

Cost/Benefit Analysis of a Strike : Theory and Application

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performance of the economic system. This has the clear policy implication that the most effective method of reducing strike activity is through economic policy to reduce fluctuations in the rate of inflation rather than through legislated changes in the industrial relations system which would deal only with the symptoms and not the causes of recent strike activity.

COST-BENEFIT ANALYSIS OF A STRIKE: A TENTATIVE FRAMEWORK

S. M. A. Hameed

Over a period of 16 years (1950-65), approximately 4,500 strikes took place in Canada; less than 30 or .7 percent of these were regarded as emergency disputes.¹ Government intervention in these cases symbolizes concern for protecting public interest and maintenance of an equilibrium in the exercise of economic freedom by various groups in the society. Government's non-intervention in the remaining 99.3 percent cases is a reflection of the Canadian public policy concerning labour disputes. Free collective bargaining is the corner-stone of labour legislation and practice in this country, indicating governmental commitment, in a legal and economic sense, to upholding the right of the labour unions to strike. It is logical corollary of a pluralistic market system where decisions concerning wages are made through an independent collective bargaining relationship between management and organized labour: management defending the economic principle of free enterprise and labour defending the political principles of «freedom of association» and its extension, freedom to strike.

The strikes in our industrial relations system have a positive function and appear to be in the public interest.² The resolution of conflict through this mechanism preserves the fundamental democratic

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¹ Alan PUTTEE, «The Impact of Strikes and Emergency Disputes,» Masters Thesis, McGill University, 1969.

² See Thomas KENNEDY, «Freedom to Strike is in the Public Interest,» *Harvard Business Review*, July-August, 1970.

values of freedom and liberty.³ Accepting these basic values and their sanctity, however, does not imply that the government should not protect the public when strikes prolong and create excessive hardships. Undoubtedly, the government must intervene cautiously, and only when it is clearly warranted. The chief objective of this paper is to analyze the various quantitative and not so quantitative costs and benefits, associated with strike which may be used as a criterion in the government intervention policy.

A THEORETICAL FRAMEWORK

N. W. Chamberlain and J. M. Schilling did a pioneering study which measured the impact of strikes in three key industries, namely, coal, railroad and steel.⁴ However, they did not use a theoretical framework for explaining the behavior of cost and benefit curves, associated with a strike in progress. Neither did they indicate the range within which government intervention becomes feasible.

A recent theory of strike cost and government intervention policy suggested that the following psycho-economic variables may be observed from the beginning of a strike to determine the phase during which costs exceed benefits. Logically, the higher the costs in relation to benefits, the greater the urgency with which the government must intervene.⁵

Value of Total Production Lost (VTPL)

As a strike progresses, each man-day lost represents additional Resource Units Unemployed (RUU)⁶ and corresponding loss in production. Thus VTPL curve is an upward sloping function, increasing with additional RUU. It rises slowly up to point *i* as the loss to the economy is likely to be reduced by the extent of inventory liquidation (see Chart I). Beyond that point, VTPL accelerates till it hits a plateau as *s* when the effect of substitutes and the phenomenon of offset factor begin to operate.⁷

³ John R. COMMONS, *Legal Foundations of Capitalism*, Madison: University of Wisconsin Press, 1957.

⁴ Neil W. CHAMBERLAIN and Jane SCHILLING, *The Impact of Strikes: Their Social and Economic Costs*, New York, Harper and Brothers, 1954.

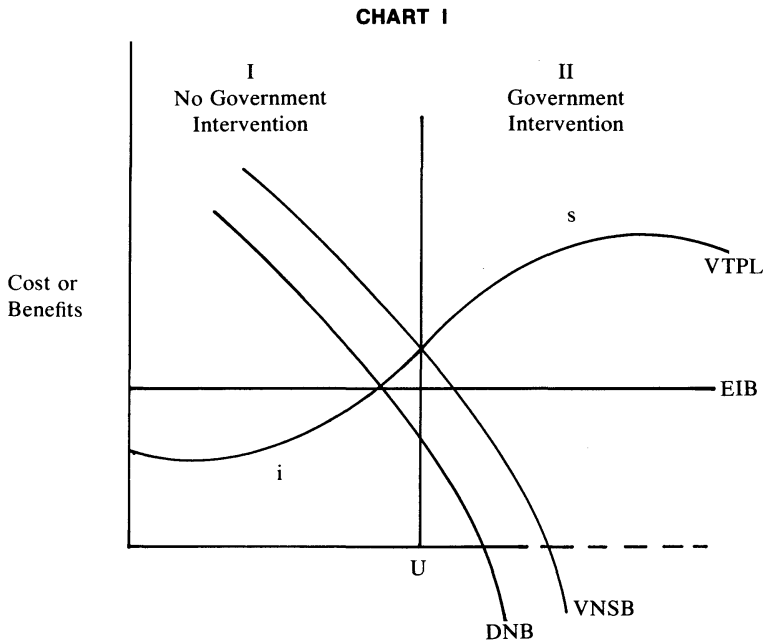
⁵ S. M. A. HAMEED, «A Theory of Strike Cost and Government Intervention Policy,» *Indian Journal of Industrial Relations*, Vol. 7, No. 2, October, 1971. Following helpful suggestions from a referee of *Industrial Relations Quarterly Review*, I have modified the shapes of DNB, VNSB and EIB curves.

⁶ In an extended sense, RUU represent not only the lost man-hours in the struck industry but also laid off workers in other affected industries.

⁷ Given sufficient time interval, there exists a possibility, especially in multi-plant companies to shift production from the struck plant to another (if it happens to operate at less than capacity) to compensate for output losses. See C. L. Christensen, «The Theory of the Offset Factor: The Impact of Labour Disputes Upon Coat Production.» *AER* XLIII (September, 1953).

Discounted Net Benefit (DNB)

To the extent that unions are a part of the society, benefits accruing to this group are benefits to the total society. Thus part of the production loss sustained by the economy is made good by DNB TO THE UNION MEMBERS. It is equal to the negotiated wage increase over the contract period plus strike pay less continuing loss of pay during the strike.⁸ The first two factors constitute benefits to the striking employees whereas the third factor is a growing loss for each day of the strike. If the loss is discounted from the constant value of the benefits the resulting shape of the Discounted Net Benefit curve will be a negative slope.

*Emotional and Institutional Benefits (EIB)*

The industrial disputes, which are recognized and allowed to take place within a legal framework are beneficial in a behavioral and institutional sense as they ensure release of emotions necessary for the continuation of a system of free collective bargaining. They prove cathartic

⁸ Since the negotiated wage increase will not be known till an actual settlement is reached, the Conciliation Board award on the wage rate may be used as a bench mark for calculating DNB. This introduces a normative element in the intervention process, akin to a wage-prime guideline.

and help in «clearing the air.» The parties can then approach the bargaining table for a more meaningful and acceptable settlement. This benefit is present in every strike in a society where free collective bargaining exists and continues at a certain level throughout the duration of strike. EIB curve is therefore a horizontal function.

Value of Net Social Benefit (VNSB)

The value of net social benefit curve is a synthesis of two benefit curves (DNB and EPB) and one cost curve, namely, loss of economic freedom to producers and consumers (LEF) which is equal to VTPL.

GOVERNMENT INTERVENTION

The behavior of VTPL, DNB, EIB and VNSB (see Chart 1) changes as more and more resource units become unemployed, corresponding to each additional day of the strike. The pattern of change seems to fall in two discernible phases. In Phase I (till u resource units become unemployed) the benefits (DNB and EIB) are higher than the costs (VTPL) which clearly indicates that the government must not intervene. Here the cost of maintaining the institution of free collective bargaining is minimal. The intersection of BTPL and VNSB marks the end of Phase I (at u) when the government may intervene in order to avoid the prolongation of a costly strike in Phase II. The unemployment of resources beyond u is costly because the loss of economic freedom of the consumers and producers (VTPL being equal to LEF) is far in excess of the emotional benefits of the strike.

AN EMPIRICAL ANALYSIS

An attempt is made in this section to operationalize the variables outlined above and to empirically test the theory, by using the case of Algoma Steel strike of 1966/1967. Each of the variables used in the theory will be discussed separately to explain the method of its quantification.

VALUE OF TOTAL PRODUCTION LOST (VTPL)

A Leontieff or input-output technique⁹ is used for calculating VTPL in the Algoma Steel strike. The system is useful for measuring the day-to-day losses in production, not only in the struck company but in the entire economy. For example, the forward and backward linkages of the steel industry in this case, reveal the degree of its interdependence among the industries of Canada. The coefficient of forward linkage of the steel industry indicates the proportion of its output which becomes

⁹ An input-output table is a square matrix, comprised of three sectors: (1) the processing sector, (2) the final demand sector, and (3) the payments sector. The input-output system can be represented by the equation: $(I - A)X = C$ where X is the gross output vector; A is a matrix of input coefficients a_{ij} , where a_{ij} is the amount of input from industry i required per unit output for industry j ; and C is the vector of final demand.

the input into another industry; for example, it may be observed from Table 1¹⁰ that iron and steel has a high forward linkage (.987864) which means that a strike in this industry will have a much greater impact on the producing sector than a strike in another industry such as tobacco which has a low forward linkage (.000027).

The Algoma Steel strike originally involved eighty bricklayers of the Bricklayers', Masons' and Plasterers' International Union. It lasted for 26 days.

The Algoma Steel strike originally involved eighty bricklayers of the Bricklayers', Masons' and Plasterers' International Union. It lasted for 26 days. For the purpose of measuring VTPL, man-hours lost figures for the directly affected employees¹¹ were multiplied by output per man-hour estimates in the steel industry. In order to introduce time element in the calculation, seven equi-distance stages of RUU (Resource Units Unemployed) were introduced (see column 1, Table 2) and corresponding production cost figures were obtained (column 3). Each of these seven figures was then applied to the impact table¹² for assessing loss of production in other industries. Table 1 is an example of this calculation which indicates that a loss of \$122,434.25 production in Algoma Steel resulted in the total losses of \$239,655.89 throughout the Canadian economy. The process was repeated for all the seven phases of the strike (see column 4, Table 2).

DISCOUNTED NET BENEFIT (DNB)

In operationalizing the concept of Discounted Net Benefit some compromises had to be made because of the non-availability of data on strike pay. However, there was no difficulty in calculating monetary benefit per worker over a three year contract which gave 72c per hour. Wages lost during the seven arbitrarily selected phases of the strike were calculated at the rate of \$3.28 per hour which was the average rate at the time. These estimates are shown in columns 5, 6, 7 and 8 of Table 2.

¹⁰ The data are obtained from Table 8 of the Dominion Bureau of Statistics publication, *The Input-Output Structure of the Canadian Economy*, 1961, Catalogue No. 15-501.

It is possible to use this publication for calculating production losses for Algoma Steel strike of 1966-67 by assuming that no major structural changes have occurred between 1961 and 1967. This is not an unreasonable assumption since, in general, structural changes take place very slowly, and any changes which may have occurred will be slight due to the relatively short period involved.

¹¹ The calculation could be based on three different reported figures, namely, striking employees, directly affected, and indirectly affected. The figures used here are those of the middle category (i.e. 545).

¹² The matrix $(I - A)^{-1}$ is called an impact table. This table can be used to find the changes in gross output caused by a change in final demand. To apply an impact table to discover the loss of product caused by a strike, it is first necessary to find out what amount of change in final demand would have caused this fall and then apply this «artificial final demand» to the impact table.

TABLE 1

<i>Indust. No.</i>	<i>Name of ndustry</i>	<i>Coefficient</i>	<i>Product Lost</i>
1.	Agriculture	.005987	742.07
2.	Forestry	.002934	363.63
3.	Fishing, Hunting	.000324	40.16
4.	Metal Mines	.126115	15,630.20
5.	Non-Metal Mines	.006024	746.60
6.	Coal Mines	.020040	2,483.70
7.	Petroleum, Natural Gas	.009727	1,205.49
8.	Meat, Poultry	.001809	224.18
9.	Dairy Factories	.001373	170.18
10.	Fruit, Vegetable Can.	.000466	57.79
11.	Feed, Flour, Cereal	.001024	126.96
12.	Biscuit, Bakeries	.000664	82.28
13.	Sugar, Confectionary	.000283	35.02
14.	Other Food	.002150	266.42
15.	Soft Drinks	.000332	41.14
16.	Alcoholic Beverages	.000453	56.20
17.	Tobacco Industries	.000027	3.31
18.	Rubber Production	.004616	572.14
19.	Leather Production	.000203	25.10
20.	Synthetic Textiles	.000582	72.11
21.	Coton, Yarn	.000722	89.50
22.	Knitting Mills	.000053	6.61
23.	Clothing Industries	.000442	54.73
24.	Other Textiles	.001279	158.55
25.	Sawmills	.001542	191.12
26.	Furniture Fixtures	.000419	51.91
27.	Other Wood	.003070	380.53
28.	Pulp and Paper	.005403	669.60
29.	Other Paper	.004235	524.88
30.	Printing, Publishing	.007041	872.59
31.	Iron and Steel	.987864	122,434.25
32.	Smelting Refineries	.109294	28,498.52
33.	Other Primary Metals	.016379	2,029.96
34.	Structural Metal	.010092	1,250.79
35.	Metal Stamp	.006488	804.15
36.	Other Metal Mfg.	.048080	5,971.85
37.	Machinery	.012937	1,603.40
38.	Aircraft and Parts	.000791	98.07
39.	Motor Vehicle	.001130	140.06
40.	Vehicle Parts	.004234	524.75
41.	Other Trans. Equipment	.002023	250.75
42.	Electrical Appliance	.000696	86.32
43.	Elect. Ind. Equipment	.001716	212.67
44.	Com. Equip. and Wire	.008313	1,030.28
45.	Other Elect. Products	.004931	611.04
46.	Clay, Lime, Cement	.020370	2,524.72
47.	Non Metal Mining	.003210	397.79
48.	Pet. Prod. Industries	.019905	2,467.05
49.	Plastic, Synthetics	.001051	130.27
50.	Paint and Varnish	.003183	394.48
51.	Pharmacy, Soap	.002810	348.33
52.	Other Chemicals	.018518	2,295.15
53.	Misc. Manufacturing	.004699	582.42
54.	Construction	.016105	1,996.05
55.	Trade, Wh. Retail	.064303	7,969.74
56.	Transport, Storage	.056507	7,005.93

57.	Communications	.009684	1,200.22
58.	Utilities	.044323	1,006.58
59.	Fin, Ins, Rl. Estate	.020093	2,490.31
60.	Business Services	.006783	840.63
61.	Hotel, Rest.	.005301	656.98
62.	Other Services	.014633	1,813.62
63.	Office Supplies	.004427	178.75
64.	Adv. and Travel	.016056	1,989.92
65.	Operating Supplies	.095815	11,875.39
	Total (Row 1-65)		239,655.89

EMOTIONAL AND INSTITUTIONAL BENEFITS (EIB)

The concept of EIB, as outlined and presented graphically in the previous section, is elusive and hard to quantify. As techniques of quantification in behavioral sciences improve, one might expect to measure the degree of catharsis obtained by the workers in the early phases of strike. This may mean a saving of many more man-hours which could be lost either through additional strikes or other covert expressions of conflict such as slowdown, absenteeism or petty grievances. In the absence of empirical results of a research which could relate emotional employee catharsis with man-hours saved, one may simply ask: what measureable benefits does the Canadian society have in not banning the strikes?

There are innumerable environmental variables which govern the structure and working of an industrial relations system. It has, among other factors, prevented scholars from propounding a comparative theory of industrial relations. Nonetheless, efforts have been made to explain why, for example, Canadian and Australian systems differ. The most glaring difference is the freedom of strike in Canada and compulsory arbitration in Australia. If in a partial analysis, we were to treat this difference as a causal factor, other features being broadly similar, we may conclude that greater incidence of strikes in Australia is due to compulsory arbitration. Thus it may be argued that the threat of a strike reduces the possibility of its actual occurrence, producing an Emotional and Institutional Benefit of a system of free collective bargaining. Canada has this benefit and it accrues to the whole society. Symbolically and materially it is present in each strike that takes place in the Canadian economy. Can we measure this benefit if it existed in the Algoma Steel strike?

In some years Australia had fifteen times as many strikes as those in Canada. In 1966 the discrepancy was not as great, although Australia had 656 strikes in excess of those in Canada which resulted in a loss of 386,632.2 man-days. It may be stipulated that by not having compulsory arbitration Canada saved these man-days which would have cost \$2,822,415.06 in that year (column 9, Table 2). This is the value of EIB in Algoma Steel and other strikes taking place in 1966.

TABLE 2
Costs and Benefits of Algoma Steel Strike

<i>RUU</i> <i>Resource Units</i> <i>Unemployed</i> <i>(Per Employee)</i>	<i>Manhours</i> <i>Lost For</i> <i>545</i> <i>Employees</i> <i>(Col. 1 ×</i> <i>545)</i>	<i>Production</i> <i>Lost</i> <i>Col. 2 ×</i> <i>8.986</i>	<i>VTPL</i> <i>Results</i> <i>From the</i> <i>Impact Table</i>	<i>Total</i> <i>Benefi Over</i> <i>Contract</i> <i>Life</i>	<i>Cost in</i> <i>Wages</i> <i>Lost</i>	<i>Discounted</i> <i>Net Benefi</i> <i>Per</i> <i>Employee</i> <i>(Col. 5-</i> <i>Col. 6)</i>	<i>DNB</i> <i>For 545</i> <i>Employees</i> <i>(Col. 7 ×</i> <i>545)</i>	<i>EIB</i>	<i>VSB</i> <i>Col. 8 &</i> <i>Col. 9</i>	<i>VNSB</i> <i>Col. 10-</i> <i>Col. 4</i> <i>(VSB-LEF)*</i>
1	2	3	4	5	6	7	8	9	10	11
25 (4.34 days)	13,625	122,434.25	239,656.89	499.20	82.00	417.20	227,374.00	2,822,415.06	3,049,789.06	2,810,132.17
50 (8.75 days)	27,250	244,868.50	457,338.45	499.20	164.00	335.20	182,984.00	2,822,415.06	3,005,099.06	2,547,760.61
75 (13.09 days)	40,875	367,302.75	683,401.12	499.20	246.00	253.20	137,994.00	2,822,415.06	2,960,409.06	2,277,007.94
100 (17.50 days)	54,500	489,737.00	914,104.17	499.20	328.00	171.20	93,304.00	2,822,415.06	2,915,719.06	2,001,614.89
125 (21.91 days)	68,125	612,171.25	1,143,531.51	499.20	410.00	89.20	48,614.00	2,822,415.06	2,871,029.06	1,727,497.55
148 (25.90 days)	80,660	724,810.76	1,353,723.55	499.20	485.44	13.76	7,499.20	2,822,415.06	2,829,914.26	1,476,190.71
150 (26.25 days)	81,750	734,605.50	1,372,010.70	499.20	492.00	7.20	3,924.00	2,822,415.06	2,826,339.06	1,454,328.36
175 (30.45 days)	95,375	857,039.75	1,600,684.53	499.20	584.00	-84.80	-46,216.00	2,822,415.06	2,776,199.06	1,175,514.53
200 (35.00 days)	109,000	979,474.00	1,829,351.64	499.20	666.00	-156.80	-84,456.00	2,822,415.06	2,737,959.06	908,607.42

VTPL = Value of Total Product Lost

EIB = Emotional and Institutional Benefits

DNB = Discounted Net Benefits

VSB = Value of Social Benefit

VNSB = Value of Net Social Benefit

LEF = Loss of Economic Freedom

*VTPL = LEF, VSB — LEF = VNSB

VALUE OF NET SOCIAL BENEFIT (VNSB)

The Canadian society has accorded legal recognition to strikes and in this paper we have argued that this acceptance has two identifiable benefits, namely Discounted Net Benefit (DNB) to the workers and Emotional and Institutional Benefits (EIB) for the entire economy. A combination of these two benefits (i.e. Value of Social Benefit, VSB) must always be greater than the Loss of Economic Freedom (LEF) to the producers and consumers, if the strike has to remain viable and play a positive role.

Conceptually, the Loss of Economic Freedom is different from the loss of production (VTPL) due to strike, but in order to make LEF operational, it may be equated with VTPL. In column 11 of Table 2, the differential between VNSB and LEF is labelled as the Value of Net Social Benefit (VNSB) which is higher than BTPL in the non-intervention phase and lower in the intervention phase of the strike (see Chart II).

POLICY IMPLICATIONS

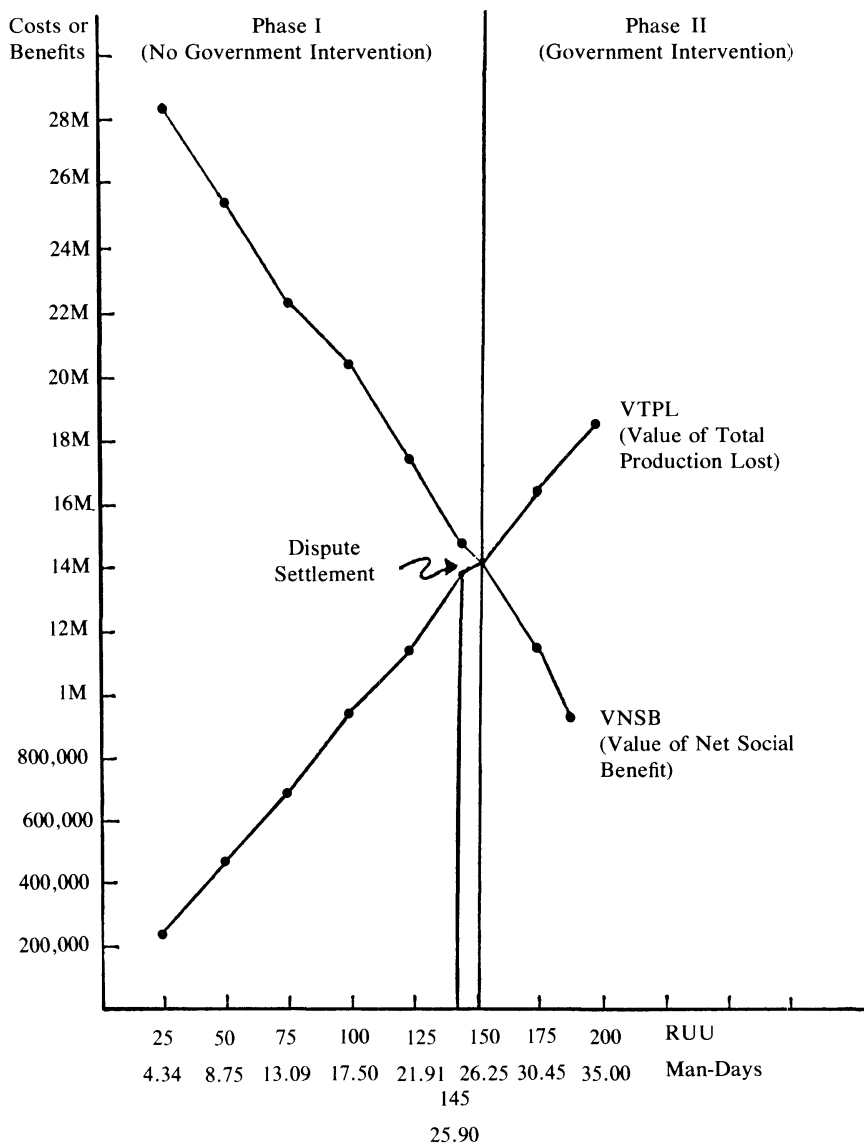
Under the existing labour-relations laws in Canada there is no provision for shortening the length of a strike, unless it is deemed an emergency dispute. The government's intervention in a legal strike is considered repugnant to the tenets of free collective bargaining. This stand was defensible some three or four decades ago when automation had not reduced the effectiveness and utility of strikes.¹³ But now, the public is often subjected to prolonged and purposeless strikes. The law safeguards the workers' right to strike but seems reluctant to protect the freedom of the public to obtain goods and services after a *defined period of strike*.

The government has no objective guidelines or criteria to decide how long a strike may be permitted to continue without an intervention. The theory briefly outlined in this paper has suggested that costs and benefits of a strike must be regarded as relevant considerations. The quantification of various cost/benefit components has been attempted in the case of Algoma Steel strike to determine the period after which intervention was advisable. In Chart II, the cost curve (VTPL) which included production losses in Algoma Steel and in all other affected industries has been plotted for a period of 35 days. The benefit curve (VNSB) is a downward sloping curve which intersects VTPL, 1.08 days after the actual settlement took place. The government's non-intervention in this strike, according to our cost/benefit analysis, is absolutely defensible. But it is not known if there would have been an intervention, had the strike extended into Phase II. In all probability the government may not have intervened because it may not have constituted an emergency dispute.

¹³ Thomas KENNEDY, *op. cit.* and S. M. A. HAMEED, «Responsive Bargaining: Freedom to Strike with Responsibility,» *Industrial Relations Quarterly Review*.

CHART II

Algoma Steel Strike



Resource Unit Unemployed Over a Period of Time

According to the criteria of our analysis, the Algoma Steel strike in Phase II has lower social benefits (VNSB) and higher production costs (VTPL). At this point, a question of value judgment becomes pertinent: should such a strike be permitted to continue? The decision-makers may have considerations beyond those discussed in this paper, which may allow a costly strike to prolong. But if the labour and management, government and the public know that a given strike has entered a phase where its costs are greater than its benefits, then we have developed some objective guidelines for an intervention policy. Furthermore, the very awareness that a strike has become costly in relation to its benefits, will exert an extraneous pressure on the parties for a speedy settlement.

CONCLUSION

The theory of strike cost and government intervention policy has a number of variables, all of which can be operationalized. The shape of the VTPL and VNSB curves when fitted with the empirical data for the Algoma Steel strike correspond with the envisaged shapes in the theory. Their intersection simply distinguished the intervention and non-intervention phases of the strike as envisioned in the theory. It demonstrated that a cost/benefit analysis of a strike is feasible in providing an objective criterion for government intervention policy.

The average duration of strikes in Canada has increased since World War II. They are also becoming less effective and costlier, especially in the public sector. Thus, the government's stance of intervention only in the «emergency» disputes needs re-examination. The basis of intervention, mainly to protect the public from undue inconvenience, should now become «costliness» of the dispute rather than its «emergent» nature. Needless to point out that the latter criterion has always been vague and largely subjective.

In an era of technological precision, the methodology of social sciences continues to be qualitative, subjective and vague. There are very few operational theories in industrial relations, partly because of a tendency to reject theorizing and quantification of social variables on the grounds that the problems are much too complex to be reduced to numbers. But it may be argued that numbers, although a poor reflection of social phenomena, tend to crystallize thinking and attitudes. For instance if the cost and benefit figures for each day of a strike in progress are publicised by the Department of Labour, there would be a change in labour management and public response toward the desirability and expected length for which the strike may continue. This is a process of public education which may, by itself, preclude the need for government intervention.