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THE LABOR SUPPLY OF SELF-EMPLOYED WORKERS: THE CHOICE OF WORKING HOURS IN WORKER CO-OPS

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ABSTRACT

If workers in cooperatives are like workers in conventional workplaces, they care about the length of their working hours. In this paper, their choice of hours is characterized as a conventional labor supply decision and a familiar hours-wage relationship is derived. This is estimated using mill-year observations on the plywood co-ops in the Pacific Northwest. The results are compared with those from the labor supply behavior of self-employed workers and with those in capitalist plywood mills.

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I. INTRODUCTION

This paper contributes to two literatures in economics. The first is the research on the supply of labor that focuses on the responsiveness of hours of work to wages. There is a huge body of work on this topic (Keane (2011)) and it will be drawn upon selectively to contrast the empirical results here with earlier findings. The second literature relates to the behavior of worker cooperatives, that is, enterprises owned and managed by those who work in them. In economics, the orthodox characterization of the behavior of the worker co-op is that it maximizes the net returns per member-worker. This monetary objective was proposed by Ward (1958) to contrast it with the profit maximization goal of the capitalist enterprise that is owned and managed (often indirectly) by the supplier of capital. Although the implications of Ward's hypothesis have been extensively examined by theorists, only rarely have these implications been confronted with observations

A more general objective is offered here for the worker co-op, one that follows Scitovsky's (1943) amendment of profit maximization that endows the capitalist entrepreneur with a utility function in which both monetary returns and working hours are arguments. Analogously, allowing the co-op to trade-off income for working hours implies a labor supply decision for the co-op workers and this trade-off is estimated below. As the co-op is a group of self-employed workers, all of whom work the same number of hours and earn the same hourly returns, their estimated labor supply behavior may be compared with that estimated for other self-employed individuals. If the hours of workers in co-ops are unrelated to their work incentives, Ward's maximand - net monetary returns per member-worker - is sustained.

The worker co-ops to be examined are those engaged in plywood production in the Pacific Northwest between 1968 and 1986. In the twentieth century, these enterprises constituted the most

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substantial worker-owned and worker-managed sector in United States manufacturing industry. After providing a brief description of these worker co-ops, the model will be outlined and then fitted to observations on these enterprises. On the assumption that the resulting hours-wage relationship reflects the preferences of plywood workers, the hours worked in co-ops are compared with the hours worked by employees in a conventional (capitalist) plywood mill. This comparison leads to the inference that hours are shorter in the capitalist mill than those preferred by plywood workers, a consequence of the higher wages that discourage the capitalist mill from selecting hours that workers prefer. In short, in the capitalist mill, the hours-wage relationship expresses the preferences of the owners or managers, not those of the workers.

II. THE PLYWOOD MILLS OF THE PACIFIC NORTHWEST

The establishment of the Olympia Veneer Company in 1921 is usually taken to represent the birth of the worker cooperatives in the plywood industry of the Pacific Northwest. It served as the paradigm for the worker-owned and worker-managed enterprises that were established in subsequent decades in the plywood industry. In the 1950s, almost one hundred percent of U.S. softwood plywood was produced in the Pacific Northwest and between one-quarter and one-fifth of that was made in the co-ops (Berman (1967), p.93). After that time, the importance of the Northwest in the U.S. production of plywood declined because of depletion of its old timber forests, environmental restrictions on logging, and the subsequent rising cost of logs. The use of southern pine for plywood allowed the South to displace the Northwest as the major region of plywood production in the U.S.[1] See Figure 1. So, with the empirical analysis restricted to mills producing plywood between 1968 and 1986, this is a study of firms in a declining industry in this location. As the industry contracted in the Pacific Northwest so many co-ops closed; some converted to conventional forms of organization. Whereas Berman (1967) surveyed 24 plywood co-ops in the Pacific Northwest in 1964, at the time of writing, I am able to

[1] "The total wood cost in the South is slightly less than in Oregon and Washington. Most of this difference is due to lower logging and hauling costs. The terrain in the South is much gentler than that in western Oregon and Washington, so all logging can be done by tractors/skidders." Oregon Forest Resources Institute (2012, p.70).

confirm only one of them still operating in Washington state.[2]

The research reported below relies upon 55 mill-year observations on eleven co-op mills in even-numbered years between 1968 and 1986. The set of observations is not balanced. The identity of the co-ops examined here are listed in Table 1 together with the dates of their birth and, if known, the dates of their demise. All these plywood co-ops were in Washington state.[3] Other information on these co-ops is supplied in Table 1 including their size and their capital equipment. By no means were these co-ops all the same and this will be recognized in the equations fitted below that allow for fixed differences among them.

The plywood co-ops conformed to the Rochdale principles that define the cooperative enterprise. All co-op members were workers in the enterprise and most workers (often, all workers) were members. Membership in a plywood co-op required the acquisition of a share and a probationary period of employment. The co-op member-workers were often referred to simply as "shareholders". One method for the exchange of shares was through the Business Opportunities section of the *Portland Oregonian* and an analysis of the prices of these shares is contained in Craig and Pencavel (1992) where it is shown that prices for these shares moved with the fortunes of the plywood industry. They also differed noticeably across the co-ops. Regrettably, these share prices could not be obtained for the Washington co-ops under study here.[4]

Each member had one vote in the co-op's decisions in selecting the directors from among the workers. The turnover of directors was high. In a co-op mill at a given moment, each worker received

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[2] This is Hardel Mutual Plywood in Chehalis which was described by another plant's manager as "still going strong".

[3] A number of plywood co-ops operated in Oregon and at least two in northern California, but the state of Washington conducted a survey of plywood mills every two years and this provided information on the output and raw material inputs of these mills. Oregon's mills contributed to the study of the co-ops' share prices (Craig and Pencavel (1992)), but information is lacking on their hours of work.

[4] "Regrettably" because the equation that is fitted below is interpreted as a labor supply equation, but as such it omits variations in non-labor income. A co-op worker's principal asset was his share in the company in which he worked and movements in the price of his share would serve as an indicator of variations in his wealth. Insofar as movements in the prices of shares are correlated with variations in the prices of log inputs and of plywood output, the addition of these variables to the equation fitted below leaves the negative coefficient on wages almost the same. This is evident from the estimates reported in Table 6 of Craig and Pencavel (1992).

the same hourly pay, the amount incorporating any dividends on common stock although, on the principle of only rewarding labor not capital, some co-ops prohibited the payment of dividends. Also, each worker worked the same number of hours.[5]

The principal constraints on each plywood mill were the price of its major input, logs, and the price of its output, plywood, both being beyond the control of any single mill. Most logs came from Federal and state forests and were sold at public auctions. Plywood is bought and sold on international markets and, in recent years, imports from east Asia have prompted calls from native plywood producers for protection. Log and plywood prices are volatile because the demand for plywood varies with home and office construction which is highly cyclical. Because mills used different varieties of wood, log and plywood prices varied across mills but much of the variation in these prices is over time.[6] Consequently, the wage paid out of net receipts to the co-op workers also varies with movements in the prices of logs and the prices of plywood. Illustrative of this is the following estimated regression equation which uses the 55 mill-year observations described below on the co-ops to relate the logarithm of the real hourly wage of co-op workers, $ln(w)$, to the logarithm of real log prices $ln(r)$ and the logarithm of real plywood prices $ln(p)$ controlling for fixed mill effects, υ_i:

$$ln(w)_{it} = \upsilon_i + \underset{(0.152)}{0.942}\, ln(p)_{it} - \underset{(0.154)}{0.252}\, ln(r)_{it} \qquad (1)$$

where heteroskedastic-consistent standard errors are in parentheses and the R^2 statistic is 0.577. Without the mill fixed effects, variations in $ln(p)_{it}$ and $ln(r)_{it}$ remove only 14 percent of the variation in $ln(w)_{it}$.

In the same industry, in the same region, and at the same time, conventional plywood mills

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[5] "Since the income a shareholder receives is based entirely on hours of work performed, equalization of hours worked and of overtime for all shareholders is carefully safeguarded so far as possible. Records are kept of time worked, and extra work is allotted to men who have worked fewer hours. Conversely, if a man has built up a total of hours of work too far above that of others, he may be forced to take a few days off." (Berman (1967, p. 153)

[6] Thus, for the 55 mill-year observations on co-op mills that are used below, 93.6 percent of the variation in the logarithm of log prices and 40.9 percent of the variation in the logarithm of plywood prices are removed by fixed year effects alone.

operated, conventional in the sense that the workers were supervised by managers hired by those who did not work in the mill and who supplied the capital. The production workers in most of these conventional plywood mills were covered by collective bargaining contracts although a few mills were non-union. The non-union mills tended to be small and they operated intermittently. The co-op mills and the conventional unionized mills were of comparable size and operated both in prosperous years and in years when plywood prices were low. There was little difference between the co-ops and the capitalist mills in the type of work involved: it was dirty, noisy, and dangerous that required much heavy lifting although there were opportunities for superior performance through workers' expertise and good judgment.[7]

The presence of these conventional mills allows for the reactions of the co-ops to changes in their price environment to be compared with the reactions of the conventional mills to these changes and this has been the subject of previous research. 102 mill-year observations on nineteen unionized mills are used below to compare with the co-op mills. Earlier research has reported that these plywood co-ops respond to shocks in input (log) prices and to output (plywood) prices by adjusting their wages, rather than by changing employment whereas the corresponding adjustments in the capitalist plywood mills tend to take the form of changing input and output quantities including employment.[8]

Along several dimensions, the workers within each plywood co-op were homogeneous and, moreover, procedures were adopted that cultivated such homogeneity: virtually all the workers were men,[9] jobs were rotated , and hourly pay and work hours were the same for all workers. Attendance at mill-wide meetings was usually high and member-workers were involved deeply in plant decisions. The similarity of workers eased decision-making and workers were more inclined to carry out decisions they helped to determine. In addition, the problems in formulating and executing the goals of an organization are less formidable when the individuals have similar values and are treated in a like manner. This similarity of the workers within the co-op makes the model-building exercise below more plausible than in other situations involving groups of individuals because the model neglects differences among the workers within the enterprise. Consider now the determination of work hours in the co-ops.

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[7] See, for example, Berman's account (1967, pp. 43-50).

[8] See Craig and Pencavel (1992) and Pencavel and Craig (1994).

[9] Gunn (1980, p. 395) reports a few non-shareholding women in office jobs.

III. HOURS OF WORK IN THE WORKER CO-OPS

First, did variations in working hours make a difference to the operations of co-ops? One simple way to answer this is to fit production functions to co-ops and ask whether variations in hours of work affected output and, indeed, whether these effects of hours differed from the effects on output of differences in the number of workers employed. That is, a common specification for estimating production functions combines hours of work, *H*, and employment, *E*, into a single variable: worker-hours, the product of the number of workers and average hours of work.[10] With a Cobb-Douglas production function, this implies a specification of the following sort:

$$ln(X)_{it} = \alpha_0 + \alpha_1 ln\,(E.H)_{it} + \alpha_2\,(other\ inputs)_{it} + \varepsilon_{1it} \qquad (2)$$

But this equation implies that a given proportional change in employment has the same effect on output (*X*) as the same proportional change in hours per worker. The effects of differences in hours on output may be distinguished from those of employment on output by fitting

$$ln(X)_{it} = \beta_0 + \beta_1 ln\,(H)_{it} + \beta_2\, ln(E)_{it} + \beta_3\,(other\ inputs)_{it} + \varepsilon_{2it} \qquad (3)$$

When equations (2) and (3) are fitted by least-squares to the mill-year observations on the plywood co-ops in the Pacific Northwest, the estimates of the key parameters are

$\alpha_1 = 0.507$	$\beta_1 = 0.431$	$\beta_2 = 0.674$
(0.179)	*(0.209)*	*(0.402)*

A given percent increase in working hours has a smaller effect on output than the same percent increase in employment, but variations in hours of work matter for production.[11] The model below is designed to determine the basis for these variations in working hours. In these data, although there are no variations in hours worked among the workers within each co-op, there are variations in hours worked across co-op mills in a given year and also variations in hours worked across years for each and every

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[10] Of course, another strategy in estimating production functions is to measure labor by the number of workers alone and to ignore hours of work as Defourny *et al.* (1992), Fakhfakh *et al.* (2012), and Jones (2006) appear to do in their research on the production functions of worker co-ops.

[11] These production functions also include the logarithm of the inputs of raw material logs, a measure of capital, mill fixed effects, and year fixed effects. Robust standard errors are in parentheses.

co-op mill. To account for these variations, the conventional model of labor supply is drawn upon to describe movements and differences in working hours in terms of variations in workers' returns to work.

Ward (1958) suggested that the behavior of the co-op be understood as selecting its inputs to maximize net returns to each member-worker. In his simplest version, there is only one variable input, the number of member-workers, E, and net returns per worker are distributed in the form of per worker wages, w , expressed as

$$w = \frac{pX(E) - C}{E}$$

Output is given by X, p is the price per unit of output, and C represents fixed costs. Ward's graphical representation is reproduced in Figure 2 where the curve $v\,v'$ equals the gap between gross revenues and costs divided equally among the workers. The employment that maximizes w is E_o in Figure 2.

Ward did not overlook hours worked per worker. He assumed explicitly that he was neglecting hours of work ".....to avoid introducing the marginal disutility of labor as an important constraint". To represent Ward's explanation graphically, suppose employment is fixed. This was not precisely the case in the plywood coops, but employment varied little over time. The number of member-workers was a long-term decision for each co-op and short-term adjustments in labor took the form of variations in hours per worker, H.[12] Recognizing the role of working hours and re-interpreting w as monetary returns per worker per hour, the specification of the hourly returns to each member-worker w become

$$w = \frac{p\ X(E,H) - C}{E.H} \tag{4}$$

In fact, equation (4) is the appropriate description of how net returns to plywood co-op member-workers were allocated: they were distributed among workers according to their hours of work. Figure 3 assumes employment is fixed and replaces the number of member-workers on the horizontal axis with

[12] A more general model would allow a co-op to react to changes in its economic environment by choosing between adjustments in hours per worker and in the number of workers. Because employment varied little in the plywood co-ops, this generalization is not pursued here. If a co-op's preferences were extended to cover employment, the approach used by Burdín and Dean (2012) might be fruitful.

the hours worked by each member-worker. w is now related to hours of work as in equation (4). The hours that maximizes per worker-hour monetary returns is H_O.

Now add indifference curves between income and working hours in Figure 3. Given the monetary returns to a worker as expressed by the curve $v\,v'$, the hours that maximize the well-being of co-op workers is H_1, hours at which take-home pay is lower than at H_O. In Ward's language, preferences over working hours constrain the selection of the hours that maximize monetary returns. If co-op workers did not care about the length of their working hours and maximized hourly monetary returns, the indifference map in Figure 3 would consist of a series of horizontal lines with the highest attainable indifference curve tangent to $v\,v'$ at H_0. To ascertain how the representation in Figure 3 of the worker co-op's behavior accords with the observations of the Pacific Northwest plywood co-ops, preferences over pay relative to working hours will be assumed given but variations over time and across mills in the slope of $v\,v'$ will allow the work-income preferences of the member-workers to be identified.

Suppose a co-op's utility function is given by $U = f(H, y)$ where H is each worker-member's working hours and y is each worker-member's income from work in the co-op.[13] The marginal utility from income is assumed positive and diminishing while marginal utility from hours of work is negative and diminishing. The co-op worker's income is $y = w.H$, the product of his hours of work, H, and his hourly earnings, w, as specified in equation (4). It is evident from equation (4) and from Figure 3 that w varies with H and, if hours are less than those at which earnings are a maximum, increases in H raise w. An expression describing this relationship between changes in H and the changes in w along $v\,v'$ in Figure 3 in the neighborhood of e is

$$w = g(H) = A\,H^{\theta}. \tag{5}$$

[13] From their careful examination of the plywood co-ops, Berman and Berman (1978, p. 703) added hours per worker to a co-op's objective function and wrote, "The ability of the firm to control and vary hours of work to adjust the labor input should be considered an integral part of worker-managers' decision-making authority". Berman (1977) recognizes the relevance of hours of work to a co-op and he endows each co-op member-worker with a utility function defined over labor income and hours of work. Towards the end of his article, Berman acknowledges that there are no differences among workers in work hours in a single plywood co-op. In this article, instead of a single worker being endowed with a utility function over earnings and hours, each co-op is endowed with such an objective function.

If the relationship between w and H resembles $v\,v'$ in Figure 3, then, around e, $A > 0$ and $0 < \theta < 1$.[14] The choice of work hours that maximizes the coop's utility function subject to equation (5) satisfies

$$-\frac{\delta f}{\delta H} = \lambda \frac{dy}{dH} = \lambda\left(w + H \frac{dg}{dH}\right) = \lambda w(1+\theta) \tag{6}$$

where $\lambda = \partial f / \partial y$ and $dg / d H = A\,\theta\,H^{\theta - 1} = \theta\,w\,H^{-1}$.[15]

For the coop's utility function, assume it takes the form of Houthakker's (1959) addilog:

$$U = f(H, y) = -B\,H^{\gamma} + \psi(y)$$

where $\gamma = w\,H > 0$ and ψ is increasing in y . In this case, equation (6) becomes

$$B\,\gamma\,H^{\gamma - 1} = \lambda\,w\,(1 + \theta)$$

Upon taking logarithms,

$$\ln H = (\gamma - 1)^{-1}\,[\ln \lambda + \ln(1 + \theta) - \ln(B) - \ln \gamma] + (\gamma - 1)^{-1} \ln(w) \tag{7}$$

Rearranging this equation and identifying what is assumed to vary across mills by the subscript i and what is assumed to vary over years by the subscript t ,

$$\ln H_{it} = c + \upsilon_i + \delta \ln(w_{it}) + \varepsilon_{it} \tag{8}$$

where $\delta = (\gamma - 1)^{-1}$, $c = \delta \ln(\lambda\,B^{-1}\,\gamma^{-1})$, and $\upsilon_i + \varepsilon_{it} = \delta \ln(1 + \theta_{it})$. υ_i represents fixed mill effects and ε_{it} is a random disturbance. Note that, in accordance with the earlier characterization of this procedure, the co-op's work-income preferences (embodied in γ, B, and λ) are assumed constant across mills and years while the wage-hours opportunities (expressed by θ and w) are assumed to differ over time and across mills. Evidently, in equation (8), with other things constant, the (uncompensated)

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[14] At a point such as e in Figure 3, $p\,E^{-1}(dX / d H) > w$ or the per worker value of the marginal product of hours exceeds hourly wages .

[15] Second-order conditions involve the properties of the $v\,v'$ curve in Figure 3 in addition to those of the utility function.

elasticity of working hours with respect to wages is $\delta = (\gamma - 1)^{-1}$ which may be positive or negative so that a dominant substitution effect or a dominant income effect is possible. Equation (8) is the starting point for estimation although restricted and augmented versions will be reported. Consider now the observations on the plywood co-ops that will be used to estimate δ in equation (8).

IV ESTIMATING THE PLYWOOD CO-OPS' LABOR SUPPLY EQUATION

Descriptive statistics on annual hours of work and real hourly wages (in 1967 dollars) on the co-op plywood mills[16] and, to provide a comparison, on the conventional unionized mills are provided in Table 2. There are 55 mill-year observations on eleven co-op mills and 102 observations on nineteen conventional unionized mills. At all points of the distribution of working hours in Table 2, the value for working hours in the co-ops exceeds the value for hours in the conventional unionized mills.[17] As is well known (Carrington, McCue, and Pierce (1996)), the self-employed tend to work longer hours than employees. In the case of the co-op workers, do they work longer hours because they shape their work environment and, as a consequence, are less averse to work than employees whose control over their workplace is more circumscribed? Or is the difference between the hours of co-ops and the hours of capitalist mills a reflection of self-selection: those workers who are less work shy are attracted to a cooperative enterprise?[18]

Because the co-op selects its monetary distributions to its member-workers as well as its working hours, it may be important to recognize this endogeneity in estimation and, where possible, this is done by using variations in the logarithmic price of output and in the logarithmic price of logs

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[16] The observations on hourly wages were not constructed by a researcher dividing net revenues per worker by hours worked. They are taken from the records of the mills themselves and represent average values over the year.

[17] Moreover, hours in the co-ops are right-skewed while those in the conventional mills left-skewed.

[18] The observations on co-op plywood mills are not distributed across years in the same way as our observations on conventional mills. Therefore, it may be important to control for this difference in computing the difference across mills in annual working hours. When this is done, workers in co-op mills work 33 percent more hours than workers in the conventional mills. The gap between hours in co-ops and those in non-union mills is even greater: 56 percent which reflects the fact that these non-union mills often operated for only part of the year.

as instrumental variables for $ln\ (w_{it})$.[19] These output and input prices are beyond the influence of any mill and they are the fundamental predetermined variables to which all mills, co-ops and conventional mills alike, must respond. However, they are weak instruments: variations in the logarithm of output prices and in the logarithm of log input prices remove only 14 percent of the variation in $ln\ (w_{it})$ in the co-ops. Persistent differences across co-op mills in their reserve policies and debt repayments account for a large fraction of the variation in $ln\ (w_{it})$ in these data. Hence, although some instrumental variable estimates will be reported, conventional least-squares will be the principal estimating method.

The point estimates in Table 3 of δ, the (uncompensated) elasticity of working hours in co-ops with respect to their wages, are all negative. None is estimated precisely, however, so that a wide range of values are consistent with these data. Indeed, several of these estimates are not significantly different from zero by conventional criteria which would imply that a typical co-op maintained working hours virtually unchanged in the presence of shocks to net returns. Because conventional F tests could not reject the hypothesis that, conditional on real wages, the year effects do not contribute significantly to the variation in the logarithm of working hours, the preferred single point estimates are those in rows 2 and 5 of Table 2 that control for correlated mill effects: these estimates are -0.175 and -0.103.

The null hypothesis that δ is zero is not the only interesting special case. If δ were -1, then a proportionate increase in hourly wages would leave annual earnings unchanged. In fact, by conventional criteria, almost all of the estimates of δ in Table 3 are significantly greater than -1. While an increase in hourly earnings reduces annual hours of work, the decrease in annual work hours still leaves annual earnings higher: if δ is -0.103 (as in row 5 of Table 3), a ten percent increase in w reduces annual work hours by one percent and raises annual earnings by nine percent.

The implications of the estimate of δ in row 5 of Table 3 for the familiar hours-wage supply function are drawn in Figure 4 in which working hours are relatively unresponsive to wages at high wages and low working hours and hours are more responsive to wages at low wages and long working hours.[20] This mild convexity from below is embedded in the double-logarithmic formulation of

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[19] As the error term in equation (8) incorporates variations in θ and as θ is involved in the wage-hours relation, equation (5), the concern about the correlation of wages with the disturbance in equation (8) is clear.

[20] The figure is drawn over those values of real wages observed in these data.

equation (8), but it raises the question of whether such a nonlinear hours-wage relationship would be revealed in a specification that allowed for a more flexible relationship.

To address that question, the observations were separated into two regimes: one regime corresponds to hourly wages less than the median of $3.30 and the second regime consists of observations with wages greater than $3.30. Spline functions were estimated that allow the hours-wages relationship at less than $3.30 to differ from the hours-wage relation at greater than $3.30.

Separate quadratic-in-wages equations were estimated to the observations in the two regimes subject to the constraints that the two quadratic equations meet at $3.30, the knot, where they also have the same derivatives. Descriptive statistics on hours and wages in the two regimes are provided in Table 4 from which it is apparent that, at almost every point in the wage distribution, hours are lower in the higher wage regime than in the lower wage regime.

The equation estimated is a quadratic-in-wages spline:

$$H_{it} = \upsilon_i + [\, a_1 + b_1 (w_{it} - w_0) + c_1 (w_{it} - w_0)^2 \,] D_{1it} + [\, a_2 + b_2 (w_{it} - w_1) + c_2 (w_{it} - w_1)^2 \,] D_{2it} + u_{it} \quad (9)$$

where D_{1it} takes the value of unity for observations where real wages are less than $3.30 and of zero otherwise while D_{2it} takes the value of unity for observations where real wages are greater than $3.30 and of zero otherwise. w_0 is set to 1.62, the lowest value observed and w_1 is the knot at $3.30. Mill fixed effects are given by υ_i and u_{it} is a disturbance term assumed to be randomly distributed. The least-squares estimates of the parameters in equation (9) (namely, a_1, b_1, c_1, a_2, b_2, and c_2) are reported in Table5 and Figure 5 draws the implied labor supply curve over the range of hourly wages observed.

The hours-wage relationship is negatively-sloped at relatively high and relatively low wages, but at between 2,000 and 2,100 hours (roughly 40 to 42 weekly hours) the relationship is close to vertical. In other words, at around 40 hours of work a week, changes in wages induce little change in working hours.[21] Earlier in this section, attention was drawn to the fact that the coefficient of variation in hours in the co-ops was lower than that of employees in the conventional firms. The inelasticity of

[21] The presence of a fixed effect for each mill in estimating equation (9) implies that the precise range of hours over which the fitted labor supply curve exhibits little elasticity differs across mills. The curve drawn in Figure 5 is for a mill at about the central tendency for hours with as many mills with longer hours as mills with shorter hours.

the estimated labor supply function of co-op workers at between 2,000 and 2,100 hours and where many hours observations are recorded [22] helps account for this narrower dispersion in the hours of co-op workers.

The elasticity of hours with respect to hourly wages implied by the estimates of the quadratic spline, equation (9), are graphed in Figure 6: most are negative and most are greater than -1, but at around 2,000 to 2,100 annual hours they gather around zero.[23] The estimated elasticities from fitting equation (8) - values of -0.175 to -0.103 - are well within the range of values in Figure 6.

This discussion has centered on the point estimates. Figure 7 presents a 95 percent confidence interval around the fitted labor supply of equation (9). Although lines with many different slopes and shapes may be drawn within these confidence intervals, one that cannot be drawn over the range of observed wages is a vertical line nor, *a fortiori*, a positively-sloped line.[24] Although a precise value has not been estimated, a negative hours-wage elasticity in worker co-ops appears to dominate. Is this plausible? One way to answer this is to consult the research on the elasticity of hours with respect to wages for other self-employed workers. Fortunately, there has been a number of such studies in recent years. This work has been prompted by the suspicion that many employees work in conditions in which their opportunity to change their working hours in response to alterations in their returns to work is meagre and that self-employed workers have much more scope for varying their work hours. In addition, instances in which employees have been presented with genuinely exogenous changes in wages to which they may adjust their hours of work have been hard to identify.

This has stimulated research on self-employed workers who face changes in the demand for

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[22] Almost one-third of observations on hours in the co-ops are in the one hundred hours interval between 2,000 and 2,100.

[23] In part, the labor supply curve in Figure 5 resembles the shape that Berman (1967, p.229) conjectured. From close study of the plywood co-ops' behavior. Berman wrote, ...the short-run supply curve for hours of labor for shareholder-workers might take the shape of a vertical line at the forty-hour-weekly point (showing shareholders willing to work forty hours over a wide range of wage rates), positively inclined at the top at some point of high wages (shareholders willing to take advantage of prosperity to work longer hours at higher wages), and negatively inclined at the bottom at some point of low wages (shareholders willing to work longer hours as wages decline, to obtain adequate total compensation while keeping the company competitive on costs)."

[24] However, the hypothesis that the labor supply curve is vertical at wages above $3.30 and negatively-sloped at wages below $3.30 cannot be rejected at conventional levels of significance.

their services that has given them the opportunity to alter their work behavior. This research has examined different dimensions of work such as whether the self-employed worker works for pay on a given day or when the worker stops paid work or how many hours the worker works. It is the last dimension of work - hours - that would provide the obvious comparison with these estimates of hours in the plywood co-ops.

For instance, there are several studies of the hours that taxi drivers work and, on this topic, the research of Ashenfelter, Doran, and Schaller (2010) most closely resembles the procedure in this paper. Their preferred estimate of the uncompensated elasticity of hours with respect to wages of New York taxi-drivers is -0.23 with a relatively small estimated standard error. With far fewer observations than those available to Ashenfelter *et al.*, the estimated elasticity in these plywood co-ops cannot claim to be estimated precisely though the finding of a dominant income effect appears to hold both for New York taxi drivers and for Pacific Northwest plywood co-op workers.[25]

Other empirical research on the hours worked of self-employed workers includes Boulier's (1979) analysis of non-salaried dentists. He found annual hours of these dentists were negatively related to the price of a tooth extraction, the elasticity being -0.049. Using 1,456 observations on 286 self-employed men from the Panel Study of Income Dynamics, Parker, Belghitar, and Barmby (2005) report a negative elasticity of annual hours of work with respect to hourly wages of -0.234 though this becomes imprecise when the standard deviation of past wages is introduced into the fitted equation. All in all, the finding of a negative wage elasticity of working hours reported in this paper for the plywood co-ops does not appear out of line with wage elasticities estimated for other self-employed workers.

Hours, Wages, and Changes in Mill Ownership

Finally, what does the hours of work equation estimated to the co-op observations imply about the hours worked of workers in the capitalist mills? This is not straightforward to answer because of the presence of mill-specific intercepts that account for the hours worked in each mill to be different from those worked in other mills. Conveniently, over this period, two mills converted from one form of organization to the other. Therefore, in two instances, hours and wages are observed for the mill as a co-op and hours and wages are observed for this same mill as a capitalist enterprise. One mill

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[25] Camerer, *et al.* (1997) also report a negative-inclined wage-hours relationship for taxi-drivers though Farber (2005) faults their instrumental variable procedure.

converted from a co-op to a capitalist enterprise[26] and a second mill converted from a conventional mill to a co-op.[27] In each case, the average wages and the average hours are calculated over the two years each was a co-op and over the adjacent two years when the mill operated as a conventional unionized plant. In each instance, estimates from fitting equation (9) to the coop mills are used as those values of hours that are "preferred" by the workers at these given wages. By how much do actual hours in the union mills diverge from those "preferred" at these wages where the implications of the estimates of equation (9) define those that are "preferred". The results are shown in Table 6.

When each mill operated as a capitalist workplace, the workers were covered by a region-wide collective bargaining agreement negotiated by the International Woodworkers of America and an association of employers. In one instance, substantially higher wages obtained relative to those in the co-op. Presumably, the higher wages reflect the effect of the union on wages in a bilateral monopoly setting. The collective bargaining agreement allowed for local differences in the terms of the agreement and the employers' association ensured that its members retained their "right to manage" (including their determination of working hours) in their plants.

In the top panel (PANEL A) of Table 6, the actual values of annual hours and real wages for Peninsula Plywood are recorded averaged over the two years when the mill is observed as a co-op (namely, 1968 and 1970) and over the adjacent two years (1972 and 1974) when the mill became a conventional firm covered by a collective bargaining agreement. Evidently, upon conversion from a co-op to a unionized mill, real wages changed negligibly but hours of work fell substantially. Because real wages changed little, the hours implied by the estimates of equation (9) also changed little but a large gap opened up between actual hours and preferred hours: at the wage of $3.723 the plywood workers in the capitalist mill would have preferred to have worked over 800 more hours than they did.

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[26] This mill was Peninsula Plywood Corporation of Port Angeles, Washington founded as a workers' co-op in 1941. It was sold to ITT Rayonier Inc. in April 1971. (The decision to sell was "opposed by many of the shareholders" although "a PenPly working share of $1,000 in 1941 grew to be worth $300,000 in 1971".) It operated as an affiliate of ITT Rayonier until 1989 when it became K Ply, after its acquisition by Klukwan, Inc. This closed in 2007. See Plywood Pioneers Association (2001) and accounts in the *Peninsula Daily News* online.

[27] This mill was Anacortes Veneer which opened in 1939 as a co-op. Subsequently, it was bought by the Forest Products division of the Times-Mirror Corporation. It converted back to a co-op in the 1980s before closing in 1992. Gunn (1986, pp. 347-8) mentions its reconversion.

It might be thought that this inference - that the workers in the capitalist mill would have preferred to work more hours at the given wage rate - is implausible. However, when the Current Population Survey has asked employees whether they would like to work the same or fewer or more hours at the same hourly wage, over one quarter express a preference for more hours. See Goldenand Gebreselassie (2007).

In the bottom panel (PANEL B) of Table 6, the actual values of annual hours and real wages for Anacortes are provided averaged over the last two years (1978 and 1980) when the mill was operated as a division of the Times-Mirror Corporation and over the first two years (1984 and 1986) when the mill reverted to a co-op. Evidently, real wages fell substantially in moving from a mill covered by a collective bargaining agreement to one not so covered but hours of work rose. In 1978 and 1980, when the mill was unionized and real wages high, the workers would have chosen to work fewer hours than they did (the gap between actual and predicted hours is 185). Upon becoming a co-op and selecting their work hours and their pay, the workers opted for lower hourly wages and longer hours. As a co-op, the gap between actual and preferred annual hours narrows to about a week's hours.

Therefore, on the assumption that the estimates of the hours-wage relationship fitted to the observations on the co-ops and reported in Table 5 represent the plywood workers' preferences (conditional upon real wages), there are large differences between the hours actually worked by employees in capitalist mills covered by a region-wide collective bargaining agreement and the hours they would prefer at these wages. Thus, the gaps between actual and preferred hours are smaller when each mill operates as a co-op and larger when each mill is a capitalist workplace. These gaps are greater in the capitalist workplace because the hours in the capitalist mills reflected the preferences of the owners and the management - and their demand for hours was negatively-related to the collectively-bargained wages.[28] In the co-op mills, the negative relation between hours and wages in the coop plants reflected the preferences of the workers and a dominant income effect on hours of wage differences.

[28] On the demand for hours in capitalist mills, see the estimates in Pencavel and Craig (1994).

V. CONCLUSIONS

The determination of working hours in cooperatives has been a neglected topic of empirical research in the literature on democratic firms.[29] Yet, because the actions of worker co-ops reflect their preferred responses to shocks to their economic environments without being compromised by the preferences of a firm's capital owners and hired managers, the actions of worker co-ops offer an attractive setting to map the work-income preferences of workers. Workers in these co-ops set their work hours and the ultimate constraints on their actions were prices outside their influence.

Using different specifications and functional forms, the empirical work in this paper on the plywood cooperatives in the Pacific Northwest suggests that their hours and wages tend to be negatively associated implying the income effect of a wage increase exceeds the substitution effect. However, most estimates imply that an improvement in market conditions permitting an increase in hourly wages does not reduce annual hours of work sufficiently to cause a reduction in annual earnings. There is evidence of a vertical labor supply curve at hours around 40 hours a week. For those scholars engaged in research on labor supply, there is here a suggestion of an emerging empirical regularity: the labor supply functions of self-employed workers tend to be negatively-sloped with respect to their wages.

For scholars engaged in research on co-ops and attracted to Ward's hypothesis of the co-op's income per member-worker maximization, the imprecision of the estimates here allows these scholars to retain their adherence to Ward's model. Scholars who find that Ward's focus on a monetary objective misses the important non-pecuniary benefits of the cooperative venture, the use of a utility function for the co-op that incorporates working hours and perhaps other aspects of work may be a welcome development that is amenable to further empirical application.

During the period of analysis, two mills converted from one type of ownership to another and this allows for the examination of the change in hours of work <u>in the same plant</u> when the identity of the owners switches between worker-owners and capital-owners (or their representatives). In both instances, working hours are lower when the mill is owned by those who supply the capital than when

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[29] Craig and Pencavel's (1993, p. 307) article on the objectives of worker cooperatives concluded ".....that earnings, hours, and employment all enter the cooperatives' objectives." This result was arrived at through a different procedure from the more conventional one used in this paper. Nevertheless the conclusions of the two papers are not at variance.

the mill is owned by the rank-and-file workers in the plant. When these mills were conventional capitalist workplaces, the employees were covered by a multi-employer collective bargaining agreement and the hours of work are those chosen by management in response to the wage specified in the union-management contract. To the capitalist management, the hourly wage is a cost whose effects on the owner's net revenues can be moderated by cutting hours of work; to the worker co-op, the hourly wage is a factor in a worker's income and the effects on his income can be enhanced by working longer hours. The wage plays a different role in the objectives of the two ownership forms.

This illustrates the important and long-acknowledged point that the interpretation of the hours-wage relation requires attention to the issue of identification: is this a demand function or a supply function or neither? In the case here, with observations at the workplace level, the identification problem is resolved by specifying the decision-makers: the member-workers in the co-op mill and the capital owner-managers in the capitalist mill. In other cases, the decision-makers may not be so clearly determined.

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Table 1

Characteristics of the Eleven Plywood Co-operatives in Washington State Used in this Study

name	year			capacity in million sq. ft.	number of		
	started as a co-op	plant built	closed as a co-op		lathes	driers	presses
North Pacific	1949	1921	?	55	1	3	2
Peninsula	1941	1941	1971	96	2	3	3
Anacortes	1939	1939	1992	128	2	3	3
Buffelen	1955	1916	1991	50	2	3	4
Everett	1951	1923	?	125	2	4	3
Puget Sound	1942	1942	?	120	2	3	2
Fort Vancouver	1955	1928	1996	125	2	4	3
Hardel Mutual	1952	1947	still open	39	1	2	2
Hoquiam	1955	1947	2012	36	1	1	1
Stevenson Co-Ply	1955	1949	1992	60	2	2	1
Mt. Baker	1950	1950	1992	60	2	2	2

Most of this information is drawn from Appendix A of Berman (1967) and describes these mills in 1964. The conversion of a conventional mill to a co-op is indicated when the year of "plant built" differs from the year "started as a co-op". The entry "?" means that information could not be found to specify the year the mill closed. Buffelen stopped producing plywood in 1991 and now specializes in doors.

Table 2

Descriptive Statistics on Annual Hours of Work and Real Hourly Wages

in Worker Co-ops and in Conventional Mills

	Coop mills		Conventional unionized mills	
	annual hours	real wages	annual hours	real wages
minimum	1.232	1.628	0.864	1.030
25th percentile	1.960	2.947	1.758	3.691
median	2.048	3.299	1.912	4.132
mean	2.086	3.361	1.860	4.364
75th percentile	2.265	3.781	2.000	4.758
maximum	2.920	5.371	2.840	10.031
coefficient of variation	0.145	0.209	0.158	0.269

Hours are expressed in thousands of annual hours and wages in 1967 dollars.

Table 3

Estimates of δ in Equation (8) Fitted to 55 Mill-Year Observations on Worker Co-ops

row		Point estimate (standard error) of δ	R^2
1	OLS excl. mill & year fixed effects	-0.086 (0.076)	0.016
2	OLS incl. mill fixed effects	-0.175 (0.061)	0.424
3	OLS incl. mill & year fixed effects	-0.259 (0.115)	0.559
4	INV excl. mill & year fixed effects	-0.006 (0.106)	
5	INV incl. mill fixed effects	-0.103 (0.113)	
6	INV incl. mill & year fixed effects	-0.374 (0.369)	

Heteroskedastic-consistent estimated standard errors are in parentheses.

Table 4

Descriptive Statistics on Annual Hours and Hourly Real Wages for Observations in the Lower Wage Regime (<$3.30) and in the Higher Wage Regime (> $3.30)

	Real Wages < $3.30		Real Wages > $3.30	
number of observations	27		28	
	hours	wages	hours	wages
mean, μ	2.120	2.815	2.054	3.900
median, M	2.088	2.935	2.040	3.782
1st quartile, Q_1	1.952	2.652	1.976	3.564
3rd quartile, Q_3	2.400	3.149	2.164	4.179
minimum	1.232	1.628	1.512	3.305
maximum	2.920	3.293	2.568	5.371
standard deviation, σ	0.377	0.437	0.212	0.476
σ / μ	0.178	0.155	0.103	0.122
$[1/2(Q_3 - Q_1)] \div M$	0.107	0.085	0.046	0.081

Hours are expressed in thousands of annual hours and hourly wages in 1967 dollars.

Table 5

Least-Squares Estimates of the Coefficients (and Estimated Standard Errors in Parentheses) of the Quadratic-in-Wages Spline Function

Least-Squares Estimates of Equation (9)				
parameters	estimate		parameters	estimate
< $3.30 regime			**> $3.30 regime**	
a_1	2.676 (0.248)		a_2	2.063 (0.080)
b_1	-0.856 (0.361)		b_2	0.127 (0.144)
c_1	0.293 (0.139)		c_2	-0.137 (0.103)
goodness of fit statistics: $R^2 = 0.497$; see = 0.247				

Table 6

Average Hourly Real Wages and Annual Hours Worked (Actual and Implied) for Two Mills that Changed Their Ownership Structure

PANEL A	**Peninsula Plywood**			
mill as a....	observed average real hourly earnings	observed average work hours	preferred hours given wages	observed minus preferred hours
....co-op	$ 3.734	2,580	2,621	- 41
...capitalist	$ 3.723	1,804	2,622	-816
difference	$0.011	850	-1	775

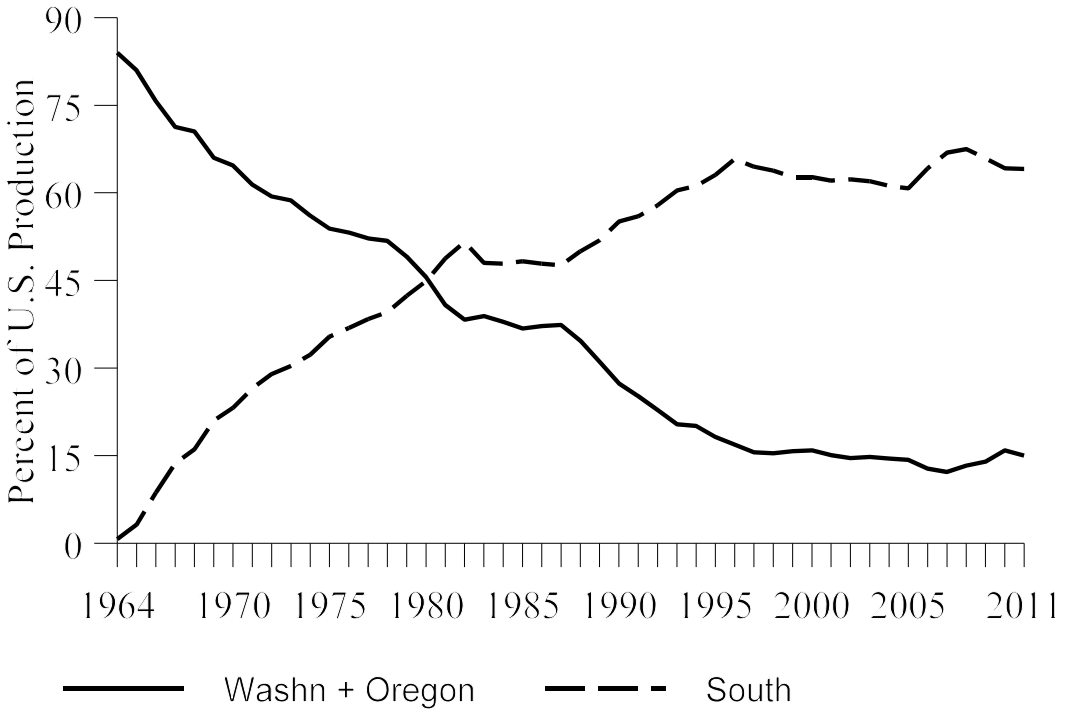
In PANEL A, the observed values for the co-op are the average of the years 1968 and 1970. The observed values for the capitalist mill are the average of 1972 and 1974. The line "difference" means the co-op value minus the capitalist value.

PANEL B	**Anacortes Veneer**			
mill as a....	observed average real hourly earnings	observed average work hours	preferred hours given wages	observed minus preferred hours
....co-op	$ 2.201	1,808	1,766	42
...capitalist	$ 4.489	1,700	1,515	185
difference	-$2.288	108	251	-143

In PANEL B, the observed values for the co-op are the average of the years 1984 and 1986. The observed values for the capitalist mill are the average of 1978 and 1980. Observations for 1982 are unavailable. The line "difference" means the co-op value minus the capitalist value.

Figure 1

Softwood Structural Panel Board Production: Percent of Total U.S. Production of Plywood from Washington and Oregon and from Southern States, 1964-2011



Softwood structural panel board production includes plywood, waferboard and oriented strand board. The Southern States are Alabama, Arkansas, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Texas, Virginia, and West Virginia. From U.S. Forest Service, Pacific Northwest Research Station, Production, Prices, Employment, and Trade in Northwest Forest Industries All Years, http://www.fs.fed.us/pnw/ppet/

Figure 2

Ward's Proposed Optimal Employment of the Worker Co-op

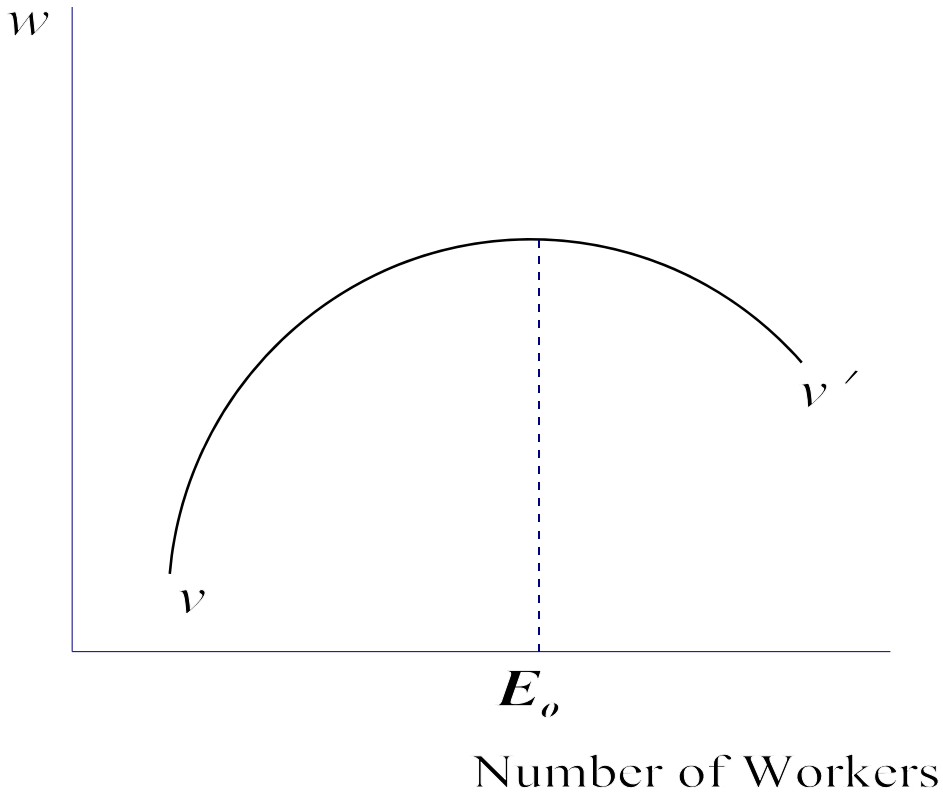
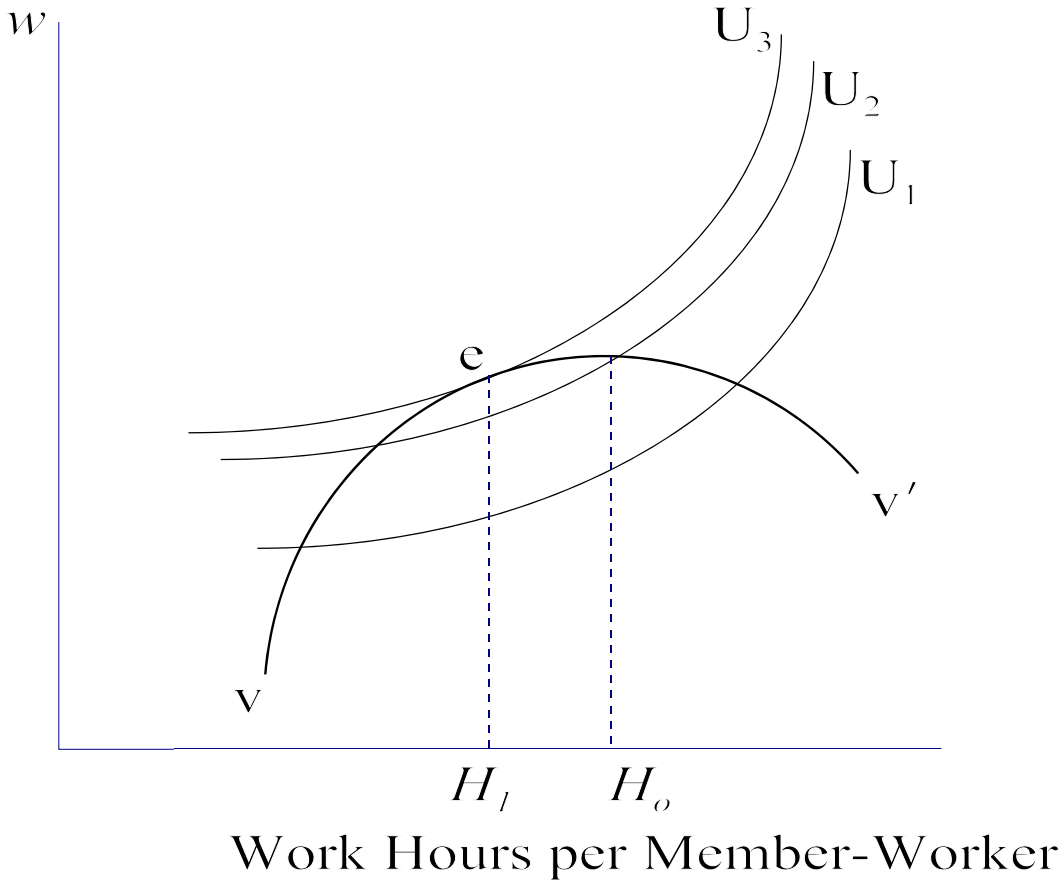


Figure 3

A Worker Co-op's Utility Maximizing Choice of Hours



Notes to Figure 3: U_1, U_2 and U_3 are indifference curves between hourly earnings and working hours such that U_3 is preferred to U_2 which, in turn, is preferred to U_1. H_o denotes the hours of work per worker that maximizes net returns per worker but, given work preferences, these hours are too long and the co-op's members prefer shorter working hours of H_1 even though their take-home pay is lower.

Figure 4

Labor Supply Curve of Worker Co-ops Implied by the Estimates in Row 5 of Table 3

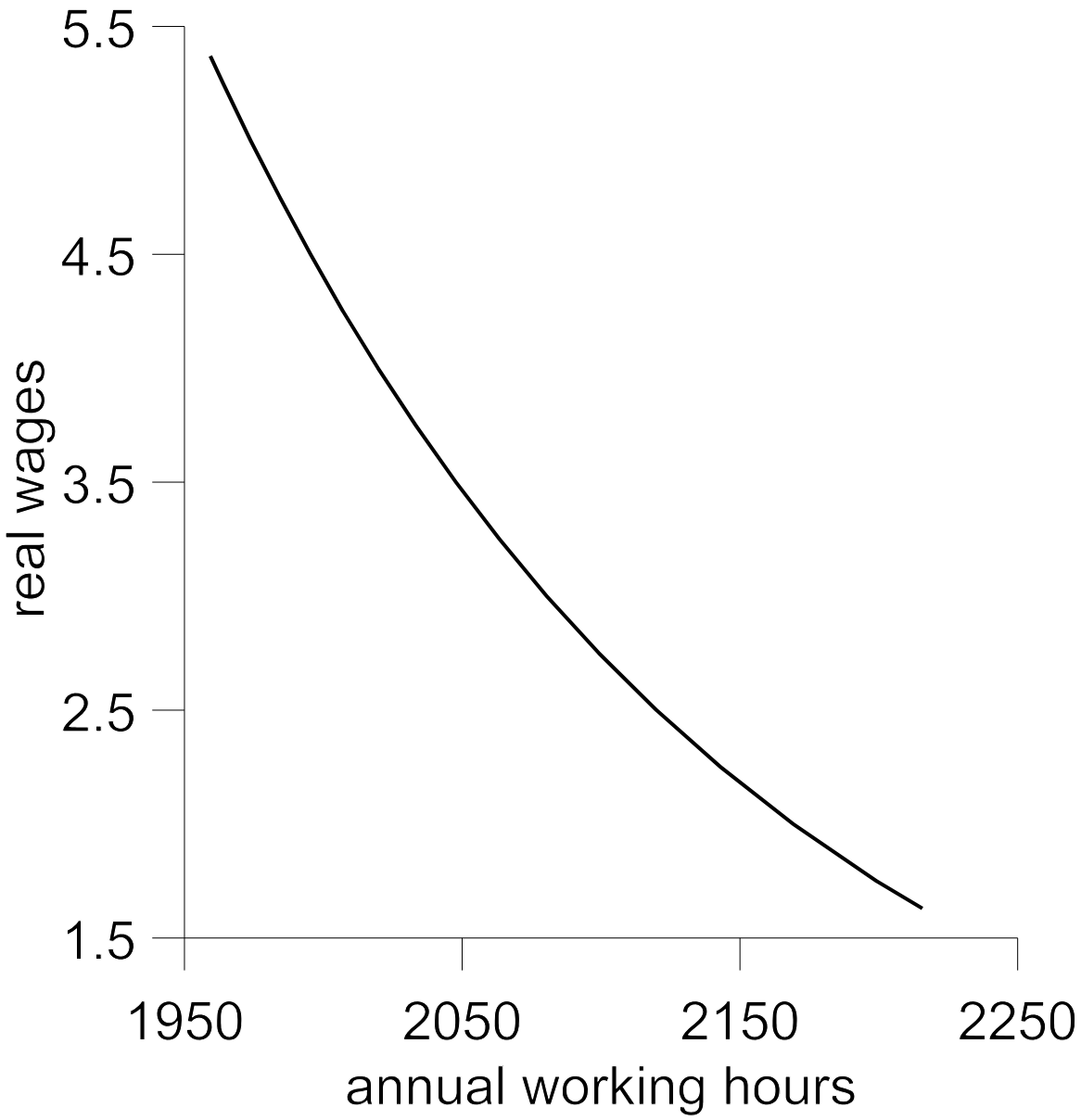


Figure 5

Labor Supply Curve of Worker Co-ops as Implied by the Fitted Quadratic-in-Wages Spline

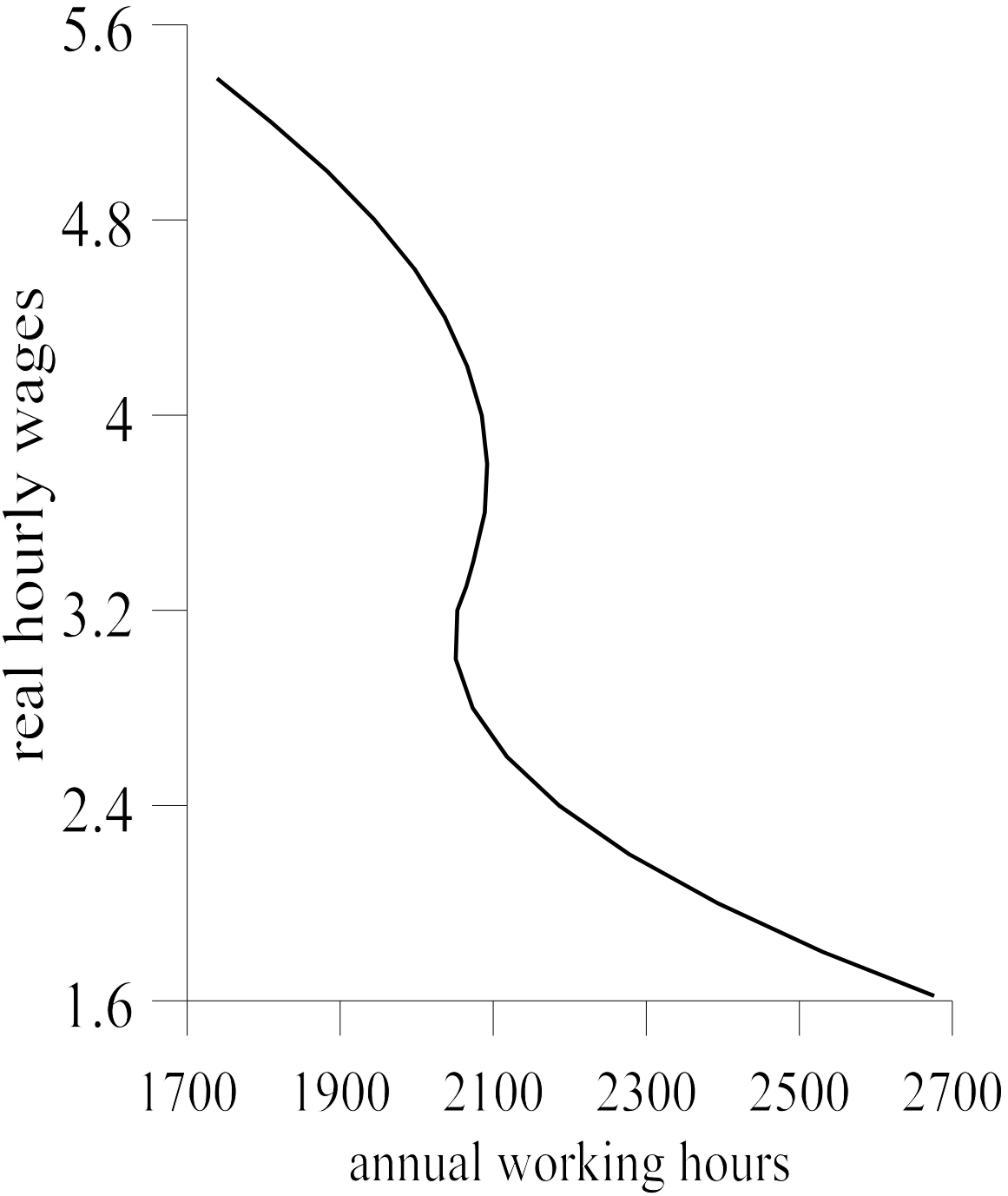


Figure 6

Elasticity of Hours of Work with respect to Wages Evaluated at Different Points on the Labor Supply Curve Implied by the Quadratic-in-Wages Spline Estimates

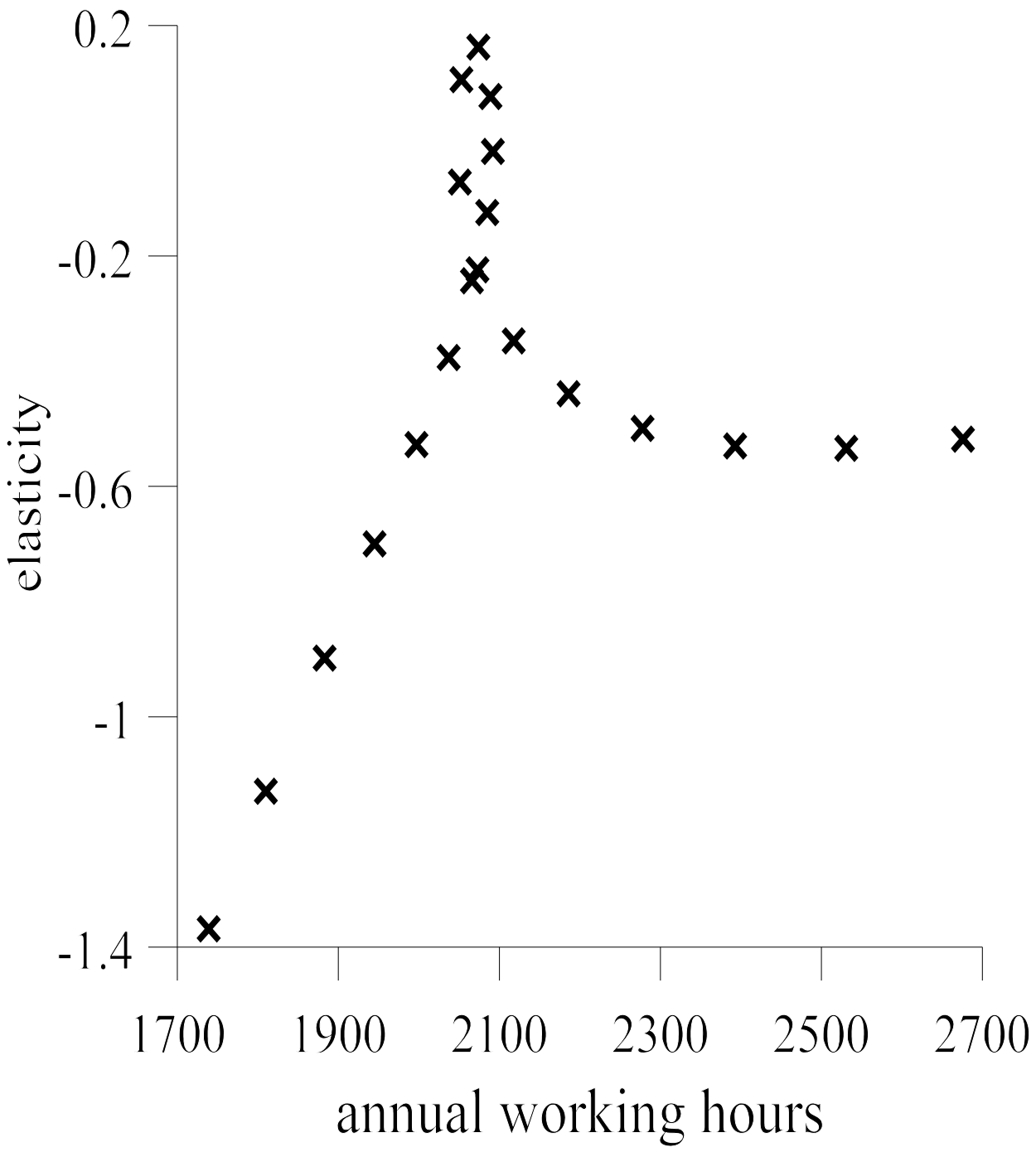
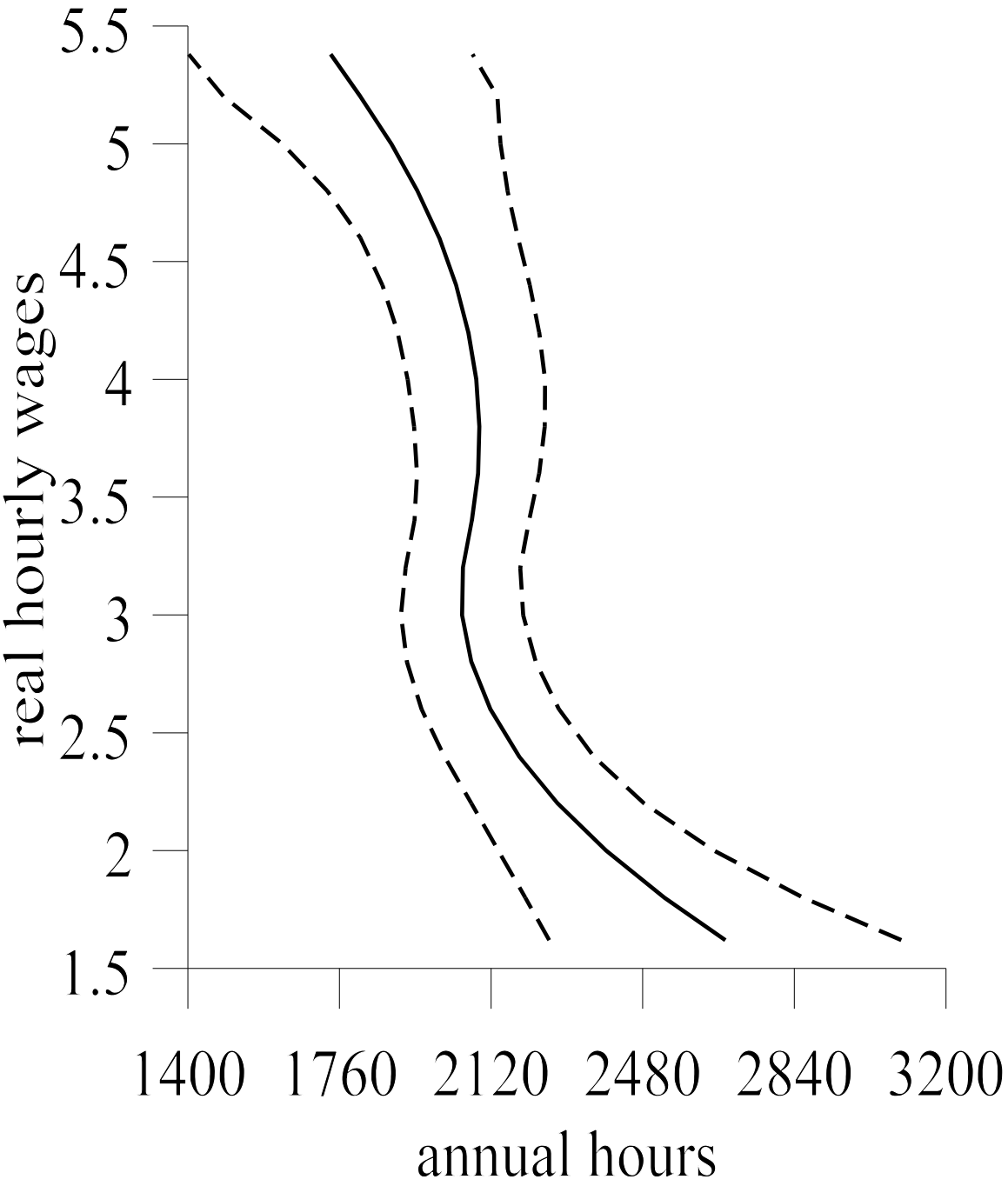


Figure 7

Ninety-Five Percent Confidence Intervals around the Labor Supply Curve of Worker Co-ops from the Implied Quadratic-in-Wages Spline



DATA APPENDIX

My thanks to the following people for help in the collection of these data: Ben Craig, Katrina Berman, David Larson, Don Traux, Cheryl Erickson, Dory Leach, James Norgard, and Robert Anderson.

In the tables below.....

.....MILLNO attaches a number to each mill

....MaxLathe is the length in feet of the mill's largest lathe in the year specified

.....HOURS is the average annual hours worked per worker computed as the hours worked per day times the number of days of operation

.....EMP is the number of workers in the mill averaged over the weeks of the year

.....Inputs of logs is the quantity of raw material logs used by the mill in that year where log are measured in thousands of feet

.... Real Output is the annual aggregate output in square feet of softwood plywood and veneer. Plywood and veneer are aggregated using region-specific prices and then deflated by a producer price index.

Input/Output Quantities for Co-op Mills - Observations numbered 136 - 156

Obs	Mill No.	Year	Max Lathe	HOURS	EMP	Inputs of logs	Real Output
136	21	1970	72	2088	466	29000	0.20561
137	21	1972	72	2080	465	40000	0.18444
138	21	1974	72	1480	406	20000	0.07867
139	23	1980	100	2400	339	36000	0.17161
140	23	1982	100	1952	323	33387	0.14702
141	23	1984	100	1960	317	33142	0.15716
142	23	1986	60	2400	329	19000	0.18725
143	29	1968	72	1760	136	10000	0.07350
144	29	1972	72	2120	148	7090	0.07951
145	29	1976	72	2016	161	2998	0.08172
146	29	1978	72	2016	159	6690	0.08207
147	29	1980	missing	1992	142	1460	0.07383
148	38	1968	60	2168	232	20000	0,14087
149	38	1970	72	1960	236	17500	0.13437
150	38	1972	60	2000	238	23000	0.15116
151	38	1974	62	2520	227	21420	0.10358
152	38	1976	60	2200	254	25700	0.14876
153	38	1978	60	1920	254	29101	0.15668
154	38	1980	60	1896	245	24190	0.13372
155	38	1982	60	1920	238	21843	0.13494
156	38	1984	70	2048	246	23000	0.13435

Wage/Price Observations on Co-op Mills - Observations numbered 136 - 156

Obs	Mill No	Year	real wage	real log price	real output price
136	21	1970	2.8490	85.222	97.445
137	21	1972	3.5301	93.888	123.133
138	21	1974	2.8197	143.627	127.570
139	23	1980	3.7839	107.415	126.020
140	23	1982	2.9351	107.988	97.639
141	23	1984	3.2933	83.176	98.549
142	23	1986	2.1730	84.879	95.083
143	29	1968	3.6993	95.977	124.002
144	29	1972	3.8657	91.890	123.133
145	29	1976	4.2988	150.858	143.755
146	29	1978	4.7595	119.359	166.027
147	29	1980	3.9278	131.735	126.020
148	38	1968	3.8032	95.977	124.002
149	38	1970	3.4904	85.222	97.445
150	38	1972	4.3135	93.888	123.133
151	38	1974	2.6520	143.627	127.570
152	38	1976	3.1752	121.508	143.755
153	38	1978	4.4560	119.359	166.027
154	38	1980	2.9515	122.413	126.020
155	38	1982	2.8429	104.526	97.639
156	38	1984	3.2867	72.820	98.549

Input/Output Quantities for Co-op Mills - Observations numbered 157 - 173

Obs	Mill No.	Year	MaxLathe	HOURS	EMP	Inputs of logs	Real Output
157	38	1986	60	2008	243	28610	0.14892
158	4	1968	108	2000	249	7000	0.11024
159	4	1972	108	2320	230	8145	0.13010
160	4	1980	72	2040	285	12000	0.11441
161	4	1982	77	2400	251	8000	0.10722
162	4	1986	60	2496	252	14545	0.12700
163	5	1968	108	2240	405	59672	0.17244
164	5	1970	108	2920	369	28182	0.15725
165	22	1980	missing	1232	244	1200	0.06180
166	31	1968	82	2360	232	25000	0.10718
167	31	1972	82	2744	227	22733	0.11210
168	31	1976	86	2000	207	28291	0.11205
169	31	1978	84	2568	237	28528	0.13450
170	31	1980	86	2160	305	20000	0.08580
171	31	1982	86	2288	259	26000	0.16380
172	31	1984	80	2000	266	28000	0.12589
173	31	1986	84	2000	309	30000	0.15777

Wage/Price Observations on Co-op Mills- Observations numbered 157 - 173

Obs	Mill No.	Year	real wage	real log price	real output price
157	38	1986	3.0479	74.461	95.083
158	4	1968	3.4137	91.178	124.002
159	4	1972	3.9151	91.890	123.133
160	4	1980	3.7398	122.413	126.020
161	4	1982	2.1832	104.526	97.639
162	4	1986	1.6284	74.461	95.083
163	5	1968	4.2971	86.379	124.002
164	5	1970	3.1711	79.196	97.445
165	22	1980	2.8677	122.413	126.020
166	31	1968	2.8058	95.977	124.002
167	31	1972	3.2260	98.682	123.133
168	31	1976	5.3714	149.684	143.755
169	31	1978	3.6374	133.190	166.027
170	31	1980	3.6753	107.415	126.020
171	31	1982	2.6817	107.988	97.639
172	31	1984	3.0881	83.176	98.549
173	31	1986	3.1489	84.879	95.083

Input/Output Quantities for Co-op Mills - Observations numbered 184 - 200

Obs	Mill No.	Year	Max Lathe	HOURS	EMP	Inputs of logs	Real Output
184	13	1976	missing	1928	348	missing	0.06211
185	13	1978	missing	1800	369	missing	0.07758
186	13	1980	missing	1512	279	missing	0.05611
187	13	1982	missing	1856	262	missing	0.07285
188	13	1984	missing	1728	354	missing	0.06914
189	25	1980	missing	2250	230	missing	0.15874
190	25	1982	missing	2080	252	missing	0.17112
191	25	1984	missing	2400	240	missing	0.17380
192	25	1986	missing	2280	236	missing	0.20200
193	29	1982	72	2040	145	missing	0.08520
194	29	1984	72	2064	150	missing	0.09464
195	29	1986	missing	1968	174	missing	0.12104
196	14	1984	missing	1440	183	missing	0.05665
197	14	1986	missing	2176	256	missing	0.13123
198	22	1982	missing	2400	157	missing	0.10726
199	22	1984	missing	2056	160	missing	0.11274
200	22	1986	missing	2088	182	missing	0.12483

Wage/Price Observations on Co-op Mills - Observations numbered 184 - 200

Obs	Mill No.	Year	ID	real wage	real log price	real output price
184	13	1976	13/76	3.6349	121.508	71.907
185	13	1978	13/78	4.0615	119.359	71.920
186	13	1980	13/80	3.5428	122.413	71.583
187	13	1982	13/82	2.9800	104.526	62.647
188	13	1984	13/84	4.4800	72.820	58.353
189	25	1980	25/80	4.0137	122.413	126.020
190	25	1982	25/82	3.5856	104.526	97.639
191	25	1984	25/84	3.2832	72.820	98.549
192	25	1986	25/86	3.7804	74.461	95.083
193	29	1982	29/82	3.3065	112.487	97.639
194	29	1984	29/84	3.3047	72.820	98.549
195	29	1986	29/86	3.1193	72.009	95.083
196	14	1984	14/84	2.5655	72.820	98.549
197	14	1986	14/86	1.8374	74.461	95.083
198	22	1982	22/82	2.9767	104.526	97.639
199	22	1984	22/84	3.3836	72.820	98.549
200	22	1986	22/86	2.4048	74.461	95.083

Hours and Real Wages of Unionized Capitalist Mills - Observations numbered 34-55

Obs	Mill No.	Year	HOURS	EMP	real wage	real log price	real output price
34	7	1970	864	142	2.4289	85.222	97.445
35	7	1972	2016	197	3.2671	93.888	123.133
36	7	1974	2000	209	3.1115	143.627	127.570
37	10	1970	2400	151	2.5358	69.727	97.445
38	10	1972	2032	147	3.6722	79.105	123.133
39	10	1974	2144	224	3.4269	108.398	127.570
40	10	1976	1888	219	4.6215	126.791	143.755
41	10	1978	2400	227	3.8691	119.871	166.027
42	10	1980	2488	192	3.3542	85.932	126.020
43	10	1982	1664	204	3.113	96.912	97.639
44	10	1984	2592	204	3.1626	80.911	98.549
45	10	1986	2840	172	2.8653	76.606	95.083
46	12	1968	2000	235	3.9841	95.977	124.002
47	12	1970	1912	220	3.9411	78.335	97.445
48	12	1972	2000	220	3.3026	98.682	123.133
49	12	1974	1976	190	4.6209	135.497	127.570
50	15	1974	2000	160	4.1268	135.497	127.570
51	15	1976	2000	135	4.3282	149.684	143.755
52	15	1978	2000	208	3.7594	133.190	166.027
53	16	1976	1976	308	4.6318	121.508	143.755
54	16	1978	1920	355	3.9082	119.359	166.027
55	16	1980	1600	306	4.1455	122.413	126.020

Hours and Real Wages of Unionized Capitalist Mills - Observations numbered 56-75

Obs	Mill No.	Year	HOURS	EMP	real wage	real log price	real output price
56	16	1982	1584	258	4.0448	104.526	97.639
57	16	1984	1760	222	4.2164	72.820	98.549
58	17	1972	1920	144	7.8709	98.682	139.673
59	17	1974	1760	138	5.8382	135.497	156.228
60	17	1976	2000	100	6.4203	149.684	162.128
61	17	1978	2080	211	3.6957	133.190	185.647
62	17	1980	1496	162	6.0415	107.415	146.044
63	17	1982	1336	154	6.1065	107.988	98.954
64	18	1976	2016	195	3.6758	121.508	143.755
65	18	1978	1984	246	4.1077	119.359	166.027
66	18	1980	1832	217	4.2803	122.413	126.020
67	18	1982	1208	163	1.0300	104.526	97.639
68	18	1984	2280	266	3.5149	72.820	98.549
69	18	1986	2016	301	3.1147	74.461	95.083
70	20	1968	1224	435	7.0308	95.977	124.002
71	20	1970	1888	230	5.5400	86.943	97.445
72	20	1972	1896	380	4.7983	91.890	123.133
73	20	1974	1816	242	7.447	138.884	127.570
74	20	1976	1912	351	4.4985	150.858	143.755
75	20	1978	1864	330	4.5855	119.359	166.027

Hours and Real Wages of Unionized Capitalist Mills - Observations numbered 76 - 96

Obs	Mill No.	Year	HOURS	EMP	real wage	real log price	real output price
76	20	1980	1328	304	4.5396	131.735	126.020
77	20	1982	1512	209	3.7654	112.487	97.639
78	20	1984	1536	320	2.7279	72.820	98.549
79	24	1968	2000	224	5.4331	95.977	122.659
80	24	1970	2000	96	10.0307	86.943	101.063
81	24	1972	1600	213	6.2156	91.890	139.673
82	24	1976	1840	247	4.2890	150.858	162.128
83	24	1978	1600	203	4.6633	119.359	185.647
84	24	1980	1600	136	5.8176	131.735	146.044
85	24	1982	1760	86	5.8448	112.487	98.954
86	24	1984	1600	157	3.6584	72.820	95.604
87	24	1986	1120	150	5.3578	72.009	95.083
88	30	1974	1752	466	3.9618	135.497	127.570
89	30	1976	1888	594	3.3399	149.684	143.755
90	30	1978	1912	603	3.1929	133.190	166.027
91	37	1972	1960	147	6.1176	98.682	139.673
92	37	1974	1920	144	5.3706	135.497	156.228
93	37	1976	2008	77	7.2520	149.684	162.128
94	37	1978	1920	96	6.5475	133.190	185.647
95	37	1980	1480	124	6.4141	107.415	146.044
96	5	1972	2008	432	3.5001	93.888	123.133

Hours and Real Wages of Unionized Capitalist Mills - Observations numbered 97 - 115

Obs	Mill No.	Year	HOURS	EMP	real wage	real log price	real output price
97	5	1974	1600	424	3.9453	138.884	127.570
98	5	1976	2000	431	3.8418	150.858	143.755
99	5	1978	1928	432	3.5265	119.359	166.027
100	5	1980	1616	300	4.3851	131.735	126.020
101	5	1982	1304	246	3.7506	112.487	97.639
102	5	1984	1640	260	4.7539	72.820	98.549
103	5	1986	1744	248	4.1161	72.009	95.083
104	9	1968	1920	232	5.8532	95.977	124.002
105	9	1970	1920	257	4.9997	78.335	97.445
106	9	1972	1960	301	4.7687	98.682	123.133
107	9	1974	1400	277	5.5231	135.497	127.570
108	9	1976	1960	250	4.4159	149.684	143.755
109	9	1978	1936	374	3.8167	133.190	166.027
110	14	1968	2400	430	3.8389	95.977	124.002
111	14	1970	2040	453	3.3171	85.222	97.445
112	14	1972	1785	452	4.0875	93.888	123.133
113	14	1974	2450	380	2.8847	143.627	127.570
114	14	1976	2032	344	3.7569	121.508	143.755
115	14	1978	2016	383	4.3294	119.359	166.027

Hours and Real Wages of Unionized Capitalist Mills - Observations numbered 116 - 135

Obs	Mill No.	Year	HOURS	EMP	real wage	real log price	real output price
116	14	1980	1384	247	4.6476	122.413	126.020
117	27	1968	1920	522	3.7424	91.178	122.659
118	27	1970	1832	568	3.9881	87.374	101.061
119	27	1972	1904	588	4.1366	91.890	123.133
120	27	1974	1896	595	3.2407	143.627	127.570
121	27	1976	1944	622	4.5766	121.508	143.755
122	27	1978	1960	678	4.5357	119.359	166.027
123	27	1980	1848	628	4.6357	122.413	126.020
124	27	1982	1576	578	4.1652	104.526	97.639
125	27	1984	1840	420	4.8863	72.820	98.549
126	27	1986	1888	574	3.9661	74.461	95.083
127	33	1974	1824	419	3.9303	143.627	127.570
128	33	1978	1928	349	4.0151	119.359	166.027
129	34	1980	2080	273	4.3863	107.415	126.020
130	34	1982	2000	232	4.4660	107.988	98.954
131	34	1984	1880	146	4.8561	83.176	95.604
132	35	1980	2168	59	5.2992	107.415	146.044
133	36	1980	1856	177	4.3366	122.413	126.020
134	36	1982	1832	157	4.0365	104.526	97.639
135	36	1984	1800	133	5.0963	72.820	98.549