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8 This article is concerned with the law evasion (reduced wages) and law avoidance Abstract (modified employment) aspects of noncompliance behavior by risk-averse firms under the minimum wage law. It demonstrates that the adverse disemployment
effects of a legal minimum wage under the conventional "full compliance" assump-
tion should be modified by an "employment effect" of noncompliance, although it
is shown that risk-averse violating firms would employ less labor than they would
if they were risk-neutraL Findings suggest that the most effective strategy for motivating risk-averse firms to comply with minimum wage laws is imposing stiffer
penalty fees.

NONCOMPLIANCE BEHAVIOR OF RISK-AVERSE

FIRMS UNDER THE MINIMUM WAGE LAW

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8 A growing literature is concerned with issues of compliance
with and enforcement of the U.S. federal minimum wage law
(see, e.g., Ashenfelter and Smith 1974, 1979; Gramlich 1976; Siskind 1977; Ehrenberg and Schumann 1981; Gordon 1981; Sellekaerts and Welch 1984; Chang and Ehrlich 1985a). In particular, Ashenfelter and Smith analyze the determinants of compliance behavior by profit-maximizing risk-neutral employers under minimum wage legislation and provide a set of compliance estimates with which to evaluate the government's enforcement strategies for the years 1973 and 1975.
Their findings suggest that there is incomplete compliance, although government's inspection efforts are not random and are allocated to
eliminate market incentives for noncompliance. Using an econometric
approach to test their theory of noncompliance, Sellekaerts and Welch

A1JfHOR'S NOTE: I am indebted to James F. Ragan, Jr. and Carol H. Tremblay for their valuable ~ comments and suggestions. I am also gnlteful to Isaac FlIrlich, David G. Hula, Victor J. Tremblay, C(and an anonymous referee for their helpful comments. All remaining errors are, of course, mine.

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390

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Chang / NONCOMPLIANCE AND RISK-AVERSE FIRMS 391

investigate employer noncompliance with the federal minimum wage provisions of the Fair Labor Standards Acts (FLSA) in the period 1973-1980. Their estimates suggest that minimum wage enforcement does not constitute an effective deterrent for violating employers. Chang and Ehrlich further develop an economic model of compliance in which the effects of the level of the minimum wage and the structure of monetary sanctions on noncompliance behavior by risk-neutral firms are analyzed.
In the presence of uncertain detection and conviction, the decision of a firm for or against compliance depends not only on the government's policing efforts and penalty schemes but also on the preferences of the firm toward risk. Ehrlich (1973) has shown that even risk-averse individuals may demand "risk" and thus undertake "gambling" activities if existing environments or opportunities are sufficiently favorable. This article, based on the expected utility max-imization approach, attempts to provide an analysis on minimum wage compliance mechanisms by considering the important case of risk aversion by employers. In the process, it will deal with several inter-esting questions yet unanswered: In the current enforcement system of de facto partial wage restoration and absence of penalties, will risk-averse firms that choose not to abide by the law be fully deterred from paying their workers "free market," or competitive, wage rates-those that would prevail in the absence of minimum wage legislation? If not, what are the conditions under which they will be motivated to pay higher wage rates? With unchanged government inspection efforts and legal sanctions, will a violating firm hire less labor and pay a
higher wage rate when it is risk-averse than when it is risk-neutral?
Under what conditions will the incentives for noncompliance be
completely eliminated for risk-averse firms that would otherwise
attempt to pay low, competitive wage rates? What would be the impact
of the government's direct inspection efforts and indirect deterring
fines on the choice of wage and employment by a risk-averse firm? ~ These questions are significantly related to the law evasion aspect (the c? effects on wage paid) and the law avoidance aspect (the effect on labor
employed) of the noncompliance decisions by risk -averse firms under ~
minimum wage legislation. Answers to these questions will have

.392

PUBLIC FINANCE QUARTERLY

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"', "c behavioral implications for wage evasion and employment effect of

noncompliance, on one hand, and policy implications for the design
of government's compliance mechanisms on the other.
In what follows, a simple model of noncompliance behavior by
risk-averse firms is developed. Then, the wage and employment
responses of violating firms to changes in the government's inspection
activities and penalty schemes are examined. Some concluding re-marks can be found in the final section.

THE SIMPLE MODEL OF NONCOMPLIANCE

I begin by characterizing the optimal behavior under minimum wage legislation of a representative risk-averse firm. The firm is assumed to maximize its expected utility from profits, EU(Jt). U(Jt) is a von Neumann-Morgenstern utility function assumed to be strictly concave, continuous, and twice differentiable, so that U'(Jt) > 0, reflecting the positive marginal utility of profit, and U"(Jt) < 0, capturing the firm's behavior toward risk. For methodological sim-plicity, it is assumed that the firm is faced with the (subjective) probability A of being detected and convicted if it chooses not to abide by the law, that is, if it pays its workers a wage rate (w) that is lower than the legislatively established minimum (M). The probability of detection and conviction is assumed to be a monotonically increasing function of compliance resources. Under effective enforcement of the law, outright evasion of minimum wage legislation is punishable by a
legal sanction. It is further assumed that the risk-averse firm, when
caught and convicted of violating the law, is required to pay back a
multiple, k (> 0), of the difference between the legal minimum wage
and the wage actually paid for each unit of labor. As a result, the
potential total cost of noncompliance would be F = k(M -w)L, where
L is the quantity of labor hired. ~
Let the market price of the firm's product be p, its production ((

function y = /(L) be a strictly increasing concave function of labor (L), "-
and the total costs of fixed capital be H. The expected utility of profits ~
for the noncomplying firm then will be given by: 1

Chang I NONCOMPLIANCE AND RISK-AVERSE FIRMS 393

EU(x) = (1 -A)U(XO) + AU(XJ, (1)

where 'to = p.f(L) -wL -H, representing the level of profits when the violating firm avoids being detected and punished, and Xl = p.f(L) - wL -k(M -w)L -H, representing the amount of profits when the firm is convicted for violating the minimum wage law. Under expected-utility-maximizing behavior, the incentive for noncompliance can be measured by the excess expected utility from noncompliance, V = EU(x) -U(p.f(L) -ML -H]. However, risk-averse firms may incur some additional "fixed" utility costs of noncompliance beyond the prescribed legal sanctions in the forms of loss of federal contracts or public goodwill, and these costs may vary in magnitude across risk-averse firms. It is assumed that the actual frequency of violations of the minimum wage provisions is a monotonically increasing function of the excess expected utility from noncompliance.
Let w" be the "free market," or competitive, wage rate that would prevail in the absence of minimum wage legislation. In order to examine whether the noncomplying firm would be motivated to pay a wage rate above the competitive level, assume that the firm solves the maximization problem by choosing w and L to maximize the expected utility from profits in equation (1), subject to the constraint that w is no less than the free market wage, w". The first-order Kuhn-Tucker conditions are:

aEU(x)/aL = (1 -A)U('fo)[Pf(L) -w] + AU'(XI)(Pf(L)-
[w + k(M -w?) so; L[aEU(x)/aLl = 0; L ~ 0 (2)

aEU(x)/aw = (1 -A)U'('foX-L) + AU'(xJ(k -1)L + 11 so;
w[aEU(x)/aw] = 0; w ~ 0 (3)

aEU(x)/al1 = w -WO ~ 0; l1[aEU(x)/al1] = 0; 11 ~ 0 (4) ~a

where U(XJ = dU(xJ/dxj (for i = 0, 1), f'(L) = df/dL, and JA. is the ~ Lagrange multiplier for the constrained maximization problem.

394 PUBUC FINANCE QUARTERLY

WAGE AND EMPWYMENTRESPONSES TO GOVERNMENT'S COMPLIANCE STRATEGIES

I now examine the effects on the wage (the law evasion aspect) and labor employment (the law avoidance aspect) of noncompliance be-havior by the risk-averse firm under alternative enforcement schemes. Unless full compliance is achieved by widespread, resource-consuming, enforcement activities (work-site inspections, prosecutions, trials) such that the probability of detection and conviction, A, is socially costly set at unity, the wage and employment decisions will be directly affected by the potential losses from noncompliance that, in turn, depend on the magnitude of k, the "penalty rate." It is therefore instructive to discuss the following three different cases associated with deterring monetary fines:

0 < k < 1. (i)

This case appears to reflect the actual enforcement practices by the
U.S. Department of Labor's Wage and Hours Divisions under which
a firm convicted of violating the law is required to pay back only a fraction of the difference between the minimum wage and the wage actually paid for each unit of labor (see Gordon 1981; Sellekaerts and
Welch 1984, 245). This suggests the following proposition: ~

Proposition 1: (a) (Wage Evasion): A risk-averse firm that decides against compliance would not be deterred from paying its workers the free-
market wage rate if minimum wage enforcement policy is based on the
requirement that a convicted firm pay back a fraction of the difference
between the statutory minimum and the actual wage paid for each unit
of labor. (b) (Employment Effect of Noncompliance): The violating
firm will hire more labor than it would have hired if it had complied
with the law, although the firm will hire less labor at the free-market
wage rate in the face of minimum wage enforcement than it would have ~ hired if there had been no legislative minimum wage. G Proof. To prove Proposition l(a), note that oEU(n)/oL = 0 in equation (2)
as long as L > O. Because w > 0, equation (3) states that [(1 -iI.)U(no) ~ (-L) + il.U(nJ(k-1)L + IJ.] equals O. This implies that IJ. > 0 because
0 < k < 1, L > 0, and U(nJ > 0 (i = 0, 1). It then follows that oEU(n)/
olJ. = 0 in equation (4), implying that the wage rate actually chosen, w*,

~~ Chang I NONCOMPUANCE AND RISK-AVERSE FIRMS 395

will be equal to~. To prove 1(b), the objective function in equation

cO; (1) is used. Now that the firm takes the free-market wage rate to pay 0 its workers, the expected utility function of profits can be rewritten as

EU(L; wO, A, k) = (1 -A)U[p}tL) -woL -HJ (5)
+ AU[p}tL) -(WO + k(M -w?)L -HJ.

The firm then employs labor at L *, the employment level that satisfies
the following necessary condition:

dEU(L; wo, A, k)/dL = (1 -A)U'(xo)(Pf(L) -wj (6)
+ AU(xt)(Pf(L) -[WO + k(M -wj]) = O.

The sufficient condition for the maximization problem requires that d2E[U(L; ~, '" k]/dL 2 < 0 or that ~ < 0, where ~. pf(L *)[(1-),,) U(~) +

)"U(nJ] + (1-)..)U"(~)fpf(L*)-~]2 +)"U"(nJ (Pf(L*)- [~+ k(M-
wj])2. The assumptions of risk aversion and a strictly concave produc-
tion function guarantee that this condition will hold. It then follows
that dEU(L; ~,).., k)/dL is less than zero when evaluated atLO where
pf(L O) = wo, and is greater than zero when evaluated at L where
pf (L) = ~ + k(M -WO). In other words, the expected-utility-maximiz- '

ing level of employment, L *, should satisfy the following condition:
WO < pf(L*) < ~ + k(M -~) < M. If the firm had ~mplied with_the
law, it would have employed labor up to the level of L at whichpf(L) =
M. If, however, there had been no minimum wage law, the firm would
have employed labor up to the level of LO at whichpf(Lj = woo Because
the quantity oflabora?tually hired isL* where ~ <pf(L*) <!!f, then
pf (L O) < pf (L *) < pf (L). This further implies that L. > L * > L due to
the strict concavity of the production function. Q.E.D.

Thus, under current system of partial wage restoration with no
additional sanction, risk-averse violators who perceive noncompli- ~

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ance as a favorable game would not be deterred from paying their
workers the low, free-market wage. Because each unit of labor is paid ~ less than its marginal contribution to output by noncomplying firms,
it appears that workers are forced to share the "costs of risk" -the
potential costs of monetary sanctions -facing violating firms. This

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396 PUBLIC FINANCE QUARTERLY .

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sort of "risk-sharing" between workers and employers is obviously
not socially or legislatively justifiable because it stems not from pure
production uncertainty, such as breakdown or malfunction of equip-
ment, but from noncompliance decisions by firms! But it should
especially be noted that it is the enforcement scheme that causes
gamble, not noncompliance. Moreover, Proposition 1(b) has another
important implication: the expected adverse disemployment effects of .J a legal minimum wage under the conventional "full compliance"
assumption must to some degree be modified by an "employment
effect" of noncompliance. It is then interesting to see how the fIrm
would modify its labor employment in response to changes in I.. or k.
This leads to the proposition given below:

Proposition 2: Any ceteris paribus increase in the probability of inspection and conviction, A, or the magnitude of penalty rate, k, will further reduce labor employment provided A and k are still less than one.
Proof. Totally differentiating equation (6) and rearranging tenDs yields
the following two comparative-static derivatives:

dL*/dA = (A)-t(U'(~)(Pf(L*) -w1
- U'(nJ(pf(L*)- [WO + k(M -wj))); (7)

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dL */dk = (A)-tA[U'(no)(M -wj + U"(nt)(Pf(L*) (8)
- [WO + k(M -wj])(M -wjL*]

As expected, both dL */dA < 0 and dL */dk < 0, followed by the sufficient
condition that A < 0, the result in l(b) thatpf{L*) < [...,0 + k{M -wj],
as well as the risk-aversion assumption that if' < O. Q.E.D.

One question of concern is whether a violating firm would hire less
labor when it is risk-averse than when it is risk-neutral. To analyze this ~

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problem, first note that Chang and Ehrlich (1985a) have shown that a
noncomplying, risk-neutral firm will employ labor up to the quantity ;J of L * * at which the value of the marginal product of labor equals the
expected wage of noncompliance, namely,pf(L **) = w" + M(M -w").
Next, evaluate dEU(L; ~, 1.., k)/dL in equation (6) at L = L **. This

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Chang I NONCOMPLIANCE AND RISK-AVERSE FIRMS 397

gives, after rearranging terms, (1 -A)k(M -w")[U'(nu) + AU(3tJ], which is positive when 0 < A < 1. Because the expected utility function of noncompliance is strictly concave in L, the quantity of labor hired under risk aversion, L *, will be less than that under risk neutrality, L * *. This result is summarized below before the examination of the second case when k = 1.

Proposition 3: Other things equal, a risk-averse, noncomplying firm will employ less labor than it would if it were risk-neutral when 0 < k < 1 and 0 < A < 1.

k = 1. (ii)

This is the enforcement scheme that requires a convicted firm to fully pay back the difference between the minimum wage and the wage actually paid for each unit of labor. The noncomplying firm is still not likely to pay at a wage rate higher than the competitive level. Note that for w > 0 and iJEU(3t)/iJw = 0 in equation (3), J,l = (1- A)U(nu)L, which is positive. This in turn implies that iJEU(3t)/iJJ,l =0, and thus w = WO in equation (4).
Due to the fact that the preceding two enforcement schemes cannot eliminate evasion of the minimum wage law, a natural question is whether a system of severe penalties for noncompliance decisions would be more successful. Considered in the analysis is Becker's (1968) concept of deterring fines. This is based on the recognition that monetary sanctions, according to Becker, are essentially transfer payments and thus socially costless relative to the production of direct enforcement activities through resource-consuming inspecting and
prosecutorial efforts. Such a notion of fines leads to the examination
of the third case in which the penalty rate is set above one.

k> 1. (iii) C3

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When k > 1, the risk-averse firm is likely to be motivated to pay a
higher wage rate above the low, competitive market wage level. ~ However, one cannot rule out the possibility that workers might get
paid at free-market wage rate unless the structure of the deterring fines
is appropriately designed. To see these results, note that when k > 1,

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398 PUBUC FINANCE QUARTERLY
the value of ~ can be either positive or zero for [(1 -I..)U(no)(-L) +
I..U'(3tJ(k -1)? + ~] in equation (3) to be equal to o. Consequently,
from equation (4), w = w" for ~ > 0 and w > w" for ~ = 0, given that
wage evasion is considered to be a favorable risky game. The question
of policy significance, then, is the level of punitive fines necessary to
induce firms to comply with the minimum wage provisions of the FLSA.
If the noncomplying firm decides to pay its workers at a wage rate ,~.c:;

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of w(WO s w s M), then for each unit of labor hired, the expected ~:;3 monetary losses from noncompliance, [w + Ak(M -w)], will be greater ~~;;li:';/,~

fCC',;""" than or equal to M when, and only when, Ak ~ 1.3 In this case, ~:":~~;',::

~i;1,::'1 (1- A)U?p;IYL) -wL - H] + A'Tf~IYL) -wL -k (M -W\I_ H]:-~:;cl,,"j. '1\ "U'J\ J"' (9) c,"":';'~
< U(pft:L)- [w + Ak(M -w)JL -If) ~r1,..';;f~c

'i~"'!';"l~ due to Jensen's inequality theorem for a strictly concave function of c", c,;.,.~
utility. Let

AZ = U(pft:L) -ML -H] -U(pft:L) -[w + M(M -w)JL -If) (10)

where L is defined as before the quantity of labor hired under full
compliance, and taking the first-order Taylor expansion of equation
(10) around Land w + Ak(M- w),

AZ -U'(.)?(Pf(L) -M](L -L)-L[(I- MXM -w]). (11)

For L < (?L,pf(L) > ?)pf(L) = M, and hence [Pf(L)-M)(L-L) is
positive. AZ will then be nonnegative if Ak ~ 1. Thus the utility of profit
from compliance, U(P/(L) -ML -H), exceeds the expected utility of
profit from noncompliance, EU(3t), implying that compliance will be
better off than noncompliance when k ~ 1/1... This has policy implica-
tions for the design of government's enforcement schemes, as the
following proposition states: ~
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Proposition 4: (Compliance Mechanisms): Market incentives for non-
compliance for risk-averse firms would be eliminated if the package ,.J
of compliance strategies, (I..., f), is designed such that the deterring
penalty rate k is set to be critically equal to the inverse of the probability
I... of detection and conviction.

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Chang / NONCOMPUANCE AND RISK-AVERSE FIRMS 399

Thus, as far as monetary efficiency in enforcement efforts is con-cerned, the effective strategy for motivating risk-averse, violating
firms to comply with minimum wage laws is imposing stiffer punitive
fines. This is consistent with Becker's (1968) argument and finding
that social welfare is increased if deterring fines are used whenever feasible.

CONCLUDING REMARKS

This article has been concerned with the noncompliance behavior of risk-averse firms under minimum wage legislation. It has examined the conditions under which noncomplying firms are likely to pay wages above the free-market levels that would prevail in the absence of a minimum wage law.
Furthermore, it has shown that, as long as noncompliance is a favorable game, firms that are averse to risk may even attempt to pay their workers wages at competitive levels if minimum wage penalty schemes require a partial or full back payment with no additional sanction. At this point, outright evasion of the minimum wage might become an increasingly serious problem when one further recognizes the fact that direct enforcement through policing and prosecutorial activities is socially costly. In addition, minimum wage evasion leads workers to be paid under their marginal contributions to output. Put alternatively, workers appear to be forced to bear a portion of the potential costs of punishment facing violating firms. Wage evasion,
however, has been shown to be accompanied by some increase in labor
employment compared to the amount of labor hired when there is full
compliance. Such an employment effect of noncompliance would
consequently offset to some degree the adverse disemployment effect
of minimum wage laws under the "traditional" assumption of com-
plete compliance, depending on both the government's inspection ~ efforts and the requirement for either partial or full wage restoration. C
Based on the analysis of noncompliance behavior under risk aver- ~
sion, this article has an implication for government's compliance
mechanisms concerning the stiffer penalty schemes for deterring
minimum wage violations. Although it is apparent that the federal

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400 PUBUC FINANCE QUARTERLY

minimum wage enforcement authority is reluctant to impose high

monetary fines on convicted firms to achieve monetary efficiency in enforcement efforts, it is not clear whether such a reluctance is related to

the "employment effect" of noncompliance with the minimum wage law.

NOTES

1. The model in equation (1) is basically the two-state-preference framework that has been widely employed to analyze choices under uncertainty (see, e.g., Arrow 1984; Hirshleifer 1965, 1966; Allingham and Sandmo 1972; Ehrlich 1973; Routhschild and Stiglitz 1976; Lippman and McCall 1981; Chang and Ehrlich 1985b).
2. Workers under pure production uncertainty are paid less than their marginal contributions
to output and therefore bear some portion of the costs of risk associated with "nature." In addition, the demand for labor curve will not be given by the value-of-marginal-product curve when production involves risk. For a detailed analysis, see McKenna (1986, 42-45).
3. Because [w +)..k(M -w)] -M = (l-M)(w -M) and w < M, w +)..k(M -w) ~Mifand

onlyifM~l.

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