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Farm mechanization: the impact on labour at the level of the farm household*

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Abstract. This paper presents data regarding the relationship between mechanization and labour at the level of the farm household. Individual farm histories from a small parish in rural Quebec serve as a basis for examining the impact of mechanization over time. Contrary to statistics based on larger geographical units, the analysis shows that mechanization does not reduce labour for individual farms over the long term. The effect of mechanization on non-paid and paid labour is also found to vary depending on the extent of farm capitalization. The implications of these findings are discussed with respect to the theoretical literature regarding the temporal priority of mechanization or labour, the penetration of capitalism in agriculture, and the survival of the family farm.

Résumé. L'étude présente des données sur la relation entre la mécanisation et la main-d'oeuvre au niveau du ménage agricole. L'histoire individuelle de fermes d'une petite paroisse rurale du Québec constitue la base de données qui permet d'examiner les répercussions de la mécanisation au fils des années. Contrairement aux données statistiques qui se fondent sur de plus grandes unités géographiques, l'analyse démontre que la mécanisation ne réduit pas, à long terme, la main-d'oeuvre sur les fermes individuelles. L'effet de la mécanisation sur la main-d'oeuvre salariée et non salariée varie selon l'importance de la capitalisation agricole. La portée des résultats de l'étude est analysée en regard des travaux théoriques sur la priorité temporelle de la mécanisation ou de la main-d'oeuvre, sur la pénétration du capitalisme dans le domaine agricole et sur la survie de l'exploitation familiale.

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Introduction

More than any other factor, it has been improved farm machinery that has caused the farm labour force and the farm population to decline by more than one-half since 1945.
(Royal Commission on Farm Machinery, 1971: 501)

Even if one argues with the causal direction of the Royal Commission's claim, the relationship between farm machinery and labour remains a dramatic illustration of the way in which machinery replaces labour. However, the process by which this replacement occurs has remained largely unexplored. Since virtually all of the analysis has taken place with units of analysis at the level of countries, provinces, or nations (Berardi, 1981: 491), there is little direct evidence that individual farm households experience a drop in labour associated with increased mechanization.

In this paper, we will examine evidence related to this issue. In doing so, we find little support for the suggestion that a decline in the labour force encourages the purchase of machinery at the level of the individual farm. In addition, we find that increases in farm machinery reduce labour only in a minority of cases, and that the most frequent effect of a machinery purchase is to increase non-paid and paid labour in farm households.

Theoretical framework

Much of the theoretical discussion regarding the relationship between mechanization and labour has taken place with respect to three different issues; the temporal precedence of machinery or labour in the process of change, the penetration of capitalism, and the survival of the family farm. From each of these positions we identify a question to guide the analysis of our data.

The priority of mechanization or labour?

Within the literature on agricultural economics, one finds a focus on the conditions under which machinery will be substituted for labour. Street (1953), Garver (1958), and Haythorne (1960) point to the decline in manpower at the outset of the Second World War as a major factor which pushed farmers to increase mechanization. Higbee (1963) and Holt (1970) on the other hand, point to the modern tax policy and rising costs of labour due to competition from the industrial sector as the major factors. The former theorists argue that it was the lack of labour which forced mechanization; the latter that it was mechanization and its associated increase in productivity per worker which led farmers to substitute machines for labour and increased the movement of labour out of rural regions.

An important test of these two views can be made by examining the sequence of events at the level of the farm. Do we find that farm households experience a drop in labour before or after the introduction of machines? To date, this test has not been made, largely because the data available are only at the level of units larger than the farm and the time sequence of events has

been difficult to determine. Our first objective then, will be to examine this question using our farm household data.

The penetration of capitalism

From a more radical perspective, the relationship between mechanization and labour has been dealt with as part of the discussion regarding the penetration of capitalism into agriculture. The farm implement industry, as a capitalist industry, is seen to penetrate agricultural production in a number of ways. On the one hand, it is seen to replace the non-paid family labour of the independent commodity producer, and to create conditions which aid the transformation of the labour intensive farm to the highly capitalized farm. Although not transforming the relations of production on the farm in this case, machinery increases the dependence of agricultural production on industries which are organized on such a basis.[1]

A second formulation of the argument is that machinery aids the penetration of capitalism in a more direct manner. Machinery makes possible the increases in productivity which permit in turn the expansion of farms beyond the level of family labour. It also increases the productivity of the worker to levels which are attractive to capitalist enterprises. As a result, machinery aids the process of transformation from non-paid to paid labour on the farm, thus creating a situation in which farms themselves become capitalistic enterprises.

Typically, the analysis of agricultural production by the more radical theorists has also been done using large units of analysis. Changes in the ratio of paid to non-paid labour have been investigated, but not at the level of the individual farm household, and not with a focus on the role of mechanization in these changes. As with the previous analysis by the agricultural economists, we are still uncertain regarding the details of the process and are left with the suspicion that the relationship between mechanization and paid labour previously identified may be spurious. Our second objective then, will be to examine the relationship between mechanization, paid labour, and unpaid labour at the level of the farm household.

The survival of the family farm

The third issue which we will examine cuts across both the orthodox and radical perspectives referred to above. In spite of numerous predictions from both perspectives that the family farm is on the way out, we find that it continues to exist, although in a form which has changed considerably since the turn of the century (Nikolitch, 1969; Canada, 1970; Bernier, 1976; Hedley,

1. This account of the role of machinery and the one to follow are based on material found in the writings of Lenin (1961), Mitchell (1975), Bernier (1976) and Friedmann (1978), among others.

1976; Friedmann, 1978; Mann and Dickenson, 1978; Shaw, 1979; Morisset, 1981).

In their discussion of this topic, Mann and Dickenson (1978) outline three explanations for the continuation of the family farm which can be found in the literature. The first argues that through self-exploitation, the family farm has a "competitive advantage over capitalist forms of production whose success is dependent upon at least receiving the average rate of profit." (1978: 469). The second explanation emphasizes the role of technological improvements: improvements which make production increases possible without expanding the labour force much beyond the nuclear family. Arguing against these two positions, Mann and Dickenson suggest that the excess of production time over labour time which is characteristic of many forms of agricultural production make this a high risk and high cost venture for capitalist organization.

Our empirical material relating to mechanization provides an opportunity to examine in some detail the second of these explanations as outlined by Mann and Dickenson. Using the farm history data, we can explore the extent to which machinery reduces labour demands in an attempt to supplement their theoretical critique with a more empirical one.

Research design

The data for our analysis comes from a small parish in rural Quebec. The parish is situated in an area of marginal farmland approximately seventy-five kilometers from Quebec city. Fifty percent of the ninety households directly involved in agricultural production were randomly sampled and detailed interviews were conducted with up to four adults in the household. As part of these interviews, respondents were asked to provide a history of the farm from the time one of the family members first took control of the enterprise. Any changes in the organization, products, or financing of the farm were recorded along with the dates for the changes. For the purposes of this paper we will focus on the responses regarding changes in machinery and labour.

Whenever a respondent reported the purchase, replacement, or sale of moveable farm equipment, we considered that a change in machinery had occurred. Similarly, any change in the number of persons working on the farm was considered a change in labour. This included both paid and non-paid persons.

The period of time covered by the farm histories in our sample varies from farm to farm. Since we included several people who were once farmers, but are now retired, we have data from farms which were operated as early as 1933. It is to be expected, therefore, that the data will suffer from the limitations on recall which are almost always a feature of historical analysis. In order to minimize this problem, all members of the household were invited to

participate in the construction of the farm histories when it came to this part of the interview. In some cases the respondents used existing records to verify the accuracy of the information, but the length of the interview did not permit us to demand this in all cases.[2] The detail of the resulting information, however, suggests that most of the farm histories were conscientiously completed, leaving us with a reliable account of the major changes on the farms.

In order to understand the presentation and interpretation of the data, it is first necessary to describe the manner in which it has been coded and the structure of the computer program used for its analysis. Each change which occurred in machinery and/or labour forms the basic unit of analysis for the program, and associated with it is identifying information such as the household number, the date, and the nature of the change. Changes are classified in terms of their type (ie. machinery, non-paid labour, or paid labour) as well as whether they entailed an increase, a decrease, or a transformation of type. Any addition in the number of machines or labour was coded as an increase; a reduction in these categories was coded as a decrease. Where substitution of one type of labour or machine was indicated (eg. substitution of a spouse's labour by a son's), the unit was coded as a transformation of type. The availability of identifying information for each farm permits controls to be introduced in the analysis as we proceed.

The data are manipulated by a computer program which first searches a farm record for a change of a particular type (eg. a change in mechanization). Information regarding that change is recorded, and the program then searches for a subsequent or concurrent change of a second type (eg. a change in non-paid labour). Information regarding the second type of change as well as information regarding the time period between the two changes is recorded, before the program begins the search again. Summary information is provided regarding the number of changes occurring for each type; the number of times the change represents an increase, a decrease, or a transformation of type; the number of times the first type of change is followed by the second; and the average period of time between the first and second type of change.[3] (cf. Technical Appendix)

The basic unit of analysis used for the calculation of statistics is a pair of

2. For similiar reasons we limited our information to the description of events which took place throughout the history of the farm. No attempt was made to solicit detailed intentions for or interpretations of those events beyond that which took place as part of the informal conversation in the interview.

3. This method of analysis was chosen over standard time series analysis since the effects of different types of machinery would most likely be felt over different time periods, the farm periods covered were of varying lengths, and the sample was not sufficiently large to permit the level of analysis demanded by standard time series procedures.

changes, identified by the computer program (eg. an increase in mechanization followed by a change in labour). If each change in the pair is independent from the other, we expect that the proportion of the first type of change followed by the second type of change (column 4 in Table 1) will be approximately equal to the proportion of the second type of change in the total sample (column 3 in Table 1). To the extent that these two figures differ, the assumption of independence of events can be questioned.

This type of analysis will also permit us to provide an estimate of statistical significance. Since the sample has been randomly selected from a larger population, the binomial distribution will give us the probability that the proportion in column ~~three~~ four of Table 1 could have occurred by chance. We have chosen to consider a probability of .05 or lower using a one-tailed test as an indication of statistical significance.

Results

The results will be presented and discussed in terms of the three theoretical issues identified above, although there will be some overlap due to the fact that the data touches on several of the positions taken. The basic results are provided in Table 1.

The priority of mechanization or labour?

The farm history data permit us to examine the sequence of changes over time. If we find that decreases in labour are more likely to be followed by increases in machinery than increases in machinery are to be followed by decreases in labour, we have some support for the temporal priority of labour over mechanization. These findings in turn would support those theorists who treat labour outmigration from rural areas as a major stimulus for the mechanization of farm production. A reversal of those findings, of course, will support those who argue that mechanization and the expansion of the industrial base on which it rests initiated the outmigration of labour.

Searching from changes in labour to changes in mechanization shows that a decrease in either paid or non-paid labour is followed by an increase in mechanization in almost all cases (.97 of the 69 instances). On the surface, these findings suggest that a drop in labour is responsible for an increase in mechanization. However, if we examine the consequences of an increase in labour, we find that it too is followed by an increase in mechanization in virtually all cases (.97 of the 151 instances). Both of these proportions are identical with the proportion of increases in machinery for the sample as a whole, indicating very little, if any, influence of changes in labour on machinery.[4]

By way of contrast, we find some support for the claim that the mechanization of the farm affects the amount and type of labour, although even this data raises more questions than it answers. Following .77 of the changes involving an increase in mechanization, we find an increase in labour within an

Table 1. Basic information regarding changes in mechanization and labour (base frequencies are in parentheses).*

			All farms		
1	*2*	*3*	*4*	*5*	*6*
D LAB	I MACH	.97 (216)	.97 (69)	.66	5.3
I LAB	I MACH	.97 (216)	.97 (151)	.70	4.4
I MACH	I LAB	.61 (121)	.77 (202)	.00**	4.6
I MACH	D LAB	.24 (121)	.14 (202)	.00**	1.9
I MACH	I OFW	.48 (56)	.47 (83)	.47	2.2
I MACH	D OFW	.34 (56)	.43 (83)	.05**	1.9
I MACH	I NPL	.57 (84)	.77 (157)	.00**	5.3
I MACH	D NPL	.23 (84)	.13 (157)	.00**	1.5
I MACH	I PL	.70 (37)	.82 (74)	.01**	6.0
I MACH	D PL	.27 (37)	.18 (74)	.04**	4.2
		High level of capitalization			
I MACH	I NPL	.55 (33)	.76 (84)	.00**	6.1
I MACH	D NPL	.30 (33)	.13 (84)	.00**	0.5
I MACH	I PL	.79 (14)	.89 (27)	.15	7.5
I MACH	D PL	.21 (14)	.11 (27)	.15	1.7
		Low level of capitalization			
I MACH	I NPL	.59 (51)	.78 (73)	.00**	4.4
I MACH	D NPL	.06 (51)	.12 (73)	.13	2.7
I MACH	I PL	.63 (24)	.79 (47)	.02**	5.0
I MACH	D PL	.29 (24)	.21 (47)	.16	5.0

(1) First type of change
(2) Second type of change
(3) Proportion of second type of change
(4) Proportion of first being followed by second
(5) Probability of getting (4) by chance (one tailed)
(6) Average years between first and second change

I MACH = Increase in MACHinery
D MACH = Decrease in MACHinery
I LAB = Increase in LABour
D LAB = Decrease in LABour
I OFW = Increase in Off Farm Work
D OFW = Decrease in Off Farm Work
I NPL = Increase in Non-Paid Labour
D NPL = Decrease in Non-Paid Labour
I PL = Increase in Paid Labour
D PL = Decrease in Paid Labour

* Base frequencies differ even though the first type of change remains the same, due to the manner in which the pairs of events are selected (cf. Technical Appendix).

4. The high proportion of increases in machinery relative to decreases and transformations is most likely due to the tendency of our respondents to report purchases of machinery without indicating the withdrawal of old equipment from production.
Even if this replacement of machinery were true in all cases, it would not change the implications we have drawn from the data. The act of replacing old machines with new is just as much a part of the process of mechanization as is the addition of new machines alone. Our data on machinery cost indicates that replacement is also demanding from a financial point of view.

average of four and a half years. This figure is .16 higher than the proportion of increases in labour in the sample as a whole, and therefore can be taken as an indication of an increase in labour as the result of mechanization.[5] The probability of getting this value by chance is extremely low, falling well within the point chosen for statistical significance. Reductions in labour, on the other hand are less likely to occur following mechanization than would be expected from the overall distribution of these reductions. In those few instances where labour is reduced, the effect occurs in the relatively short term (1.9 years on average).

These findings support the argument that mechanization affects the amount of labour on the farm, but at the same time they contradict the direction of that influence as proposed in the literature. Rather than reduce the amount of labour, mechanization appears to increase it over the long term. In the minority of instances where a reduction of labour occurs, it does so in the short term.

The penetration of capitalism

We have argued above that capitalism penetrates agriculture in both an indirect and a direct manner. Indirectly, the integration of agricultural production and capitalism is increased as farmers use the products of capitalist industries or themselves work on a part-time basis in those industries. More directly, farmers may hire labour and themselves create capitalist relations of production on the farm.

Our data suggest that although machinery purchases integrate agricultural production with the capitalist-based implement industry, it has the effect of reducing the extent to which off-farm work continues. The proportion of times that decreases in off-farm work occur in the sample as a whole (.34) is smaller than the proportion of times they occur following increases in machinery (.43). The probability of this occurring by chance is .05, and the change occurs after an average of 1.9 years. Rather than freeing time for off-farm work, machinery purchases appear to draw the farmer out of the capitalist labour market.

In order to examine the more direct manner by which capitalism penetrates agricultural production, we must consider separately the effect of mechanization on non-paid and paid labour since the extent of paid labour is typically treated as an indication of capitalist relations of production. At the same time the separate analysis of these two types of labour will provide some direction for addressing the issues identified in the previous section.

The majority of the increases in mechanization are followed by an in-

5. The average number of years for the effect of an increase in machinery on labour to be felt (4.6 years) approaches the period of time for full depreciation on machinery such as tractors. Since 1951, the period of time for full depreciation has increased (Canada, 1969: 473).

crease in non-paid labour (.77). Since the overall proportion of increases in non-paid labour is .57, this indicates an increase in non-paid labour due to mechanization. Additional analysis of these units indicates that almost all of the increases in non-paid labour are increases in the extent to which the farmer's spouse and/or children work on the farm (98 percent of the increases in our sample). The few decreases in non-paid labour which occur do so after about 1.5 years, but their frequency is significantly lower than that which might have occurred by chance.

As is the case for non-paid labour, we find that mechanization is more likely to be followed by an increase in paid labour than one would expect by chance alone. In addition, our data indicate that this labour is provided by persons other than immediate family members. None of the paid labour in our sample was provided by the farmers' spouses or offspring.

In summary, then, we find that mechanization both aids and retards the penetration of agriculture by capitalism. By increasing the reliance of farmers on capitalist-based industries such as the farm machinery industry, it may be seen as a form of indirect penetration. However, it seems to be at the same time a significant factor in the reduction of work off the farm, therefore reducing the extent to which the farmer is directly employed as wage labour. With respect to the effect of machinery on farm labour, it seems to be equally equivocal. Instead of reducing the farmer's reliance on paid labour, mechanization appears to increase the number of workers on the farm, whether they be paid or non-paid.

The survival of the family farm

The findings above are clearly at odds with those who argue that machines provide a means whereby the family labour farm can survive, at least over the long term. Rather than reduce the labour requirements on the farm, machines appear to contribute to conditions whereby labour demands will increase. The process by which this occurs is not likely to be a simple one since the effects are felt over a period averaging five years, but we might begin to shed light on it through a consideration of the context in which machinery purchases are made.

We will start with the observation that over the period being considered, farms have been under general pressure from the market, suppliers, and from land rent.[6] The reasons for such pressures as proposed by academics, farmers, and politicians vary, ranging from the expansion of capitalism to in-

6. Morisette argues that this condition is no longer true for large farms in Quebec, due in large part to the operation of the quota system for dairy production (1981). Since we are dealing with relatively small farms under marginal conditions and with a period of time before the impact of the quota system was felt, his argument is used as a qualification on our findings, not a contradiction of our argument (cf. Conclusions).

flation, but they all generally recognize the pressure as part of a cost-price squeeze on agricultural producers.

Merely to survive under these pressures, farmers have had to increase their level of capital input or labour, or to reduce their costs. To do so, farm operators have only a limited number of options available. They may attempt to increase productivity or levels of production, cut costs, introduce outside sources of income, or devise some combination of these options. In most cases, increasing productivity or levels of production requires the introduction of additional capital or labour. Capital can provide the means whereby animals, land, equipment, buildings, fertilizers, or high yield grains may be purchased, thus providing a basis for increasing production levels. Increases in labour lead to increases in levels of production by adding to the hours or number of persons who are working on the farm. Cutting costs may be done through cuts in paid labour, supplies, repairs, or production itself. On family-based enterprises, even cutting costs by cutting personal consumption becomes an option. Finally, the farmer can attempt to survive by increasing the extent to which "outside" finances are used for the operation through borrowing or off-farm work by members of the household.

Machines play a double role with respect to these pressures. On the one hand, they make increases in production or productivity possible, by permitting farmers to do more work in the same amount of time or by reducing the amount of time necessary for a given level of output. In this way, they can be seen to alleviate the pressures of the cost-price squeeze. On the other hand, however, they add to the pressures by demanding cash or credit arrangements for their purchase.

The survival of the family labour farm depends on whether the additional productivity made possible by machinery will offset the additional costs of their purchase and operation. Given, in addition, that the size of farm families has tended to decline, survival also depends on machinery offsetting these costs without increasing the labour demands on the farm. Our data suggest that the latter condition is not met, at least in the long term, for machinery purchases appear to be followed by increased labour demands.

In order to provide a more rigorous test of this conclusion, it is necessary to include some control for the level of expansion of the farms considered. It may be that the results obtained are a consequence of a general strategy of expansion on the part of farmers. If this were the case, machinery would not play such a central role in the increased labour demands on the farm, but would increase in conjunction with labour demands as part of the general expansion of the farm. It would also mean that machinery increases are associated with increased labour demands only on those farms which are expanding.

Our data will permit us to examine the reasonableness of this line of argument, for we can easily compare farms which have a history of relatively

high levels of capital expansion with those which have a lower level.[7] If the relationship between machinery and labour is due to general farm capitalization, we would expect it to disappear on those farms where such capital expansion has not been large.

Turning once again to Table 1, we find little support for the role of capital expansion as suggested above. Machinery increases are followed by labour increases both for farms which have undergone high levels of capital expansion and for those with lower levels. Some variation, however, occurs between paid and non-paid labour. On expanding farms, only non-paid labour occurs at a higher rate than would be expected by chance, whereas on non-expanding, both paid and non-paid labour are significantly greater than expected by chance.

Clearly, machines are not the means whereby small farms might survive. The only farms which do not show an increase in labour as the result of an increase in machinery are those which are undergoing capital expansion, and even then, the lack of a significant relationship only occurs with respect to paid labour. To Mann and Dickenson's theoretical critique of those who point to technological improvements as the means by which the family labour farm can survive, we can add an empirical one which challenges the assumption that machinery reduces labour demands on such farms.

Conclusions

It should be clear from the above analysis that the relationship between machinery and labour is not as direct as aggregated data would suggest. In most cases, the introduction of machinery means a long term increase in labour for the individual farm household, with a possible amelioration of this effect only for those farms which have a history of capitalization, and only for paid labour on those farms.

These findings point to the important role which market pressures play in the relationship between mechanization and labour. Although buying a machine may permit a farm household to produce more, this advantage is only a short term gain under conditions where cost and price pressures are high. Expansion, cost cuts, or outside financing become necessary to survive: options which in turn affect the advantages of mechanization. In the long term it is only those farms which are capable of capital expansion which may avoid facing increased labour demands from mechanization. Even then, it is only

7. Farms are considered to have high levels of capitalization if they show a frequency of increases in land, buildings, animals, and/or machinery over time which is above the average for the sample. Farms with low levels of capitalization are those below the average. The average was used to ensure adequate sample sizes in the two groups. Note that this variable is measured with reference to the pattern of capitalization over time, not the level of capitalization at any one point in time.

with respect to paid labour that this occurs, if at all.

Should this be a general phenomenon, it raises some important qualifications regarding the relationship between capitalization, labour, and the penetration of capitalist relations of production. On the one hand, the data tentatively suggest that mechanization reduces the extent to which farmers are directly involved in capitalist relations of production (i.e. paid labour) off the farm. On the other hand, we find that it increases the extent to which paid labour is used on the farm, particularly for those farms which are not expanding with respect to their capital assets. At the same time, machinery appears to increase the extent to which non-paid labour is used on all types of farms. Such findings emphasize the importance of maintaining analytical distinctions between capitalization, capitalist relations of production, and the various means by which capitalism penetrates agricultural production. Machinery may go hand in hand with capitalization, but it does not bear a simple relationship to wage labour.

The analysis we have presented above is not inconsistent with the general findings that increased mechanization is associated with a reduction in labour. At the level of larger geographical units, such data most likely reflects the elimination of some farms from production and the expansion of others through consolidation. This consolidation, along with increases in productivity due to technological development, results in fewer workers (both paid and non-paid) producing the same or more goods. Such data should not be interpreted as an indication that mechanization decreases labour at the level of the farm household, however, for consolidation can occur at the same time that individual farm households experience increased labour demands.

Our data also bring into question the claim that machinery has helped to support the two person farm (Nikolich, 1969). Although in some cases it has permitted higher levels of production with reduced labour demands in the short term, the long term pressures on farm production have meant that it has led to increases in non-paid labour. Since most of this labour is provided by the operator's spouse (in most cases a woman) and children, it is these types of individuals which face increased exploitation through mechanization.

A final comment is in order regarding the generalizability of these findings. The region from which our data was collected is one in which there is a high proportion of dairy farms operated as family enterprises, a number of small industries, (providing a source of off-farm employment), and easy access to urban centres. All of these characteristics raise uncertainties regarding the extent to which we can generalize beyond such types of regions or farms.

Mann and Dickenson argue that the penetration of capitalism into agriculture is weakest where labour time does not coincide with production time (1978). If this is correct, we expect to find that dairy farms of the type

found in the region under study are more susceptible to the penetration of capitalism than farms producing grains or fruit. This would be the case for almost any kind of animal production as compared to the production of planted crops since the cycle of demands in animal production is in most cases daily rather than seasonal. We may find, therefore, that the market pressures on farms producing animal products are greater than those producing grains since the penetration of capitalism is greater. If so, the relationship between machinery and labour is likely to be very different.

A second qualification along these lines arises from the price control which is created by the establishment of the quota system in dairy production. On the one hand, this system has reduced the market pressure on farmers by stabilizing the price of their product. One would expect such stabilization to aid the family labour farm and create conditions conducive to their survival. However, the stabilization of prices appears also to have restricted movement in and out of dairy production, enhanced the expansion of some farms at the expense of others, and increased the frequency of capitalist relations of production (Morissete, 1981). It may, therefore, have created conditions in which the family labour farm is weakened. If the role of price control is indeed this important, we expect that the impact of mechanization on labour would be very different in those sectors of agriculture where such controls do not exist.

Clearly, what is needed is some comparative work investigating the relationships identified above. At present, the important role of market pressures for the impact of mechanization on farm labour is largely conjecture since we have not directly examined farms in which these pressures vary. Nevertheless, the findings to date are sufficient evidence to warrant the analysis being done.

Finally our analysis illustrates the danger of drawing conclusions about processes which operate on individual units, from data collected at a level where these units are aggregated. Although the availability of aggregated statistics makes such inferences common, it is necessary to be skeptical of the conclusions, particularly where the processes involved are complicated.

Technical appendix

The data on farm histories was treated as a series of discrete events identified by changes in type (i.e. change in mechanization, labour, etc.) and each type was characterized by different values (ie. increase, decrease or transformation). Each step of the analysis focussed on a pair of changes in which the first type of change is expected to influence the second. The first type of change and its value was specified (eg. an increase in mechanization) whereas the value of the second type of change was not identified for the selection procedure (eg. any change in labour). In general then, we can represent a particular string of events in the following way, where A represents the first

type of change and its value, and B represents the second type of change (B's value may be B or b).

B1 b2 A1 A2 b3 B4 b5 A3 b6 A4

time——————→

Dyads selected by the program from the sequence above would be:

A1-b3 A2-b3 A3-b6

A1-B4 A2-B4

A1-b5 A2-b5

In order to maintain some independence of effects for events of type A (ie. the first type of change), dyads are selected only up to the occurrence of a new type A event, so long as there are intervening B events. Thus, in our example above, dyads A1-b6 and A2-b6 were not selected since events b3, B4, and b5 intervened between A2 and A3. Both A1 and A2 are considered to be rather direct influences on events b3, B4 and b5, since the two events of type A are not separated by events of type B.

If events A and b are independent we expect that the proportion of A which are followed by b is equal to the proportion of b in the total sample [Pr(b | A)=Pr(b)]. To the extent that they are different, the assumption of independence of events can be questioned.

If we assume that the events are a random sample taken from a population, then we can calculate the likelihood of Pr(b | A) from the binomial probability distribution. This will give us a measure of statistical significance for our analysis.

The base frequencies (ie. the total number of dyads) differ in column 4 of Table 1, even though the first type of change remains the same, due to the manner in which the pairs of events are selected. If at the beginning of a farm history, the second type of change occurs but is not preceded by the first type of change, it is dropped from the analysis. Similarly, at the end of a farm history, a first type of change which is not followed by a second type is ineligible as part of a pair. This occurs for example, with events B1, b2 and A4 in the segment of events above.

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Comment/Commentaire

In search of communicative competence

For anyone who has ever relied upon a review for information on, or orientation to, a particular book, Professor Cyril Levitt's "review" of my book *Social Theory and Critical Understanding* (*CJS* 9(1): 98-102) must be a huge puzzle.

By Professor Levitt's own admission, I have written a polemical book on social theory. That was my intent. And I would have thought that, at the very least, as a reviewer he has a responsibility to *inform* readers about that book. Instead, we are given this thoroughly ambiguous, uninformative, and unfathomable soliloquy which does nothing to tell the reader what the book is about, never mind whether it has strengths or weaknesses, merits or demerits. Whatever else Professor Levitt's piece is, it is not a review as we have come to understand that process in academia.

Maybe there is a lesson in this for all of us. Seasoned sociologists have told me that they cannot decipher what Professor Levitt's piece is all about. If sociologists cannot communicate between themselves, what hope is there for "getting through," that is, communicating to the students whom we serve? At this rate we shall soon need reviewers of the reviewers.

University of Prince Edward Island G. Llewellyn Watson

Reply

In the first paragraph of my review of Professor Watson's book, I state his purpose in writing it, the method by which he hoped to accomplish this task, and its general orientation. In subsequent paragraphs, with specific reference to more than forty passages in the book, I raised the question of the author's competence in dealing with the works of Hegel, Marx, and Freud. If one is going to write about these thinkers, one must write about what they actually said.

In my treatment of this issue, I closely followed the form of presentation employed by Marx in his critique of Edgar Bauer's misrepresentation of the views of P.J. Proudhon (see "The Holy Family", *Marx-Engels Collected Works*, Vol. 4) and in his general polemics against the Young Hegelians (see

"The German Ideology", *Marx-Engels Collected Works*, Vol. 5). Anyone with a knowledge of these texts would immediately grasp the significance of my allusions in the review. The fact that Professor Watson and some "seasoned sociologists" cannot "decipher" what my piece is all about shows me that they are unfamiliar with these texts. This is precisely what I attempted to establish in my review in the first place. I find it difficult to understand how someone can write a book in which Marx looms so prominently without knowing the texts of Marx. I also note that Professor Watson in his reply did not address a single substantive issue which I raised.

I am a firm believer in "communicative competence," but what is at issue here is the *substantive competence* of the author in rendering the texts of deep thinkers accurately.

McMaster University Cyril Levitt