard stoppage strike that raise social costs precisely to exert higher pressure on employers' side. Thus the case for virtual strike seem to raise in one of the following cases: (i) when private costs imposed on the other bargaining party are high enough to assure compliance and/or striking parties care about third parties social costs; (ii) when at least a portion of social costs raised by stoppage strike falls back on striking parties.

In order to understand workers' choice between virtual strike and standard or stoppage strike we investigate parties' incentives to cooperate in the presence of negative externalities on (and by) third parties.

This article describes the results of an experiment designed to test whether the choice between standard or virtual strike is affected by the emergence of third party externality and/or by the dimension of private costs of striking activity. Following Charness (2004) and Fehr et al. (2007) we formalize employer-employees bargaining activity as a game

of alternative offers over the wage-effort pairs. Workers reply with a given level of effort to a wage proposal by employer. Bargaining process ends when an agreement is reached. We have then described 'strike activity' as the worker's refusal of a previous wage offfered by employer. In particular we have modelled 'stoppage strike' as the case in which refusal to accept a wage proposal implies stopping production, with workers gaining the opportunity cost of effort and employer gaining the cost of wages, but loosing potential earnings.

Our first treatment regarded this kind of standard strike. Our second treatment regarded standard strike with externality. We have assumed that strike would impose a net loss on third parties and on bargaining parties. The last treatment considered the case for a weaker version of virtual strike, imposing the cost of strike only on workers. We have assumed that a bargaining failure, i.e. a refusal by workers to accept a proposed wage, is not associated to stopping production, which continues under new bargaining stage. Under this setting, workers face the cost of effort while wages are paid to third parties.

Our experiment confirms that higher wages offered by an employer lead to considerably more costly effort provision. The number of strikes, the level of efforts and average total payoffs are higher under virtual strike than in standard strike.

However, when standard strike is associated with reciprocal externalities, it induces higher effort levels, higher payoffs and an extremely reduced number of strikes than virtual strike. It is unclear whether this behavior reflects reciprocity or other forms of social preferences.

Our result suggests that the dimension of externalities under standard strike might enhane incentives for stoppage strike rather than for virtual ones. This might explain why standard strikes rather than virtual ones are generally adopted by workers.

2. Experimental Design

Participants were undergraduate students recruited from classes and by posting notices at the University of Siena in the period November 2007 – May 2008. A total of 188 subjects participated in the experiment; 70 had the role of "employer"; 70 had the role of "worker" and the other 48 had the "third party" designation. Average earnings, including a € 2 show-up fee, were € 13.4 for about 50 minutes of time. In all the

treatments pairing among subjects were anonymous, the payoff functions were common information, and participants were required to calculate both employer and employee payoffs in three preliminary exercises with hypothetical wage-effort pairs. These exercises were reviewed before proceeding with the experiment, insuring that subjects understood the payoff mechanism.

Summary of the experimental design			
Session	Treatment	Participants	Total participants by treatment
1	Virtual strike	18	
2	Virtual strike	24	
3	Virtual strike	24	
4	Virtual strike	18	
5	Virtual strike	18	102
6	Standard strike	14	
7	Standard strike	14	
8	Standard strike	16	44
9	Standard strike with externality	21	
10	Standard strike with externality	21	42
Total		188	188

A. Standard strike

The first treatment concerned standard strike. We have defined it as a worker's rejection of an offer by employer in a bargaining process. Thus a refusal by worker to agree on a proposed wage, implies no effort and zero production. The bargaining process in the case of standard strike:

Phase 1: Employer offers a wage

Phase 2: Worker proposes effort

Phase 3: Employer confirms or changes wage

Phase 4: Worker accepts (agreement) or reject (strike) wage/effort pair.

Also in this case we had 10 repetitions and in each repetition the same matching between the employer and the worker. Initial endowments were 150 guilders for the employer and 50 guilders for the worker. Experimental "guilders" were converted to dollars at the rate of 20 to € 1. The schedule of cost as a function of effort is shown below:

Effort	0,1	0,2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Cost	0	1	2	4	6	8	10	12	15	18

Payoffs functions were assumed as following:

1. Agreement (no strike):

          Employer's payoff $E=(120 - w)e$

          Worker's payoff $W=(w- e - 20)$

2. Strike

          Employer's payoff $E=0$

          Worker's payoff $W= 0$

B. Standard strike with externality

In this treatment we have assumed that, in the event of a strike, a reciprocal externality occurs: worker's strike negatively affects third party and, in turn, third party negatively affects worker's payoff. This assumption could be referred to two cases: (a) third party reaction generates a negative externality for worker (we can label this as 'reciprocal externality'); (b) worker's payoff function negatively depends on third party's payoff (to simplicity's sake we can label this as 'fairness'). The experiment does not allow to distinguish between the two above cases. The bargaining process is the same as in the case of standard strike:

          Phase 1: Employer offers a wage

          Phase 2: Worker proposes effort

          Phase 3: Employer confirms or changes wage

          Phase 4: Worker accepts (agreement) or reject (virtual strike) wage/effort pair

Also in this case we have run 10 repetitions, each with the same matching between the employer and the worker, and it is assume that the same third party is involved in each matching. Initial endowments for standard strike with externality are given by 300 guilders for the employer, 200 guilders for the worker and 150 guilders for third party. In this treatment, experimental "guilders" were converted to dollars at the rate of 80 to € 1. The schedule of cost as a function of effort is shown below:

Effort	0,1	0,2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Cost	0	1	2	4	6	8	10	12	15	18

Payoffs functions were assumed as following:

1. Agreement:

Employer's payoff	E= (120 - wage)x(effort)	
Worker's payoff	W= (wage – effort cost – 20)	
Third party's payoff	T= 0	

2. Strike with externality

Employer's payoff	E=- 15	
Worker's payoff	W=- 15	
Third party's payoff	T=- 15	

C. Virtual Strike

The last treatment concerned virtual strike. We have defined it in a weaker version, as a bargaining process in which a refusal by worker to agree on a proposed wage, implies continuing providing effort and production, whereas wage is transferred to third party. This is the case of the so-called 'hold-out' bargaining, where a previous contract has elapsed and a new one needs to be settled. The bargaing process is then described as follows:

Phase 1: Employer offers a wage

Phase 2: Worker proposes effort

Phase 3: Employer confirms or changes wage

Phase 4: Worker accepts (agreement) or reject (virtual strike) wage/effort pair

The treatment has involved 10 repetitions and in each repetition there was the same matching between employer and worker, and it was assumed that the same third party would benefit in the case of a strike. Initial endowments were the following: employer (150 guilders); worker (50 guilders); third party (zero guilders). Experimental "guilders" were converted to dollars at the rate of 20 to € 1. The schedule of cost as a function of effort is shown below[1]:

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[1] As in Charness (2004) we have assumed that the return to the employer is much greater than the cost to the worker for the effort levels usually recorded; the ratio of employer benefit to employee cost depends

Effort	0,1	0,2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Cost	0	1	2	4	6	8	10	12	15	18

Payoffs functions have been set as following:

1. Agreement (no strike):

   Employer's payoff $\qquad$ $E=(120 - w)e$

   Worker's payoff $\qquad$ $W=(w - e - 20)$

   Third party's payoff $\qquad$ $T=0$

2. Virtual strike

   Employer's payoff $\qquad$ $E=- w$

   Worker's payoff $\qquad$ $W= - e$

   Third party's payoff $\qquad$ $T=w + e$

3. Results

Average effort increased in all treatments. The increase of effort over time was higher in the virtual treatment (+ 30.0%) than in the standard (+20.0%) and in the externality treatments (+10.3%). Average effort was higher in the externality treatment than in the other two treatments (total average values 0.63 ext − 0.50 virtual − 0.47 standard). The difference between average wages between the virtual strike treatment and standard strike with externality decreased until the ninth period. In the tenth period there was a pronounced deadline effect for the virtual strike treatment, in which average effort decreased (- 10%). The highest effort was recorded in the 9th period in the virtual strike treatment (0.57), in the 4th period in the externality treatment (0.52) and in the 7th period in the standard treatment (0.67).

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on the wage chosen.

Tab. 2 Wage offered by employers vs. workers' effort by period

Period	Virtual strike		Standard strike		Standard Strike with externality	
	Effort	Wage	Effort	Wage	Effort	Wage
1	0,40	43,9	0,40	45,3	0,58	59,7
2	0,42	44,4	0,43	48,6	0,64	63,9
3	0,46	45,8	0,44	46,7	0,64	60,4
4	0,50	47,0	0,45	50,6	0,67	61,2
5	0,52	46,9	0,47	50,7	0,66	65,0
6	0,47	43,3	0,48	49,8	0,64	61,9
7	0,55	51,0	0,52	50,2	0,65	62,8
8	0,55	50,3	0,52	48,7	0,59	60,2
9	0,57	51,1	0,50	44,5	0,63	59,5
10	0,52	45,4	0,48	43,7	0,64	60,9
Average	0,50	46,9	0,47	47,9	0,63	61,6

Fig. 1 Average effort by period

Fig. 2 Average wage by period
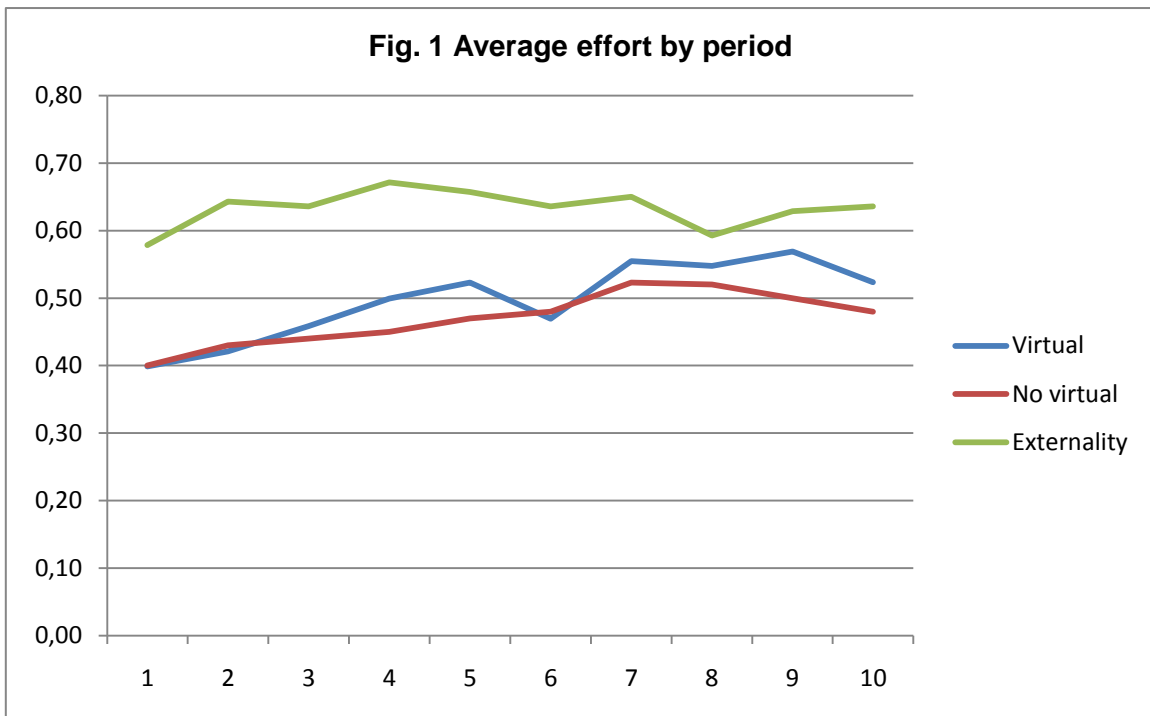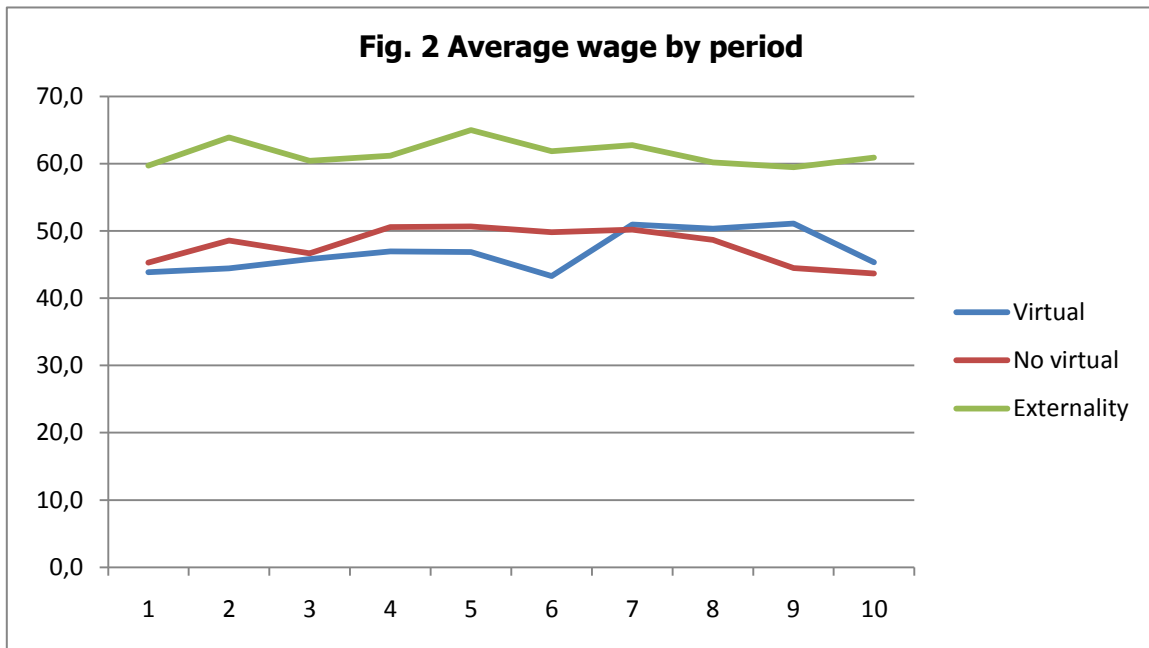
Average offered wage increased in the virtual strike treatment (+3.5%) and in the externality treatment (+0.2%) while it decreased in the no virtual treatment (-3.6%). However, there was a pronounced deadline effect in two of the three treatments, which caused the wage to decrease in the last period. By taking into account the difference between the wage offered in period 1 and the highest offered wage in all the treatments the increase was higher for the virtual strike treatment (+16,4%) than in the other two treatments (no virtual +11.9%, externality +8.9%). Average wage was higher in the externality treatment than in the other two treatments (total average values: 61.6 ext – 47.9 no virtual – 46.9 virtual). The highest wage was recorded in the 9th period in the virtual strike treatment (51.1), in the 5th period for the standard treatment (50.7) and in the 5th period for the externality treatment (62.8). Reputation effect matters more in the virtual strike treatment than in the other two treatments, as made evident by deadline effects and the occurrence of highest wages and effort in the next-to-last period.

The distributions of chosen efforts and of offered wages are similar in the virtual strike and standard strike with externality treatments, while it is more asymmetrical in the standard strike treatment. In the standard strike treatment the effort level with the highest number of observations (mode) is 0.5, while in other two treatments is 1. In the standard treatment the mode is the intermediate wage brackets 30-50, while in the other two treatments is the wage bracket 70-79.

**Tab. 3 Wage/Effort Pairs by Wage Bracket – Virtual strike**

Wage bracket	Effort										Tot.	%
	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0		
0-19	16	2						1			19	5,6
20-29	18	7	2								27	7,9
30-39	5	10	6	2	2	1	1	1			28	8,2
40-49	6	2	9	5	10	6	4	1			43	12,6
50-59	1		3	11	12	10	1	1			39	11,5
60-69		1		2	6	23	11	3		4	50	14,7
70-79					1	5	13	17	39	46	121	35,6
80-89	1			1	1			1	2	3	9	2,6
90-	4										4	1,2
Total	51	22	20	21	32	45	30	25	41	53	340	
%	15,0	6,5	5,9	6,2	9,4	13,2	8,8	7,4	12,1	15,6		

Tab. 4 Wage/Effort Pairs by Wage Bracket – Standard strike

Wage bracket	Effort										Tot.	%
	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0		
0-19	2	4	1	1							8	3,6
20-29	7	4	4	1		1					17	7,7
30-39	4	9	8	4	13	9					47	21,4
40-49	2	5	5	11	13	4	6	2			48	21,8
50-59	3	5	7	3	5	3	4				30	13,6
60-69	1		3	4	5	6	3				22	10,0
70-79			3		7	6	3	2		19	40	18,2
80-89		1			2	3	1			1	8	3,6
90-											0	0,0
Total	19	28	31	24	45	32	17	4	0	20	220	
%	8,6	12,7	14,1	10,9	20,5	14,5	7,7	1,8	0,0	9,1	8,6	

Tab. 5 Wage/Effort Pairs by Wage Bracket – Standard strike with externality												
	Effort											
Wage bracket	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0	Tot.	%
0-19											0	0,0
20-29	5	2	1								8	5,7
30-39	5	3	1	1							10	7,1
40-49	1	4	3	4				1		1	14	10,0
50-59	1	2	4	2	5	2	1	1			18	12,9
60-69		1	7		1	3	6	4			22	15,7
70-79		1	1		1		2	9	25	25	64	45,7
80-89						1				3	4	2,9
90-											0	0,0
Total	12	13	17	7	7	6	9	15	25	29	140	
%	8,6	9,3	12,1	5,0	5,0	4,3	6,4	10,7	17,9	20,7		

Fig. 3 Effort by treatment

Fig. 4 Wage by treatment
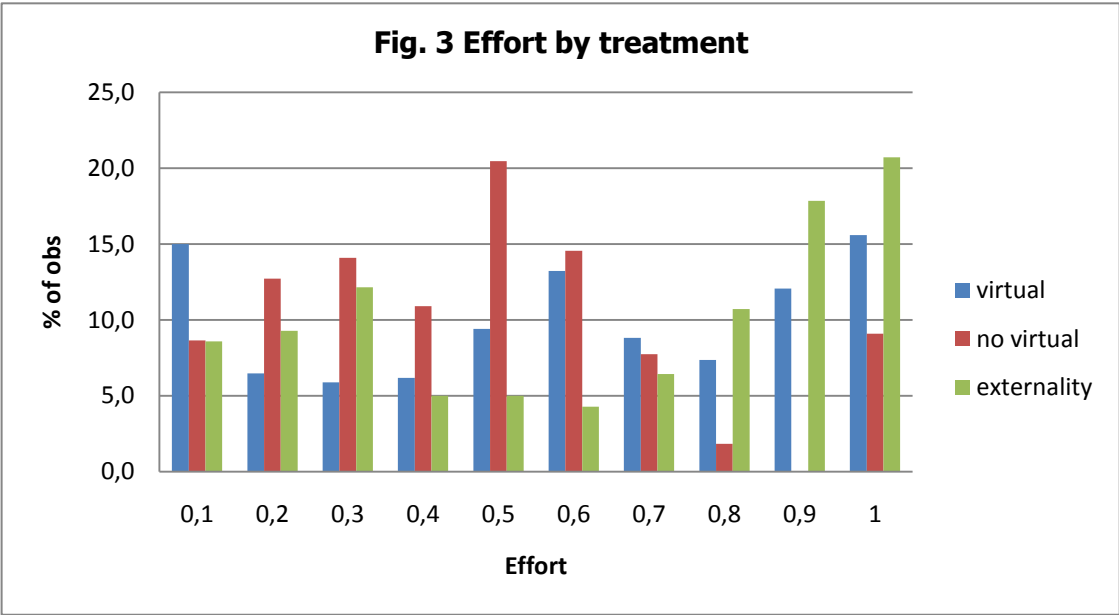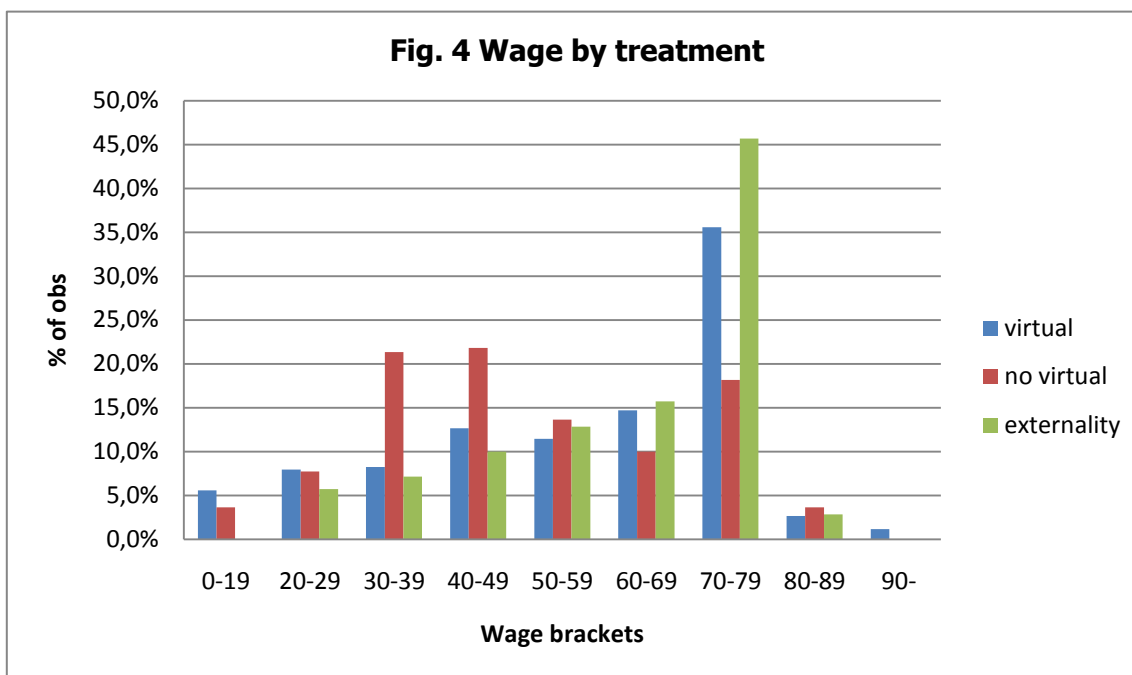
Tab. 4 Strikes by period						
	Virtual strike		Standard strike		Standard strike with externality	
Period	N. of strikes	% (n. strikes/ n. bargainings)	N. of strikes	% (n. strikes/ n. bargainings)	N. of strikes	% (n. strikes/ n. bargainings)
1	4	11,8%	2	9,1%	1	7,1%
2	3	8,8%	3	13,6%	1	7,1%
3	5	14,7%	3	13,6%	1	7,1%
4	3	8,8%	1	4,5%	3	21,4%
5	8	23,5%	5	22,7%	1	7,1%
6	4	11,8%	1	4,5%	0	0,0%
7	1	2,9%	2	9,1%	2	14,3%
8	7	20,6%	4	18,2%	1	7,1%
9	3	8,8%	3	13,6%	2	14,3%
10	5	14,7%	1	4,5%	2	14,3%
Tot. of strikes	43	12,6%	25	11,4%	14	10,0%
Tot. of subjects	102		44		42	
Tot. of pairs	34		22		14	

In the final period the relation between wage and effort in the final period is positive: effort increases with the wage. The relation is steeper in the virtual strike treatment than

in the other two treatments. In the virtual strike treatment the pairs wage/effort exhibited greater dispersion and wider range.

Fig. 8 Strikes by period (%)
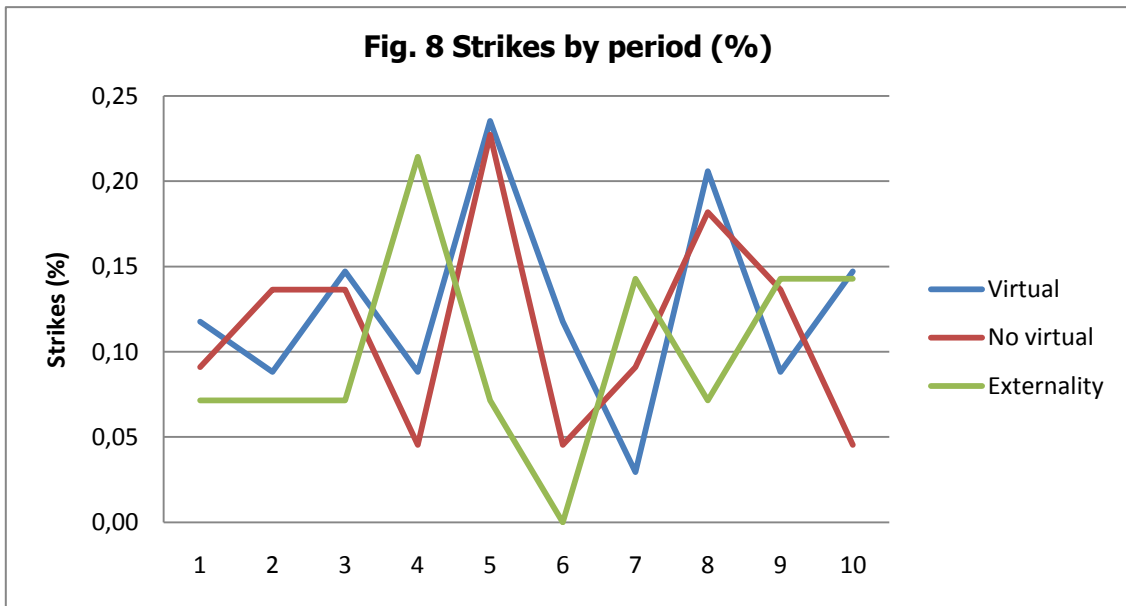
The relative number of strikes was higher in the virtual strike treatment (12.6%) than in the other two treatments (standard 11.4% - standard with externality 10.0%). The relative number of strikes in the virtual strike and in the standard strike treatment was highly correlated (corr. coeff. +0.618).The highest number of strikes was recorded in the 5th period in the virtual strike treatment (8), in the 5th period for the standard strike treatment (5) and in the 4th period for the externality treatment (3).

Average payoffs were higher in the externality treatment than in the virtual strike treatment. Average payoffs were higher in the virtual strike treatment than in the no externality treatment.

Tab. 5 Average payoffs by period								
	Virtual strike			Standard strike		Standard strike with externality		
Period	Employer	Worker	Third Party	Employer	Worker	Employer	Worker	Third Party
1	19,1	26,1	3,2	18,4	23,2	27,6	28,9	-1,1
2	25,7	26,3	2,0	22,2	22,1	28,7	31,2	-1,1
3	24,8	27,8	2,9	20,1	18,6	30,6	29,5	-1,1
4	26,2	25,4	4,5	25,6	24,8	24,2	24,0	-3,2
5	19,8	23,8	8,7	19,2	21,4	28,1	31,3	-1,1
6	25,7	23,2	3,6	23,3	26,5	32,3	32,3	0,0
7	31,4	30,5	1,5	26,7	25,4	25,8	26,8	-2,1
8	23,0	26,9	10,0	20,2	24,3	27,1	30,2	-1,1
9	30,3	31,2	2,1	22,3	26,1	27,3	25,4	-2,1
10	27,9	25,7	3,7	24,4	19,5	25,1	27,8	-2,1
Average	25,4	26,7	4,2	22,3	23,2	27,7	28,7	-1,5

Fig. 12 Employers' payoffs by periods
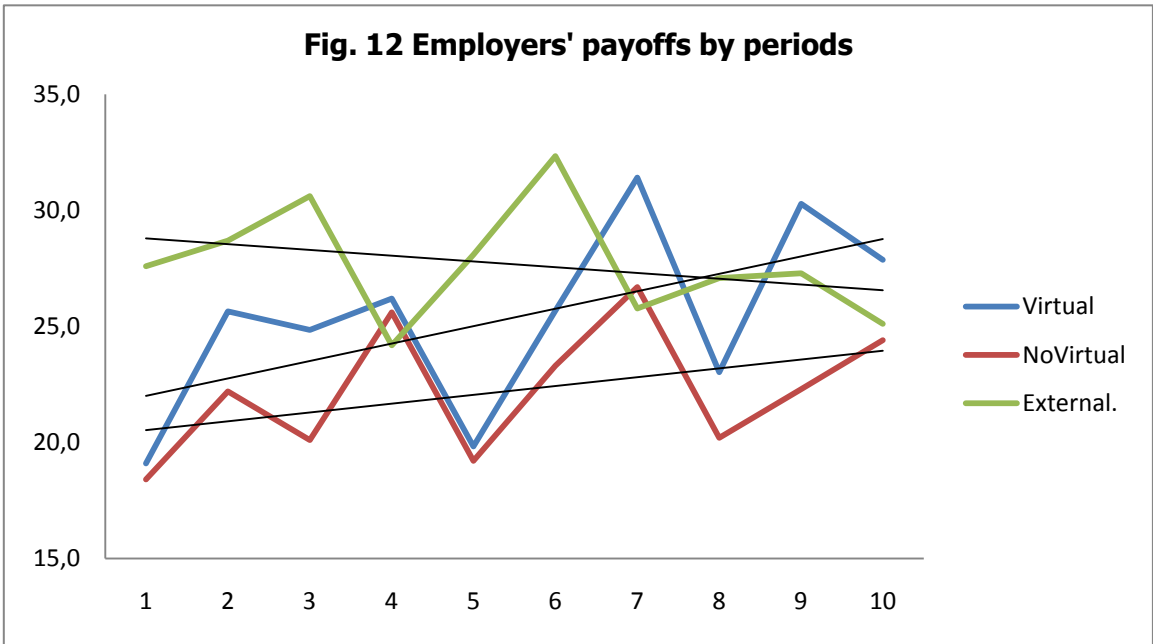
The linear regression over time of employers' payoffs was positive in the virtual strike and in the standard strike treatments and is negative in the externality treatment.

Tab. 6 Average Total Payoffs			
	Virtual strike	No virtual strike	Virtual strike with externality
Employers	366,8	297,3	538,3
Workers	289,4	237,3	487,4
Third party	35,9		135,0

Average total payoffs were higher in the externality treatment than in the virtual strike treatment. Average total payoffs were higher in the virtual strike treatment than in the standard strike treatment.

4. Preliminary Conclusions

As in the previous experiment adopting the same experimental framework (Charness 2004, Charness et al, 2007, Fehr et al. 2007) results of all treatments indicate a positive relationship between effort and wage. Wages, effort and payoffs are higher in the virtual strike case than in the standard strike treatment without externality.

The introduction of externalities in the case of standard strike decreases the number of strike, increases wage and effort and is associated to higher average and total payoffs. The increase over time of payoffs is more pronounced in the virtual strike case than in the other two treatments. This outcome can be attributed to the reputation effect. It is unclear whether this behavior reflects reciprocity or other forms of social preferences. This might explain why standard strikes rather than virtual ones are generally adopted by workers.

As a consequence, as outlined by Nicita and Rizzolli (2009), from a policy perspective a regulation forcing parties towards virtual strike when relevant externalities are at stake would thus seem necessary. Such a regulation should somehow introduce side payments for the virtual strike and/or high penalties for the standard strike, in order to properly align workers' incentives.

However, high penalties would be unenforceable in democratic systems where the right to strike is guaranteed by the constitution.

Moreover, as outlined by our treatment on standard strike with externality, there are cases in which virtual strike generates a lower level of aggregate welfare than that obtainable through stoppage strike.

Finally, one important result of our treatment in virtual strike is showing the existence of some 'fairness' concern on bargainers' side towards third party. Thus, even when there are no negative externalities on workers' and employer's side, there is a fairness effect which induces higher level of cooperation.

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ISSN 1825-8131 (online version) 1825-8123 (print version)

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