

BARGAINING ABOUT WAGES:
EVIDENCE FROM SPAIN

DEPARTAMENT D'ECONOMIA
FACULTAT DE CIÈNCIES ECONÒMIQUES I EMPRESARIALS
UNIVERSITAT POMPEU FABRA

TESIS DOCTORAL
AUTOR: SERGI JIMÉNEZ MARTÍN
DIRECTOR: DR. JAUME GARCÍA VILLAR
SETEMBRE DE 1994

(6 de 8)

c_ABS_i : 1 if agreed any union presence clause.

$\theta_A = (\text{ex_post wage} - \text{ex_ante wage}) / (\text{Inflation rate} - \text{PU}^{120})$

$\theta_B = (\text{ex_post wage} - \text{ex_ante wage}) / \text{Inflation rate}$

$DELV_i$: 1 if current contract was signed after the date of effectiveness.

$RENEGOTIATION_i$: 1 if agreement is a renegotiation of a multiyear contract.

$NOCOLA \Rightarrow COLA_i$: 1 if in the last year there was no COLA and currently there is.

$COLA \Rightarrow NOCOLA_i$: 1 if in the last year there was COLA and currently there is not.

TR_i : 1 if the cola clause is triggered.

Industry and regional variables:

u_r : Regional unemployment rate in the quarter preceding the signing of the contract (17 regions). (source: EPA)

u_j : Industry unemployment rate (annual). (source: EPA)

S_j : Number of days lost by strike per employee in the industry. (source: EH)

$\Delta \bar{w}_j^m$: Monthly mean wage increase at the j industry. (source: ECC)

IO_j : Industry Output Index (1972=100, for 22 industries). (source: BE)

IE_j : Employment level in the j industry. (source: EPA)

IP_j : Industry Price Index (1976=100, 22 industries). (source: BE)

$IProd_j$: IO_j/IE_j

¹²⁰PU is not reported on the basic data set. But given the characteristics of most of the Spanish COLA contracts it is possible to obtain it by looking at the wage increase data, inflation rate and target.

Inflation variables:

Target: Inflation rate target at the beginning of the year. (source: BE).

P: Inflation rate (December to December) of the year. (source: BE).

σ_P : Inflation rate standard deviation. It was proxied by using 5 years monthly data standard deviation. (source: BE)

P^e: Weak inflation rate expectation in the month preceding the signing of the contract. Forecast was made by means an ARIMA model with ten years monthly data. Thus, our forecast is based on data available to agents at the time of signing the contract.

UNEXPECTED_INF: $P - P^e$

PCU: Price catch-up.

Data sources:

-Banco de España: *Boletín Estadístico* (BE).

-Ministerio de Trabajo:

Estadística de Convenios Colectivos (ECC). Recording Tape. 1981-1990.

Estadística de Huelgas y Cierres Patronales (EH). Recording Tape. 1986-1990.

-Instituto Nacional de Estadística: *Encuesta de Población Activa* (EPA). Several issues.

Table 4.B.1. Resulting sample after matching the ECC.

	GS sample # BU	mean emp.	CS sample # BU	mean emp.	Exit prob. (corrected)
Unmatched	2779	313.8	--	--	--
2 obs.	1128	339.1	745	284.4	29.1
3 obs.	707	460.1	504	324.8	28.7
4 obs.	314	390.3	249	381.6	20.7
5 obs.	291	417.7	238	344.5	25.2
6 obs.	155	499.9	134	448.9	19.6
7 obs.	115	531.8	105	492.3	19.3
8 obs.	79	202.3	77	203.6	17.5
9 obs.	98	696.3	98	695.4	25.7
10 obs.	55	713.7	55	713.7	17.8
11 obs.	111	588.3	101	588.2	--

Table 4.B.2. Some descriptive statistics.

OBS:	all the sample		cola sample		non-cola sample	
	4941		2182		2119	
	mean	stdev	mean	stdev	mean	stdev
<u>BARGAINING UNIT VARIABLES</u>						
Δw	6.9385	1.7191	6.8585	1.5473	7.1360	1.8442
COLA	0.4980	0.5000	0.0000	0.0000	0.0000	0.0000
θ_A	0.2355	0.4053	0.4622	0.4638	0.0000	0.0000
$\hat{\theta}_A$	0.2596	0.3144	0.5165	0.2412	0.0000	0.0000
θ_B	0.0598	0.1317	0.1145	0.1600	0.0000	0.0000
$\hat{\theta}_B$	0.0549	0.0945	0.1071	0.1042	0.0000	0.0000
q	0.0000	0.0000	0.4471	0.3097	0.0000	0.0000
TR	0.2793	0.4487	0.5527	0.4973	0.0000	0.0000
λ_c	0.0000	0.6939	0.5428	0.4133	-0.5597	0.4192
emp(logs)	5.0792	1.3313	5.3969	1.3450	4.7891	1.2348
(DEL/100)*DELY	0.9018	0.8718	0.8685	0.8139	0.9765	0.9265
(DEL/100) ² *DELY	1.5732	2.8947	1.4165	2.2703	1.8117	3.4673
DELY	0.7464	0.4351	0.7218	0.4482	0.7942	0.4043
NOCOLA \Rightarrow COLA	0.0000	0.0000	0.2442	0.4297	0.0000	0.0000
COLA \Rightarrow NOCOLA	0.0000	0.0000	0.0000	0.0000	0.1887	0.3914
C_PROD	0.3734	0.4837	0.4028	0.4905	0.3407	0.4740
C_ABS	0.2679	0.4429	0.3056	0.4608	0.2373	0.4255
XH1	0.5048	1.8170	0.6909	2.2317	0.3513	1.2987
RH(-1)	7.4908	0.0318	7.4890	0.0315	7.4919	0.0315
CCOO	0.3300	0.3350	0.3505	0.3160	0.3163	0.3526
INDEP	0.1095	0.2445	0.0874	0.1983	0.1321	0.2807
OTHERS	0.2224	0.3492	0.1975	0.3254	0.2431	0.3676
RENEGOTIATION	0.2608	0.4391	0.2882	0.4530	0.2085	0.4064
MULTIYEAR	0.0350	0.1838	0.0453	0.2081	0.0292	0.1685
Extractives	0.0305	0.1721	0.0265	0.1608	0.0339	0.1812
Mineral Oil Refining	0.0085	0.0918	0.0100	0.0999	0.0051	0.0718
Utilities	0.0686	0.2528	0.0976	0.2968	0.0391	0.1940
Metallic Ores	0.0348	0.1833	0.0348	0.1833	0.0344	0.1824
Iron and Steel	0.0170	0.1292	0.0164	0.1274	0.0165	0.1274
Non-Metallic Minerals	0.0813	0.2734	0.0756	0.2644	0.0887	0.2844
Chemical industry	0.0933	0.2908	0.1063	0.3083	0.0877	0.2830
Manuf. of Metals	0.1396	0.3466	0.1356	0.3425	0.1477	0.3549
Machinery and Mech.	0.0378	0.1908	0.0430	0.2030	0.0311	0.1737
Electrical Eng'ring	0.0487	0.2154	0.0513	0.2207	0.0467	0.2110
Electronic Eng'ring	0.0208	0.1428	0.0256	0.1581	0.0151	0.1219
Motor Vehicles	0.0580	0.2339	0.0705	0.2561	0.0467	0.2110
Other Transport Eq.	0.0315	0.1748	0.0375	0.1902	0.0268	0.1618
Instrument Eng'ring	0.0046	0.0680	0.0032	0.0565	0.0066	0.0810

Table 4.B.2. (CONT)

OBS:	all the sample		cola sample		non-cola sample	
	4941		2182		2119	
	mean	stdev	mean	stdev	mean	stdev
Food, Drink and Tob.	0.1428	0.3499	0.1040	0.3053	0.1680	0.3739
Textile	0.0072	0.0850	0.0041	0.0641	0.0103	0.1013
Leather	0.0080	0.0896	0.0041	0.0641	0.0117	0.1080
Footwear and Cloth.	0.0064	0.0802	0.0041	0.0641	0.0094	0.0967
Timber Cork, Wooden	0.0261	0.1594	0.0187	0.1358	0.0349	0.1836
Paper, Printing & Pu	0.0649	0.2464	0.0632	0.2434	0.0703	0.2557
Rubber and Plastic	0.0538	0.2257	0.0563	0.2306	0.0500	0.2180
Other Manufacturing	0.0147	0.1206	0.0105	0.1021	0.0184	0.1344

INDUSTRY AND REGIONAL VARIABLES

Δw_j^{m-1}	7.1527	0.9012	7.1659	0.9007	7.1511	0.9026
P_j	6.1073	0.1980	6.1245	0.2088	6.0996	0.1878
P_{j-1}	6.0741	0.1920	6.0916	0.1996	6.0674	0.1840
$I\text{PROD}_j$	0.0733	0.7518	0.1398	0.7316	0.0056	0.7566
$I\text{PROD}_{j-1}$	0.0596	0.7517	0.1281	0.7311	-0.008	0.7560
u_j	-2.072	0.5650	-2.161	0.5674	-2.010	0.5506
u_r	-1.488	0.6272	-1.456	0.6993	-1.472	0.6224
S_j	0.5379	1.2447	0.5230	1.1916	0.5724	1.3366

PRICE VARIABLES

P_e	5.3147	1.9970	5.2389	1.9141	5.2890	1.9626
UNEXPECTED INF(-1)	2.1641	2.9670	2.0127	2.7123	1.7652	2.8753
σ_p	2.1825	0.4205	2.1320	0.4269	2.1824	0.4338

References

- Akerlof, G.A. and Yellen, J.L. (1986), *Efficiency Wage Models of the Labor Market*, Cambridge: Cambridge University Press.
- Alogoskoufis, G. and Manning, A. (1991), "Test of Alternative Wage Employment Bargaining Models with an Application to the U.K. Aggregate Labour Market", *European Economic Review*, 35, 23-37.
- Azariadis, C. (1975), "Implicit Contracts and Underemployment Equilibria", *Journal of Political Economy*, 83, 37-50.
- _____ (1978), "Escalator Contracts and the Allocation of Cyclical Risks", *Journal of Economic Theory*, 18, 119-155.
- Baily, M.N. (1974), "Wages and Employment under Uncertain Demand", *Review of Economic Studies*, 41, 37-50.
- Blanchard, O.J. (1979), "Wage Indexing Rules and the Behavior of the Economy", *Journal of Political Economy*, 87(4), 798-815.
- Burton, J. and Addison, J.T. (1977), "The Institutional Analysis of Wage Inflation: A Critical Appraisal", *Research in Labor Economics*, 1, 333-76.
- Card, D. (1986), "An Empirical Model of Wage Indexation Provisions in Union Contracts", *Journal of Political Economy*, 94(3), s144-s175.
- Christofides, L.N. (1987), "Wage Adjustment in Contracts Containing Cost of Living Allowance Clauses", *Review of Economic Studies*, 69(3), 531-536.
- _____, Swidinsky, R. and Wilton, D. (1980), "Microeconomic Analysis of the Canadian Wage Determination Process", *Economica*, 47, 165-178.
- Dazinger, L. (1980), "Risk Sharing in Labor Contracts", *European Economic Review*, 14, 323-340.

- _____ (1983), "On the Frequency of Wage Indexation", *European Economic Review*, 22, 297-304.
- Doiron, D.J. (1992), "Bargaining Power and Wage-Employment Contracts in a Unionized Industry", *International Economic Review*, 33(3), 583-606.
- Ehrenberg, R.G., Dazinger, L. and San, G. (1983), "Cost of Living Adjustment Clauses in Union Contracts: A Summary of Results", *Journal of Labor Economics*, 1(3), 215-243.
- García, J. (1991), "Métodos de Estimación de Modelos de Oferta de Trabajo Basados en la Predicción de los Salarios", *Investigaciones Económicas* (2a ep.), 15(2), 429-455.
- Gottfries, N. (1992), "Insiders, Outsiders, and Nominal Wage Contracts", *Journal of Political Economy*, 100(2), 252-270.
- Heckman, J. (1976), "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables as a Simple Estimator for such Models", *Annals of Economic and Social Measurement*, 5, 475-92.
- Hendricks, W.E. and Kahn, L.M. (1985), "Wage Indexation and Compensating Wage Differentials", *Review of Economics and Statistics*, 68, 484-492.
- Jimeno, J.F. (1992), "Las Implicaciones Económicas de la Negociación Colectiva: El Caso Español", *Moneda y Crédito*, 195, 223-281.
- Kaufman, R.T. and Woglom, G. (1984), "The Effect of Expectations on Union Wages", *American Economic Journal*, 74, 418-432.
- Layard, R., Nickell, S. and Jackman, R. (1991), *Unemployment: Macroeconomic Performance and the Labor Market*, London: Oxford University Press.

- McConnell, S. (1989), "Strikes, Wages and Private Information", *The American Economic Review*, 79(4), 801-815.
- Nelson, F.D. and Olson, L. (1978), "Specification and Estimation of a Simultaneous Equations Model with Limited Dependent Variables", *International Economic Review*, 19, 675-710.
- Prescott, D. and Wilton, D. (1992), "The Determinants of Wage Changes in Indexed and Nonindexed Contracts: A Switching Model", *Journal of Labor Economics*, 10(3), 331-355.
- Shavell, S. (1976), "Sharing Risks of Deferred Payments", *Journal of Political Economy*, 84, 161-168.
- Stengos, T. and Swidinsky, R. (1990), "The Wage Effects of a Strike: A Selectivity Bias Approach", *Applied Economics*, 22, 375-385.
- Ulph, A.M. and Ulph, D.T. (1990), "Labour Markets and Innovation: Ex-post Bargaining", Department of Economics, Discussion Papers in Economics and Econometrics, no 9010, University of Southampton.

CHAPTER 5

THE DETERMINATION OF THE INITIAL CLAIM AND OFFER AND THE INCIDENCE, THE DURATION AND THE WAGE EFFECT OF A STRIKE: EVIDENCE FROM THE SPANISH NGCE SURVEY

I. Introduction.

Following the work in the previous chapter we analyze wage setting in regard to the conflicting activity of the bargaining process. The vast majority of studies in this field assume that the wage setting could be consistently analyzed ignoring the fact that wage and related decisions or actions are jointly determined¹²¹. More precisely, we concentrate in analyzing the relationship between wage increase determination and strike outcomes in order to shed some light on the empirical relevance of some bargaining models. Our purpose is twofold. On the one hand, we would like to add new empirical evidence on this field by analyzing a dataset on bargaining issues available for Spain. On the other, we would like to consider carefully the econometric specification and methods which requires the treatment of this kind of data.

From the theoretical point of view, there are two major theories explaining why work stoppages occur¹²². One argues that strikes are accidents or mistakes which occur during bargaining. The other suggests that the

¹²¹ See Card (1990a) for a review.

¹²² See Card (1990a) and Kennan and Wilson (1993) for two recent reviews.

conflict is used as a revealing mechanism in the presence of asymmetric information about the level of profitability of the firm. Whilst the first does not imply any systematic relationship between strike duration and wage settlement, the second implies a negative relationship between wage outcome and strike duration, usually known as "concession schedule". Consequently, our major goal will be to obtain an answer to the following question: **Do strike incidence and/or length affect wage outcomes?**. Apart from this, we will be interested in analyzing the relevance of the one-sided asymmetric information (OSAI) theories of strike decision, duration and initial bargaining positions determination. To our knowledge, this is the first time that this last issue has been addressed using empirical data.

The empirical literature on the field is devoted to test the implications of OSAI theories. By now, evidence is very contradictory and results are not in general robust. Practically, all the empirical papers are concerned with one of two countries, Canada and United States¹²³. This has two important consequences, at least. First, what is observed strongly depends on the bargaining framework of these countries, so it can hardly be generalized, although some authors often tend to do so. Second, as far as many studies are using rather the same data set and econometric setup, they tend to confirm previous findings mostly because of data contamination. We think that the Spanish dataset could help to solve some of the problems pointed out above because of the different bargaining structure¹²⁴ with regard to the above countries. It could also contribute to improve the knowledge

¹²³See Card (1990b) for a recent review of the empirical work for these two countries.

¹²⁴See chapter 2 and Jimeno (1992) for a detailed description of the Spanish' negotiation framework and results.

about how offers are generated because it includes the union initial claim and the firm initial counteroffer for a large share of the sample.

From the econometric point of view, two problems have concentrated research attention with respect to wage determination in latest years. First, the control of self selection and the endogeneity of strike outcomes (Stengos and Swidinsky (1990)). Thus, two different wage equations, one for each of both strikes regimes, are suggested. Second, the estimation with panel data to take care of the time persistent unobserved heterogeneity of the bargaining units (BU) in a single equation context (McConnell (1989) and Card (1990b)). Note that the endogeneity issue has not been considered in any of both studies mentioned.

However, a third problem, which in our opinion has received little attention in the empirical literature, is that concerning the dynamics of the wage determination process in the presence of strikes (either realized or threats). In our opinion, bargaining is a dynamic process. It probably depends on what happened in the past and what is expected about the future, although most of the theoretical literature on bargaining does not consider this dependence because of its inherent complexity¹²⁵. Moreover, we think that also the strike decision process involves some form of dynamics, mainly in an asymmetric information context. In this case, the union tries to screen in order to extract higher wages from more profitable employers and employers could forewarn and make some preparation to take into account the risks of a strike conditional on past strikes information.

Our empirical application will carefully consider all the issues

¹²⁵See Osborne and Rubinstein (1990) and Binmore et al. (1992).

mentioned above about the wage increase equation in a panel data context paying special attention to the following questions: First, should be the strike variables endogenous or exogenous to the wage setting process? Second, which variables represent better the influence of a strike, observed (strike indicator) or underline (threat)? Third, should we consider one or two different wage equations (one for each strike regime)? Finally, is significant the self selection problem?.

The joint determination of strike and wage outcomes has been stressed since earlier theoretical studies. Hayes (1984) suggested that strike should be consider an endogenous outcome of the rational behaviour of employers and unions. Card (1990b) also stated: "*bargaining involves the determination of a wage rate and a strike length*". Moreover, in the last case, not only incidence but duration is endogenous to the bargaining process. Agents negotiate about the wage increase but with a strike threat which the union could carry out or not. An immediate implication of a joint determination model for wage and strike outcomes is such that no longer the wage-duration concession schedule can be easily obtained by looking separately at the wage equation. At least we need to control for endogeneity by means of an instrumental variables method. The relevance of such problem can be answered, in a panel data context, by means of a Sargan difference test (Arellano (1993)) comparing the sets of estimates with and without instrumenting the strike variables.

To answer the second question, we will estimate the model by replacing the strike indicator by its predicted value. In order to clarify the third question and detect differences among the behaviour of firms belonging to each one of the sectors, we conduct a Wald test. Obviously, it does not

offer much information if the null is not true. In this case, before estimating the model with any of the two subsamples we need to perform a test of selection bias, which also responds to the fourth question. In a panel data context these type of tests have been recently proposed by Verbeek and Nijman (1992) and Wooldridge (1994). Following this last paper, we extend the test procedure to a dynamic context.

We are going to deal with the bargaining issues already mentioned and, at the same time, we would like to avoid the simultaneity problems¹²⁶. Then, we need to use an Instrumental Variable (IV) method and we estimate the model by applying a Generalized Method of Moments Instrumental Variables (GMMIV) due to Arellano and Bond (1991). This method allows us to test several specification issues.

The empirical application is carried out using "La Negociación Colectiva en las Grandes Empresas en España" (NCGE), a yearly inquiry on bargaining and other topics conducted by the Spanish Ministry of Economy. As a major difference to other surveys, it provides data on initial bargaining positions, negotiation timing, strike activity, wage increase settlements and a broad set of bargaining unit and/or firm variables. Despite we have information about wage levels, we decide to concentrate the study in analyzing wage increase agreements because it is the major subject of bargaining in Spain. Although we believe that it does not fully explain wage setting at firm level, it constitutes an extremely important factor. The main reason for such relevance is that aggregate setting (nationwide or

¹²⁶Let us think, for instance, the case union tries to screen in order to extract higher wages from more profitable employers, a strike could affect firm's profits and then profits are endogenous to the wage equation.

industry agreements) determines a wage increase which is applicable at firm level in absence of a firm level agreement. Thus, firm level wage increase setting may be viewed as the combination of two forces, aggregate setting and firm profitability. The following analysis will permit us to say which one has a greater influence over agreements.

The rest of the chapter is structured as follows. In section II, we make a revision of the theoretical foundations. The empirical literature testing the relevance of the theoretical models is analyzed in section III. In section IV we deal with the suitable empirical framework to our data. Section V is related to the econometric treatment and testing. The most important empirical findings and a sequence of the tests conducted are reported and commented in section VI. Section VII concludes the chapter. The tables, a data and variables appendix and the references finalize the chapter.

II. The theoretical foundations.

In the literature about strikes there have been some attempts to avoid the well-know *Hicks Paradox*¹²⁷ about the optimality of strikes, which implies that strikes result from faulty negotiations. Early studies in this field focused on finding alternative explanations to the rationality of strikes, by means of asymmetries between union's leaders and rank and file expectations. Ross (1948) postulated a union political model by recognizing that the union leaders are motivated by personal advancement and the growth of the union. As Ashenfelter and Johnson (1969, p. 39) noted: "*The basic function of the strike is as an equilibrating mechanism to square up the union membership's wage expectations with what the firm is willing to pay*". Thus, the lack of information union's membership have about what firm is willing to pay is the major justification for a strike. Although they did not provide a rational explanation for such lack of information, this idea lays on the groundwork for later one-sided asymmetric information models. Reder and Neumann (1980) and Kennan (1980) focused on the role of bargaining costs to explain strike incidence and duration. They stated that the likelihood of a strike and its expected duration will be lower the higher the *joint costs* of a strike to the firm and its employees.

Recently, along with a set of important developments in non-cooperative bargaining, a private-information theory of disputes in bargaining has been

¹²⁷The Hicks paradox is implicit in Hicks's (1932) discussion of strikes: "If there is any theory which predicts when a strike will occur and what the outcome will be, the parties can agree to this outcome in advance, and so avoid the cost of a strike. If they do this, the theory ceases to hold." (quoted from Kennan (1986)).

developed. In this context, the rationality of strikes should be coming from asymmetries in the information set that each of the bargainers faces while negotiating¹²⁸. The basic point is that although strikes (or delays) are not Pareto optimal ex-post, they may be Pareto optimal ex-ante. As early examples, we could mention Morton (1983), Fudenberg, Levine and Ruud (1983) and, particularly, Hayes (1984). The contribution of these kind of models is twofold. On theoretical grounds, they provide a rational explanation for the existence of strikes and, on the empirical view, they preserve all the implications the above models have. Recent theoretical developments¹²⁹ consider other union actions apart from strikes, as delay in negotiation, and consider more in detail the role of bargaining procedures¹³⁰. Depending on the exact set of assumptions about what the procedure is, one out of three types of equilibria arises: *Screening*, *Signaling* and *Attrition*¹³¹. Notice that all these models rationalize the union *resistance curve*, which relates negatively wages to strike duration, as described in Hicks (1932).

Screening equilibria arise when one of both agents makes offers at a given interval, so that rejection of an offer entails a significant cost of delay until any other offer can be made. A typical example is a model where the union makes all the offers. Under this assumption union strikes and demands a very high initial wage which subsequently lowers. However, this

¹²⁸However, some recent work by Haller and Holden (1990) and Fernández and Glazer (1991) shows that lengthy strikes can also exist in symmetric information games.

¹²⁹See the excellent review by Kennan and Wilson (1993).

¹³⁰A procedure specifies in each contingency what a party knows and what it can do.

¹³¹See Kennan and Wilson (1993) for a compressive description of all three types of equilibria. The following considerations are strongly based on their comments.

model suffers a severe restriction known as the Coase (1972) property which can be stated as follows: *The chance that the firm accepts an offer within any fixed interval of time escalates to one as the length of the interval between the union's offers shrinks; moreover, the offer accepted shrinks to zero* (Kennan and Wilson (1993), p. 61). An immediate implication of such a property is that strike duration shrinks towards zero as the time interval between offers tends to zero. On the other hand, signalling equilibria arise when either party can delay long enough before counter-offering, the length of the delay acting as a signal. Cramton and Tracy (1992) constitutes a good and recent example of this kind of models. Finally, attrition equilibria occur when each of both agents incurs a privately known cost of delaying an agreement.

Although there are additional theories trying to explain the rationality of strikes (mainly since the point of view of industrial relations or explained by sociological factors), we carry out the analysis and comment on the empirical results with the implications and on the light of the previous ones.

III. The empirical evidence on strike decision, duration and wages.

The empirical implementation of the framework presented is severely limited by the inadequacy of the available data. Usually any dataset records accurately the whole negotiation process. Consequently, the bargaining process must be confined to a black box, although some authors try to circumvent this problem by means of experimental evidence¹³². This restriction perfectly explains the relative scarcity of empirical papers on bargaining strikes and related fields. As mentioned, there is only a significant amount of work about these issues for Canada and US¹³³ which we are going to analyze.

In early studies from Canada, the analysis of the wage effect of a strike was treated in a single equation context using a dummy to control the strike effect (Ridell (1980)) or a two equation framework (Auld et al. (1981)), paying little attention to theoretical issues and without considering standard econometric problems such as the potential selectivity bias. Recently, Card (1990b) used a set of dummies to capture strike's effect on wages and found virtually no relationship between strike duration and wages. Stengos and Swindinsky (1990) tried to correct the selectivity problem pointed above using the Lee (1978) union mark-up model as a reference basis. Finally, Fisher (1990) attempted to apply the theoretical work by Hayes (1984).

On the other hand, in US the research started more recently. Although

¹³²See Kennan and Wilson (1993) for a review on this field.

¹³³A recent exception is the study by van Ours and van de Wijnngaert (1993) using data from the Netherlands. For a review of the work for Canada and US see Card (1990a). For a summary of strike research in Europe, see Franzosi (1989).

there are some previous attempts such as Farber (1978), Gramm (1985) was the first to use a large dataset on contracts. More recently, Tracy (1986) and Vroman (1989) tried to test the implications of standard asymmetric information theories on contract strikes duration using the same data set. McConnell (1989) found evidence of a negative relationship between strike duration and the unpredictable component of the wage, using US contract data for the period 1970-1981. Kennan and Wilson (1989) attempted to test the readability of attrition, screening and signalling using US and Canadian contract data. They criticized the existent evidence about the negative relationship between strike duration and wages pointed out by McConnell (1989). Finally, the recent work by Cramton and Tracy (1992) constitutes an attempt to calibrate the adequacy of a signalling model with multiple threats. Before proceeding to present our data and econometric methodology, we are going to consider in more detail the topics covered in most of the recent papers for these two countries.

The general aim of most of the work is to test the theoretical restrictions embedded in one-sided asymmetric information (OSAI) or joint costs (JCT) models on strike incidence, strike duration and wage outcomes. Although some of the works address all three issues, none of them fully considers the joint determination problem. In Table 5.1 we have produced a summary of the data source, the theoretical background, the issues covered and the estimation method for each of the most important works. Notice that the theoretical framework used as a reference basis by most of the different authors is the OSAI. On the other hand, after the seminal works by Kennan (1980, 1985), some papers deal with work stoppages duration using as a reference framework the JCT. Just one, Gramm et al. (1989), follows a

divergent expectations (DE) model.

The first set of analyses have been devoted to explain work stoppage decisions. It is usual, from the econometric point of view, to specify and estimate a reduced form equation after assuming a particular functional form for the error term which leads to either the well-known Probit (for instance Vroman (1989)), Logit (Tracy (1986), Abowd and Tracy (1989), or Card (1990b)) or Linear Probability models (Vroman (1989)). In the estimation process, only Card deals with the panel nature of the data, using a conditional logit model.

We think that it is important to point out a couple of general shortcomings. First, the lack of homogeneity from work to work in the set of variables considered in the specification¹³⁴, despite many of them are dealing with, basically, the same data set¹³⁵, which makes comparisons rather difficult. Second, the relative scarcity of either bargaining unit (being again Vroman (1989) an exception) or firm specific variables (except in Tracy (1986)). This last point means that if strong heterogeneity (either observed or unobserved) is expected to arise the results obtained could be very misleading.

In Table 5.2 we report a summary of the variables considered in the above set of studies. We also report the expected sign and the findings. We group the most relevant variables in five broad categories: bargaining unit, firm, industry, aggregate and other controls. The general theoretical predictions of the models are as follows. Variables that increase the

¹³⁴In fact, there is no single variable simultaneously present in all the works.

¹³⁵Herrington (1988), Vroman (1989) and Abowd and Tracy (1989) used the same dataset for the US and Fisher (1990) and Card (1990b) for Canada.

expected size of profits should decrease strike activity. In an alternative way, variables which increase with the degree of uncertainty about future profits should increase it. Finally, variables that increase the alternative wage opportunities for union member should increase the probability of observing disputes.

In general, the findings about the effect of the key variables are contradictory across papers, although there are some exceptions such as the effect of the unemployment, for instance. Among the variables for which the findings are contradictory we highlight the catch-up (positive in Vroman (1989) and negative in Stengos and Swidinsky (1990)) and the expected inflation (negative in Herrington (1988) and positive in Vroman (1989)). The comparison of the results about industry variables between Tracy (1986) and Abowd and Tracy (1989) is also illustrative. These studies have been carried out with the same database and share specification of industry variables but Tracy (1986) also considers firm variables. It can be shown that the non-consideration of firm variables changes almost all the results for industry variables. In our opinion, it is a first confirmation of the mentioned assessment about the omission of relevant variables.

Concerning other variables, there is systematic evidence that a rise in unemployment level lowers the likelihood of a strike (Vroman (1989), McConnell (1989) and Card (1990b)). There is also some systematic behaviour in the negative effect of past contract wage in strike probabilities which is in line with recent theoretical work by Cramton and Tracy (1991, 1992).

The second set of studies deals with work stoppages duration. From the seminal work by Kennan (1985) to the more recent paper by Card (1990b) there

have been many attempts to model strike duration¹³⁶. In general, we could distinguish three specification approaches: the hazard approach, the regression approach either unconditional¹³⁷ or conditional, and the censored model. In this sort of study it is also possible to account for unobserved heterogeneity but only Kennan does it. Another point to note is that the presence of sample selection problems is not mentioned. In fact, we observe a lack of comments concerning the way duration data are generated. It is not the same to assume that all negotiations involve an indefinite threat or a fixed length (strictly positive or not necessarily positive), for instance. At least the last two cases may induce some sort of selectivity.

Turning back to the findings, the first impression we extract is that duration models are poorly determined. The key firm variables and also the industry variables are found to have insignificant effects. The main reason for such a pattern is the unobservability of almost all the key determinants of work stoppages duration. Then, the studies are concentrated in analyzing the relationship between the strike duration and the cycle conditions. Even in this field they found contradictory evidence. Whereas Kennan (1985) found a negative relationship between strike duration and the industrial production index, Card (1990b) and Stengos and Swidinsky (1990) found a negligible effect of the industry growth rate on work stoppages duration.

The third important issue we would like to summarize makes reference to the estimation of wage equations in order to be able to account for strike incidence and duration effects (see Table 5.3 for a summary). In other

¹³⁶See, for instance, Tracy (1986), Herrington (1988), Vroman (1989), Harrison and Steward (1990), Gramm et al. (1989), Gunderson and Melino (1990) or Fisher (1990).

¹³⁷Zeros in duration are considered in estimation.

words, the purpose is to test the different strike theories mentioned above. In fact, this constitutes the final aim of our chapter and the main objective of most of the empirical applications¹³⁸. Most of the papers may be considered as reduced form specifications based on an augmented Phillips curve. Although the vast majority only specify a single wage equation, Fisher (1990) and Stengos and Swidinsky (1990) considered a multi-equation framework arising either from multiple equilibria in an adverse selection model or from a selection mechanism. Estimation methods have become more complicated as agents' decision or actions are incorporated to the theoretical model. Whilst in the earliest work Herrington (1988) uses Least Squares, more recently Stengos and Swidinsky (1990) have used the Heckman's two step selectivity estimator and Card (1990b) have used a consistent IV estimator proposed by Holtz-Eakin et al. (1988) to deal with the panel structure and the consequent heterogeneity of the data.

Finally, we would like to summarize the variables which have been usually considered in the analyses. The most representative are those which account for the bargaining structure, the single firm or union and the contract length. The results seem to be in accordance with theoretical predictions. Only sales and a proxy for volatility (error in sales forecast in Herrington (1988) or sales variance in Fisher (1990)) have been considered to represent the firm structure. On the other hand, the studies include many industry or local market controls. General findings vary from one variable to one another and, many times, the evidence is contradictory.

¹³⁸Up to six studies of the previously mentioned (Vroman (1989), Abowd and Tracy (1989), McConnell (1989), Fisher (1990), Card (1990b) and Stengos and Swidinsky (1990)) consider a wage equation in order to address the effects of strikes and/or its duration.

We note that the findings about industry unemployment, detrended employment, industry wage and union density are specially disappointing. On the contrary, aggregate variables normally exhibit the expected effects.

A general shortcoming of most of the papers considered is that the wage setting process is not generally analyzed in the light of the asymmetric information theory within a context of simultaneity between wage and strike outcomes. On the one hand, some studies include a dummy or a set of dummies to capture strike incidence and duration¹³⁹. On the other hand, although there is some interest in selectivity issues (given the endogeneity of the strike decision) some authors assume a wage equation for each strike regime although in a different theoretical and empirical context. Whereas Fisher (1990) assumes that strike incidence and duration are well explained by a Tobit model independent of wage outcomes, Stengos and Swidinsky (1990) suppose that work stoppages incidence and wage regimes are simultaneously determined. Both studies reject a common wage structure across strike regimes.

Our objective of looking at the incidence of the strike decision on the wage determination must be covered paying special attention to several issues that, in our opinion, have not received an adequate treatment in recent analyses. On the one hand, strike outcomes are endogenously determined and, consequently, we feel that an IV approach is necessary in order to include these effects into the wage equation. On the other hand, the wage-driven strike variables could not be strike outcomes but threats. In such circumstances, the relevant variables are not the realization but

¹³⁹See Herrington (1988), McConnell (1989) or Card (1990b).

the expected outcomes (i.e. the forecast of strike probabilities and the expected duration). Finally, we deal with all the issues mentioned in a panel data framework where we could control for unobserved heterogeneity among bargaining units.