Minimum Wages For Women Only

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A B S T R A C T

This paper reviews the experience of the first-in-the-nation Massachusetts minimum wage law in light of contemporary minimum wage theory, and using the heretofore underutilized annual survey of manufacturing then conducted by the state. Consistent with contemporary minimum wage theory, the law is found to have reduced employment of women, increased employment of men and of capital, and eliminated "slack time" for women workers. Examining changes in the distribution of wages in several industries subject to wage decrees from 1914 to 1922, in four, where the wage decrees clearly raised wages, the wage decrees were followed by substantial losses of jobs for women workers, ranging from six percent in the laundry industry, to 14 percent in the brush industry. Results varied in the other two.

"The unemployable, to put it bluntly, do not and cannot under any circumstances earn their keep... Of all ways of dealing with these unfortunate parasites, the most ruinous to the community is to allow them unrestrainedly to compete as wage earners for situations."

Sidney Webb[1]

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[1] "Theory of Minimum Wages." *Journal of Political Economy* 20 (December 1920) p. 992.

In 1912, Massachusetts passed this country's first minimum wage law. The law applied only to women because freedom of contract was not then fully enjoyed by women. Through 1923, minimum wage laws for women were enacted in fourteen additional states, the District of Columbia, and Puerto Rico. Then, in *Adkins v. Children's Hospital*, in a 5-4 opinion, the Supreme Court declared minimum wage laws to be unconstitutional. Women as well as men enjoyed freedom of contract. Fourteen years later, in 1937, in *West Coast Hotel v. Parrish*, in another 5-4 opinion, the Supreme Court reversed itself: "What is this freedom? The Constitution does not speak of a freedom of contract."

This paper reviews the experience of the first-in-the-nation Massachusetts minimum wage law in light of contemporary minimum wage theory, and using the heretofore underutilized annual survey of manufacturing then conducted by the state. Consistent with contemporary minimum wage theory, and contradicting the assessments of minimum wage advocates of the time, the Massachusetts minimum wage is found to have reduced employment of women, increased employment of men and of capital, and eliminated "slack time" for women workers. Furthermore, by denying employment to the least able, the Massachusetts minimum wage law opened the door to the creation of a permanent underclass in our country, people unable to demonstrate their willingness to work, and thus bereft of private charitable support by those more fortunate, and in need of government welfare.

1. The Massachusetts Minimum Wage Law.

The Massachusetts minimum wage law, like most of the early minimum wage laws, provided for the issuance of minimum wage decrees by wage boards set up on an industry-by-industry basis. These wage boards typically had authority to set lower minimums for learners and children, and to grant exemptions to "slow" workers. The Massachusetts law was unique in that it was only enforceable by publication of the names of companies that paid less than the legal minimum wage.

Soon after the Massachusetts minimum wage law was enacted, a wage board was organized for the state's brush industry. The brush industry was chosen as it was a relatively small industry that employed many low-wage women. The newly-created board conducted a survey of women's wages in the industry. Then, in 1914, it set a minimum wage of 16 cents per hour. Following this, wage boards were set up, one by one, for a number of other industries. By 1923, about a quarter of women workers were covered by wage orders.

According to the Minimum Wage Commission, the wage order for the brush industry resulted in a large increase in women's wages and did not result in the replacement of women by men in employment. The fall in women's employment in the brush industry that did, in fact, occur was attributed to "general business conditions rather than to the...minimum wage."[2]

This positive assessment was repeated by advocates of minimum wages in the other states that enacted such laws. Thus, Mary Elizabeth Pidgeon of the U.S. Women's Bureau stated "The universal experience with minimum wage legislation...is that it has materially raised the wages...of women. . . In regards to women's employment, the usual experience has been that it continues to increase regardless of whether or not there is minimum wage legislation."[3]

These conclusions must be viewed with suspicion due to the dearth of data quantifying the effects of the country's first minimum wage laws, and to the apparent misinterpretation of what data there was. For example, the most extensive study of the effects of the first minimum wage laws was conducted by Marie L. Obenauer and Bertha Von Der Nienburg on behalf of the U.S. Bureau of Labor Statistics. Examining the payroll records of 40 stores before and after Oregon's first minimum wage decree, they concluded that the law had raised women's wages and had "not put men in positions vacated by women."[4]

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[2] "2nd Annual Report of the Massachusetts Minimum Wage Commission for the Year Ending December 31, 1914." p. 12.

[3] *Women in the Economy of the United States*. New York, 1975 (orig. 1937). pp. 8-9.

[4] "Effects of Minimum Wage Determinations in Oregon." U.S. Bureau of Labor Statistics, no. 176, 1915. p. 9.

Re-examining their data, John S. Peterson agreed that the law raised women's wages. Women's wages increased by an average of four percent, while men's wages rose by a lesser amount. However, Peterson disagreed on the law's effect on employment. Women's employment fell by 14.9 percent, while men's employment fell by only 7.4 percent.[5] Thus, the Oregon minimum wage had its predictable effect of raising wages and decreasing employment.

A recurrent problem with the early minimum wage studies is the identification of employment conditions following the signal of, but before the legally-effective date of the minimum wage as the employment conditions "before" the minimum wage.[6] During 1912, Massachusetts passed the minimum wage law, set up a wage board for the brush industry, and conducted a wage survey of this industry. These actions signalled the forthcoming decree. As is clearly evident in the data, the industry acted on the signal, and did not wait until the effective date of the decree. The Minimum Wage Commission admitted that employers acted in anticipation of other decrees.[7] In this study, in which care is taken to identify the date on which the minimum wage decree was economically-effective, the decrees that are economically-effective are found to have been economically-effective prior to their being legally-effective.

A unique data source allows re-examination of the effects of the Massachusetts minimum wage law. At the time, Massachusetts conducted an annual census of manufacturing. This census covered the years between the federal government's quinquennial census of manufacturing. Combining these data into a single time series requires certain adjustments: (1) The federal census covered many very small manufacturing establishments not covered by the

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[5] "Employment Effects of State Minimum Wages for Women: Three Historical Cases Re-examined*." Industrial and Labor Relations Review* 15 (April 1959) pp. 406-422.

[6] David Card and Alan B. Krueger, in *Myth and Measurement* (Princeton, NJ: Princeton University Press, 1995), revert to this old method to investigate the effects of a state minimum wage in New Jersey. See the discussion of their study by Charles Brown, Daniel S. Hammermesh and Finis Welch in the July 1995 issue *of Industrial and Labor Relations Review.*

[7] "Report of the Massachusetts Department of Labor and Industry, Division of Minimum Wages, for the Year Ending November 30, 1921." p. 20.

state census. This difference has no discernable impact on the brush industry. (2) Until 1909, figures for the very tiny broom industry are included in those of the brush industry. This appears to have effected the calculation of capital-per-worker prior to 1909. (3) The federal census reports only total employment. Accordingly, for federal census years, total employment is apportioned by sex using the average of the adjoining years' proportions.

2. Theory of Minimum Wages.

Before proceeding to a re-examination of the effects of the Massachusetts minimum wage law, it is appropriate to outline the effects predicted by economic theory. In a competitive market, minimum wages will:[8]

1. Truncate the distribution of wages; i.e., cut-off the distribution of wages at the legal minimum.

2. Raise the wages of some who would otherwise work for less than the legal minimum.

3. Reduce the fringe benefits of low-wage workers to off-set some or all of the mandated wage increase.

4. Increase the required work effort of low-wage workers to off-set some or all of the mandated wage increase; e.g., elimination of "slack time" from the workday.[9]

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[8] Peter Linneman, "The Economic Impacts of Minimum Wage Laws: A New Look at an Old Question." *Journal of Political Economy* 90 (June 1980) pp. 443-449; and, Robert H. Meyer and David A. Wise, "Discontinuous Distributions and Missing Persons: The Minimum Wage and Unemployed Youth." *Econometrica* 51 (November 1983) pp. 1677-1698.

[9] Walter J. Wessels. *Minimum Wages, Fringe Benefits and Working Conditions*, Washington, D.C.: American Enterprise Institute, 1980.

5. Disemploy some others who would otherwise work for less than the legal minimum.

6. Those whose wages are increased to the legal minimum would tend to be those who otherwise earn almost the minimum, for whom the mandated wage increase can be most easily off-set. Those who are unemployed tend to be those who would otherwise earn even less, for whom the mandated wage increase would be more difficult to off-set.

7. Substitute high-wage labor and capital for low-wage labor.

8. Increase employment and decrease wages in non-covered sectors due to the "spillover" of workers from the covered sector.[10]

These effects imply that the benefits of minimum wages for low-wage workers (i.e., higher wages) are questionable. The increase of the wages of some low-wage workers is off-set by reduced fringe benefits and/or increased work effort. Judgement is required to say that the substitution is good. To be sure, for low-wage workers who would earn close to the minimum wage in its absence, the loss of subjective utility due to the substitution of wages for fringe benefits and/or work effort is near zero. The loss is what economists refer to as a "second order effect," near zero for those who are forced to make small substitutions, but increasingly significant for those who are forced to make increasingly large substitutions.

Consider the example of a low-wage worker earning just less than the minimum for whom the off-set to a mandated wage increase would be the elimination of some "slack time" from the workday. For example, the worker could be given a higher hourly wage, and put onto a split shift. While this worker may be presumed to prefer the combination of a lower wage and

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[10] Finish Welch. "Minimum Wage Legislation in the United States." *Economic Inquiry* 12 (September 1974) pp. 285-318.

greater "slack time," the compensation of (slightly) higher wages for the loss of (a small amount of) "slack time" would be almost sufficient to leave the person feeling not worse off. But, if the wage increase mandated by minimum wage legislation is large, the loss in subjective utility to the worker from the substitution of wages for "slack time" would be significant.

The subjective loss due to minimum wage legislation is roughly inversely proportional to what a worker's wage would be in the absence of the minimum. Some low-wage workers, e.g., the aged, the infirm, and inexperienced youth, either cannot increase their productivity enough to earn the minimum wage, or, the loss of subjective utility would be so large from the substitution of wages for fringe benefits and/or required work effort, that they would rather be unemployed. For the latter, the benefit of a minimum wage comes at too high a cost in stress due to the elimination of "slack time" from the workday, and/or too high a cost of in terms of dead-end jobs due to the elimination of on-the-job-training.

Some claim that the "test" of minimum wage legislation is the trade-off between increasing the wages of low-wage workers, which is good, and decreasing their employment, which is bad. Supposedly, if the wage effect is larger than the employment effect, the minimum wage is a net good.[11] The employment effect of minimum wages is important, but for an entirely different reason. Minimum wages hurt <u>both</u> low-wage workers who gain higher wages at the cost of reduced fringe benefits and/or increased work effort, <u>and</u> low-wage workers who are unemployed. The difference between these two groups of low-wage workers is that those who remain employed are roughly compensated by the increased wages for their losses in fringe benefits and work effort, while those who are unemployed either cannot or choose not to work at the higher wage, and so may be presumed to suffer more significantly. Accordingly, the employment effect is a proxy for the net loss due to minimum wage legislation.

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[11]According to this thinking, the attractiveness of minimum wage legislation depends on the elasticity of demand for low-wage labor. If this elasticity is small, i.e., less than one in absolute value, then minimum wage legislation is viewed as attractive.

3. Effects of the Massachusetts Minimum Wage Law.

A. Women's Wages. Because the Massachusetts minimum wage law depended only on publication of the names of companies that did not accede to wage decrees, the issue of compliance should be addressed. The Massachusetts Minimum Wage Commission, after conducting its own surveys of women's wages in the Massachusetts brush industry, concluded that its wage decree was being obeyed. This is borne out in the census of manufacturing data. As Table II details, through 1912, many women received a weekly wage of less than $4, whereas starting in 1913 few women received a weekly wage of less than $5.

During this time, wages in general were rising both because of inflation and real wage progression. Accordingly, it is reasonable to question whether the observed rise in the distribution of women's wages in the brush industry was due to the wage decree or to the overall trend in wages.

Figure 1 tracks wages in the Massachusetts brush industry <u>relative to</u> wages in all Massachusetts manufacturing industries. Comparing wages in the brush industry to wages in all manufacturing industries is intended to control for changes due to inflation and real wage progression. As a further control, analogous data from New Jersey are plotted using that state's annual census of manufacturing. To be sure, New Jersey was not at the time as significant a manufacturing state as was Massachusetts. Furthermore, New Jersey's brush industry did not rely as heavily on women workers as did Massachusetts' pre-minimum wage brush industry. However, it is the only other state with comparable data.

From 1907 to 1912, average women's wages in the Massachusetts brush industry were 60 percent of average women's wages in all manufacturing industries in the state. Then, from 1913 to 1915, average women's wages in the Massachusetts brush industry dramatically rose to 97 percent. During the same time, the wages of men in the Massachusetts brush industry rose relative to wages in all manufacturing industries in the state, but not as dramatically as did women's wages, and there was no discernable change in the wages of workers in the New Jersey

brush industry relative to wages in all manufacturing industries in that state.[12] The dramatic rise in women's wages in the Massachusetts brush industry from 1913 to 1915 can therefore be attributed, as claimed, to minimum wage legislation.

B. Women's Employment. Recall that the Minimum Wage Commission admitted that women's employment fell following its wage decree, but claimed that this was due to overall economic conditions and that, in particular, men had not replaced women. Figure 2 tracks the employment of men and women in the Massachusetts and New Jersey brush industries. From 1907 to 1912, women's employment averaged 972 and men's 636 in the Massachusetts brush industry. Then, in 1913, women's employment dramatically fell to 576, and men's rose to 771. From 1913 to 1915, both men's and women's employment fell, to 576 and 631, respectively. During the same period, no dramatic change is evident in New Jersey's brush industry employment of men and of women.

The dramatic changes in employment in the Massachusetts brush industry that occurred in 1913 can be attributed to minimum wage legislation. The further changes that occurred from 1914 to 1916--two years of falling employment for both men and women, and a year of rising employment for both--can be attributed to general economic conditions. The assertion of the Massachusetts Minimum Wage Commission regarding employment is only partly verified. Women's employment fell in 1913 (and men's rose) not because of the recession that began in 1914, but because of the minimum wage law.

C. Demand for High-Wage Labor and Capital. Several collateral issues are now addressed, the first of these being the effect of minimum wage legislation on the demand for high-wage labor, proxied by men, and on capital. In theory, minimum wage legislation increases the demand for high-wage labor and capital. As was already observed in Figures 1 and 2,

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[12]Data limitation do not allow disaggregation of wages by sex in New Jersey.

minimum wage legislation can be said to have increased <u>both</u> the average wage <u>and</u> employment of men in the Massachusetts brush industry. These two observations are indicative of an increase in the demand for high-wage labor.

Figure 3 tracks capital-per-worker in the Massachusetts and New Jersey brush industries relative to capital-per-worker in all manufacturing industries. As was discussed above, the figures for 1907 and 1908 are probably unrepresentative due to the inclusion of the data of the broom industry among those of the brush industry. From 1909 to 1912, capital-per-worker in the Massachusetts brush industry averaged 97 percent of the average in all manufacturing industries in the state. Then, from 1913 to 1915, capital-per-worker in the Massachusetts brush industry dramatically rose in the brush industry, reaching a peak of 175 percent of the average in all manufacturing industries. In contrast, no such pattern is observed in the New Jersey brush industry. Thus, it can be said that the minimum wage increased both the demand for high-wage labor and the demand for capital.

D. Productivity Off-Sets. Regarding women's wages and employment, and the demand for men and capital, the effects of the Massachusetts minimum wage law can be systematically measured. However, productivity off-sets are only observed anecdotally. One way to shift the burden of a minimum wage onto the low-wage worker is to shift to piece-rate wages. This is not because those paid on a piece rate are necessarily exempted from the law, but because piece-rate wages combined with a minimum productivity standard puts the burden of meeting the minimum wage onto the worker.[13] Sure enough, the Massachusetts Minimum Wage Commission found that after its wage decree, "a larger percentage were on piece rates."[14]

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[13] In California and Wisconsin, minimum wage decrees in vegetable canning industries, where piece-rate wages predominated, merely required that a certain percentage of workers earn at least the minimum, and, thus, provided a kind of automatic exemption for "slow workers." E.M. Burns. *Wages and the State.* London: P.S. King and Son, 1926. p. 363.

[14] "7th Annual Report of the Minimum Wage Commission of Massachusetts for the Year Ending December 31, 1919." p. 35.

M.L. Stecker, who conducted an intensive study of the Massachusetts minimum wage law for the National Industrial Conference Board, found that the minimum wage law induced productivity increases from low-wage women through greater investment in capital, greater supervision, greater care in training and in hiring, and greater care in scheduling.[15] She concluded that "the minimum wage decree was the final blow to the manufacture of cheap brushes by cheap labor."[16]

E. "Slow Workers." The Massachusetts Minimum Wage Commission appears to have been relatively liberal in granting licenses to "slow workers" to enable them to legally work for less than the minimum wage. Of the cases of non-compliance discovered in wage surveys of nine industries conducted during 1919, 130 were given raises, 42 were given licenses or else recorded as license-types, and 22 were fired or left voluntarily.[17] Regarding these "slow workers," Stecker writes

> Often these employees are old, or are subnormal in one way or another. For personal reasons they have been kept on at a low wage, but their employment cannot be continued if their wages must be raised. Special licenses take care of some of these, but often neither the employer nor the employee wishes them; in these cases, the commission has waived even this requirement and recorded the case as a 'special license type,' in order to prevent the discharge of older women who would find great difficulty in getting new employment.[18]

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[15] *Minimum Wage Legislation in Massachusetts*. New York: National Industrial Conference Board, 1927. pp. 174-184.

[16] *Ibid,* p. 140.

[17] Two cases were dropped because of the financial difficulties of the company at which they were employed. Minimum Wage Commission of Massachusetts, *op. cit.,* pp. 53-54.

[18] *Ibid*, p. 182.

Clearly, much of the unemployment that could have resulted from the Massachusetts minimum wage law was avoided by exempting those recognized to be "slow workers" from the law. Even so, the law resulted in the direct loss of jobs by a number of workers. Perhaps these workers were neither aged nor infirm, but only had what economists somewhat euphemistically call "low labor force attachment," i.e., they were not motivated, and so were not graced by the minimum wage commission with licenses.

It must also be remembered that Massachusetts' relatively liberal record in regard to licenses for "slow workers" stands in stark contrast to the records of other minimum wage jurisdictions, notably the District of Columbia, Oregon and Washington, where few licenses were granted. This liberality may have been due to the need of the Massachusetts minimum wage commission to secure compliance since its only enforcement power was to publicize the names of companies violating its wage decrees.[19]

4. Estimating the Effects.

A general central limit theorem indicates that functions of many variables will be approximately distributed as the bell-shaped stable distribution, of which the normal distribution is a special case. In applied work, the normal distribution has been found useful for modelling the natural logarithm of wages, although care must sometimes be taken when dealing with the tails of the distribution.[20] Presuming that the distribution of the natural logarithm of wages is approximately normal, the effects of a minimum wage law on wages and employment can be estimated.

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[19] California also appears to have been relatively liberal in granting licenses. This may have been due to that state's attempt to continue to enforce its minimum wage law following *Adkins* in order to avoid an appeal to the federal courts.

[20] In this study, percentiles below 1 percent and above 99 percent are simply ignored.

Figure 4 displays the prototypical pattern of wages with an effective minimum wage. The lower tail of the distribution is shrunk due to the shifting of some low-wage workers to the minimum wage or slightly above, and to the disemployment of some other low-wage workers. Some below-minimum wage workers remain due to exemptions and non-compliance. This profile is clear enough in Figure 9.3 of Card and Krueger (p. 290). Unfortunately, the intervals of Table II are not fine enough to allow histograms constructed from the data of the table to display such a profile.

If the mean and standard deviation of the distribution of wages are known or can be estimated, the fraction of low-wage workers given raises due to the minimum wage – i.e., the amount "A" in Figure 5 – and the fraction of low-wage workers disemployed – the amount "B" – can be estimated. The appendix contains a sufficient methodology.

Table III presents estimates of the two effects "A" and "B" for the six industries for which data are available.[21] For the brush industry, very large wage-raising and disemployment effects are indicated. For the four next industries – the canning, candy, corset and paper box industries – the effectiveness of the minimum wage law varies. This was a time of rapidly rising wages, associated with the World War I-related inflation, which tended to make wage decrees obsolete before their legally-effective dates. In part because of non-compliance, Stecker dismisses any connection between the minimum wage decrees and either wages or employment in the canning industry[22] and the corset industry.[23] Examining the distribution of wages in these two industries, this study similarly finds little or no effect.

For the candy industry, Stecker says there was widespread compliance with the minimum wage, but contends that the rise in wages and fall in employment of women workers in the

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[21] The other parameters identified in the appendix are always very precisely estimated, but are otherwise of no concern in this study.

[22] *Op. Cit.,* pp. 143-145.

[23] *Ibid,* pp. 147-150.

industry was not due to the minimum wage decree but were due to general business conditions.[24] This study finds, from the distribution of wages, that the minimum wage decree was indeed responsible for the rise in wages and fall in employment of women workers.

For the paper box industry, the direct evidence of the effectiveness of the minimum wage decree is overwhelming, and includes the dismissal of hundreds of women.[25] Perhaps most revealing is that the minimum wage decree for this industry was later rivised downward. This study finds that only a few low-wage workers were given wage increases, but a large number of such workers were disemployed,

Data limitations preclude analysis of the first wage decree in the laundry industry, and regarding the second (a further increase), Stecker says that it brought about a large number of separations.[26] This study confirms that this minimum wage was effective in both its wage-raising and in its disemployment effects.

These econometric estimates confirm what is obvious to the eye in Figures 1 and 2 in the case of the brush industry, that – where effective – minimum wages reduced the employment of low-wage workers. It is reassuring that a disemployment effect is obtained in the four industries in which the direct evidence indicates that the minimum wage was effective, and was not obtained in the two industries in which the direct evidence indicates that the minimum wage was not effective.

5. An End to Poverty?

Among those advocating minimum wages, some would have allowed relatively liberal exemptions for "slow workers." For example, Jacob H. Hollander of Johns Hopkins University

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[24] *Ibid,* pp. 145-147.

[25] *Ibid*, pp. 150-152.

[26] *Ibid,* pp. 141-143.

would have allowed exemptions for "the deserving incompetent."[27] "The deserving incompetent" meant the aged and infirm, whose limited productivity was obviously due to some physical condition. It was presumed that those whose limited productivity was due to problems such as poor job skills could be trained so as to enable them to earn the minimum. Few discuseed what they would do with those whose limited productivity was due to poor motivation.

Other advocates of minimum wage legislation would have allowed few, if any, exemptions. For example, Victor Morris of Columbia University, stated that the "crippled, infirm, aged and slow workers...be segregated...and not be included simply as a drag on the wage rate of the entire group."[28] Henry Seager, also of Columbia University, proposed that those who could not be retrained "be sent to farm or industrial colonies."[29] Political jurisdictions denying exemptions to people too old or crippled to earn the minimum argued that these people "must be cared for some other way."[30]

What was this "other way?" This "other way" was the establishment of welfare as a right so that those who did not work, possibly because of minimum wage legislation, would nevertheless be provided with what they needed. At the time, the received social philosophy demanded that all who could work had to at least be willing to work. The state--through poorhouses and some other, very limited relief programs--provided only for those completely unable to work. For those who could work, albeit at a low wage, private charities demanded that they work to receive the supplemental assistance they needed.

For those assisting the disadvantaged of the day, the requirement of work accomplished more than reducing the burden of assistance. It induced voluntary contributions from working

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[27] *The Abolition of Poverty*. Boston: Houghton Mifflin Co., 1914, p. 71.

[28] *Oregon's Experience with Minimum Wage Legislation*. New York, 1920. p. 18.

[29] "The Minimum Wage as part of a Program of Social Reform." *Annals of the American Academy of Political and Social Science* 48 (July 1913) pp. 9-10.

[30] District of Columbia Minimum Wage Commission, quoted in *Monthly Review of the U.S. Bureau of Labor Statistics*, April 1920, p. 115.

men and women. Today, those who cannot earn the minimum are denied the dignity of doing what they can for themselves, and the true compassion of others who are more fortunate. Where formerly those in need and those better off were joined in voluntary community, there now is class struggle, envy of the rich and resentment of the poor.

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Appendix. Estimating the wage-raising and disemployment effects of minimum wages from time-series data on the distribution of wages.

$$Let \quad X_i = \mu + \sigma Z + e_i$$

$$Z = Z(p)$$

$$p = (p'_i + A\pi_{1i} + B\pi_{2i})/(1 + B)$$

where X_i is the right end-point of the ith interval of the distribution of the natural logarithm of wages, Z_i is the Z-score of the ith interval, which in turn is determined by the implied percentile, p, of the ith interval. The implied percentile, p, is determined by the observed percentile, p', and by the wage-raising and disemployment effects of the minimum wage.

To capture the wage-raising effect, assume that the minimum wage shifts A workers from the interval (M', M), where M is the minimum wage, to the interval (M, M"), where M' < M < M". Therefore, at the right end-point of any interval, the implied cumulative frequency will differ from the observed by the amount $A\pi_{1i}$, where, for M' < X_i ≤ M, the variable π_{1i} is equal to $(X_i - M')/(M - M')$; for M < X_i ≤ M", variable π_{1i} is equal to $(X_i - M)/(M" - M)$; and, the variable π_{1i} is otherwise equal to zero.

To capture the disemployment effect, assume that the minimum wage disemploys B workers from the interval (0, M'). Therefore, at the right end-point of any interval, the implied cumulative frequency will differ from the observed by the amount $B\pi_{2i}$ where, for X_i ≤ M', the variable π_{2i} is equal to $(X_i - M')/M'$; and, the variable π_{2i} is otherwise equal to zero.

In order to identify the effect of minimum wages over time (i.e., from three years "before" to three years "after"), it is assumed that the implied mean of wages within an industry changes in proportion to the mean of all wages, and that the implied standard deviation of wages within an industry and of all wages is constant over short periods of time; i.e.,

$$X_{jti} = \tau_j \mu_{ALLt} + \sigma_j Z(p'_{jti}, \pi_{1jti}, \pi_{2jti}; M', M'') + e_{jti}$$

$$X_{ALLti} = \mu_{ALLt} + \sigma_{ALL} Z(p_{ALLti}) + e_{ALLti}$$

where the j subscripts track industries, the t subscripts track years, and the i subscripts track intervals of the wage distribution. A grid search indicated that $M' = 0.75M$ and $M'' = 1.1M$ did about as well as other logically-possible combination. Experimentation also showed that setting the economically-effective date at one year prior to the legally-effective date of the wage decrees was superior to setting it at the legally-effective date in those industries in which the minimum wage decree was found to be effective.

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Table I. Minimum Wage Laws.

	Statutory Minimum	Wage Boards	Universal Coverage*	Liberal Exemptions
Current Federal Minimum Wage Law	X		X	
Selected Historical Minimum Wage Laws:				
California, 1913		X	X	X
D.C., 1918		X	X	
Massachusetts, 1912		X		X
Oregon, 1913		X	X	
Washington, 1913		X	X	

* "Coverage" of historical minimum wage laws pertains to women. "X" denotes universal or near universal coverage; e.g., the minimum wage law in Washington covered 75 percent of women workers, while the minimum wage law in Massachusetts at most covered 25 percent. The federal minimum wage law was extended to retail and service sectors during the 1960s.

Table II. Distribution of Women's Wages in Massachusetts Brush Industry.

Weekly Wage	1911	1912	1913	1914
x < 3	0.1%	0.3%	0.0%	0.0%
3 ≤ x < 4	55.9	32.8	0.0	0.0
4 ≤ x < 5	10.0	12.7	1.9	0.0
5 ≤ x < 6	12.0	14.6	23.0	14.9
6 ≤ x < 7	9.8	13.0	23.7	20.0
7 ≤ x < 8	4.4	10.6	17.7	17.2
8 ≤ x < 9	2.8	5.5	9.6	15.9
9 ≤ x < 10	2.7	2.6	11.7	9.6
10 ≤ x < 12	2.1	2.4	7.9	14.9
12 ≤ x < 15	0.4	4.0	4.3	6.5
15 ≤ x	0.0	0.6	0.1	1.0

source: Massachusetts Department of Labor and Industry, "Annual Report of Statistics of Manufacturers." Various issues.

Table III. Estimated percent of women workers receiving wage-increases ("A") and disemployed ("B") as a result of wage decrees issued under the Massachusetts Minimum Wage Law.

	Legally Effective Date	Economically-Effective Date	Estimation Period	Percent Wages Increased	Percent Disem-ployed
Brush	1914	1913	1910-1915	24.1% (13.3)	14.2% (3.2)
Canning	1919	1918	1915-1920	-3.1 (3.4)	0.9 (1.0)
Candy	1920	1919	1916-1921	13.5 (6.1)	9.1 (1.8)
Corset	1920	1919	1916-1921	7.2 (3.9)	-0.7 (0.8)
Paper Box	1920	1919	1916-1921	4.5 (2.5)	7.7 (1.1)
Laundry	1922	1921	1918-1923	17.6 (4.6)	6.0 (1.3)

(Standard errors in parentheses)
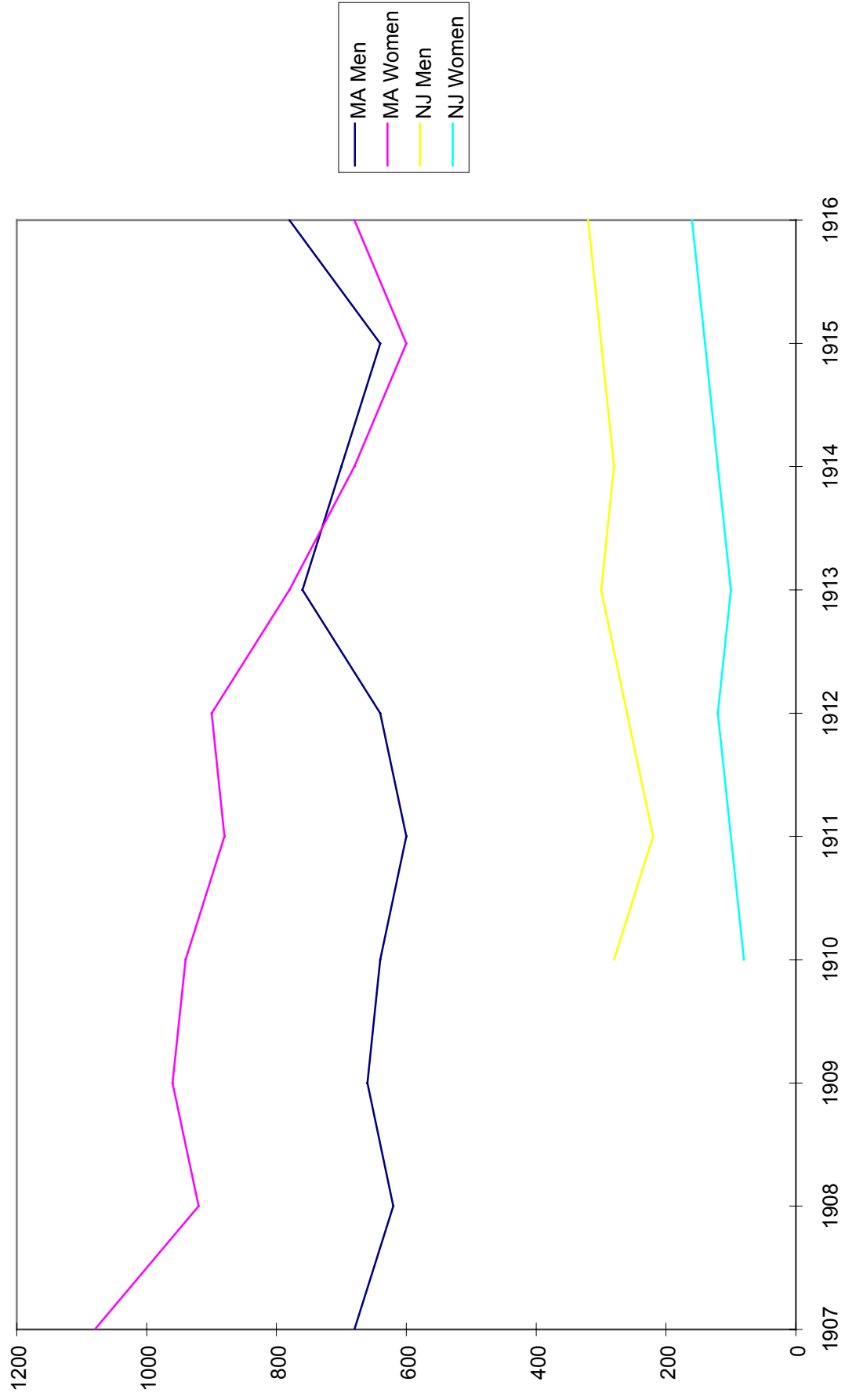
Figure 1. Employment in Massachusetts and New Jersey Brush Industries

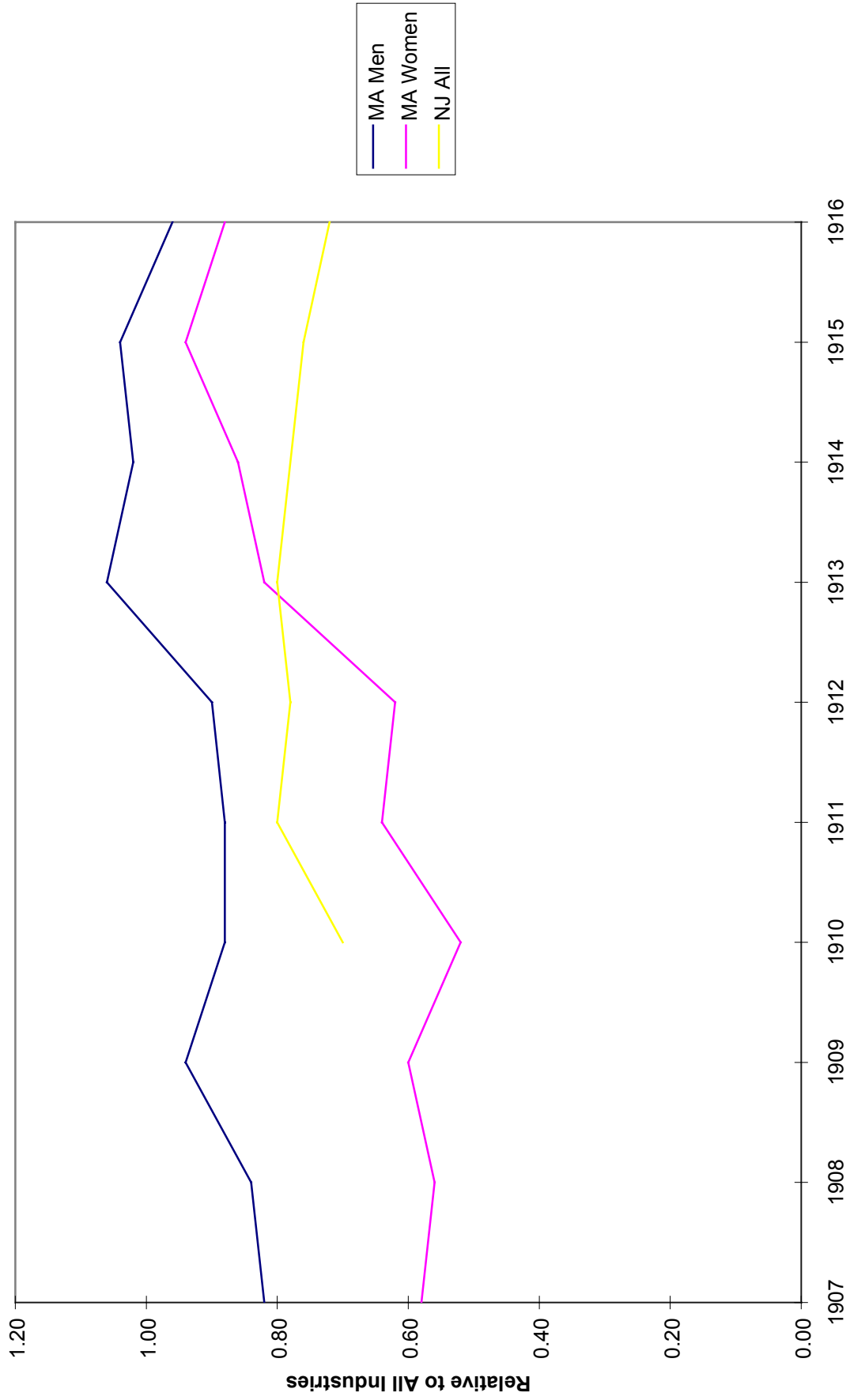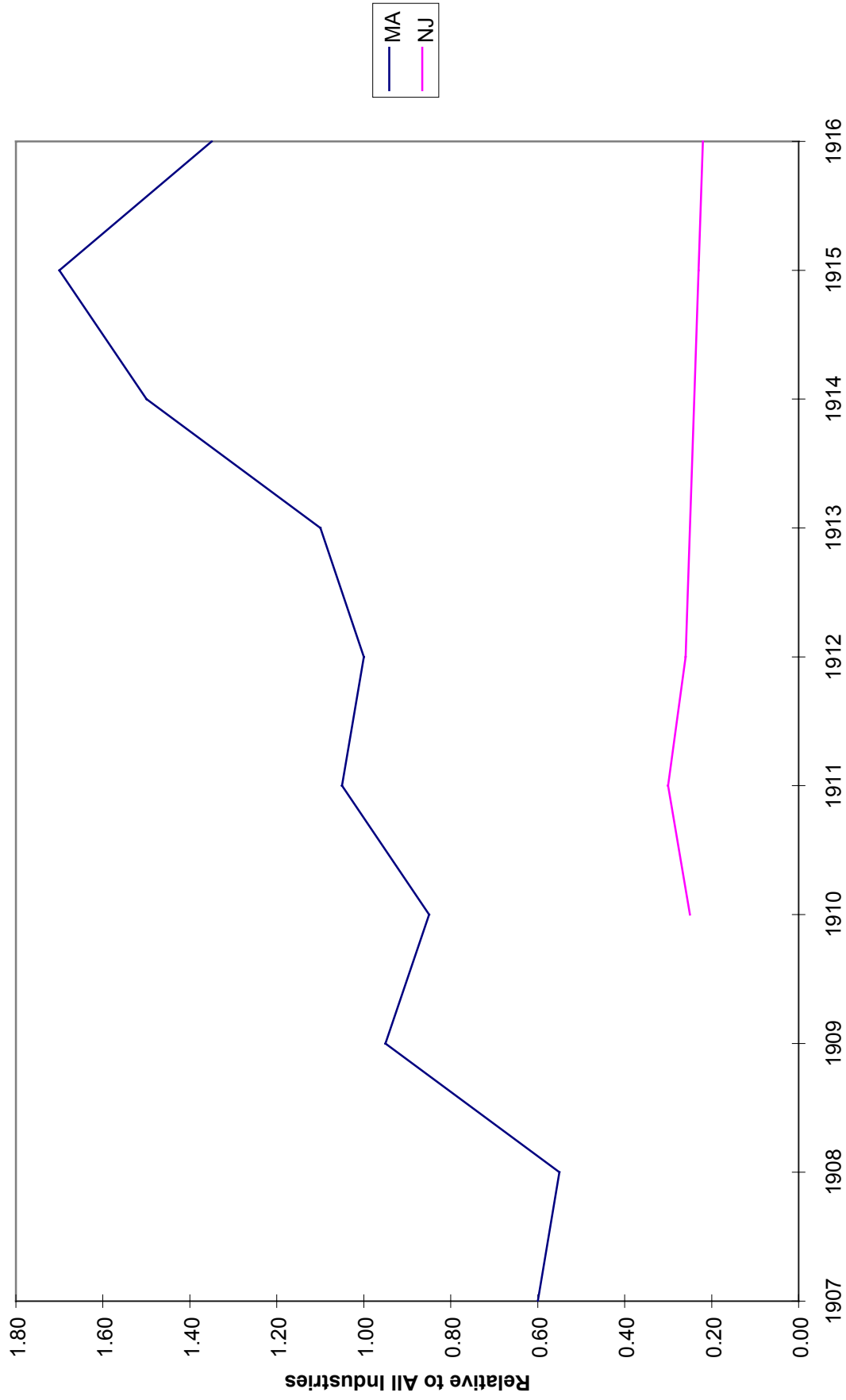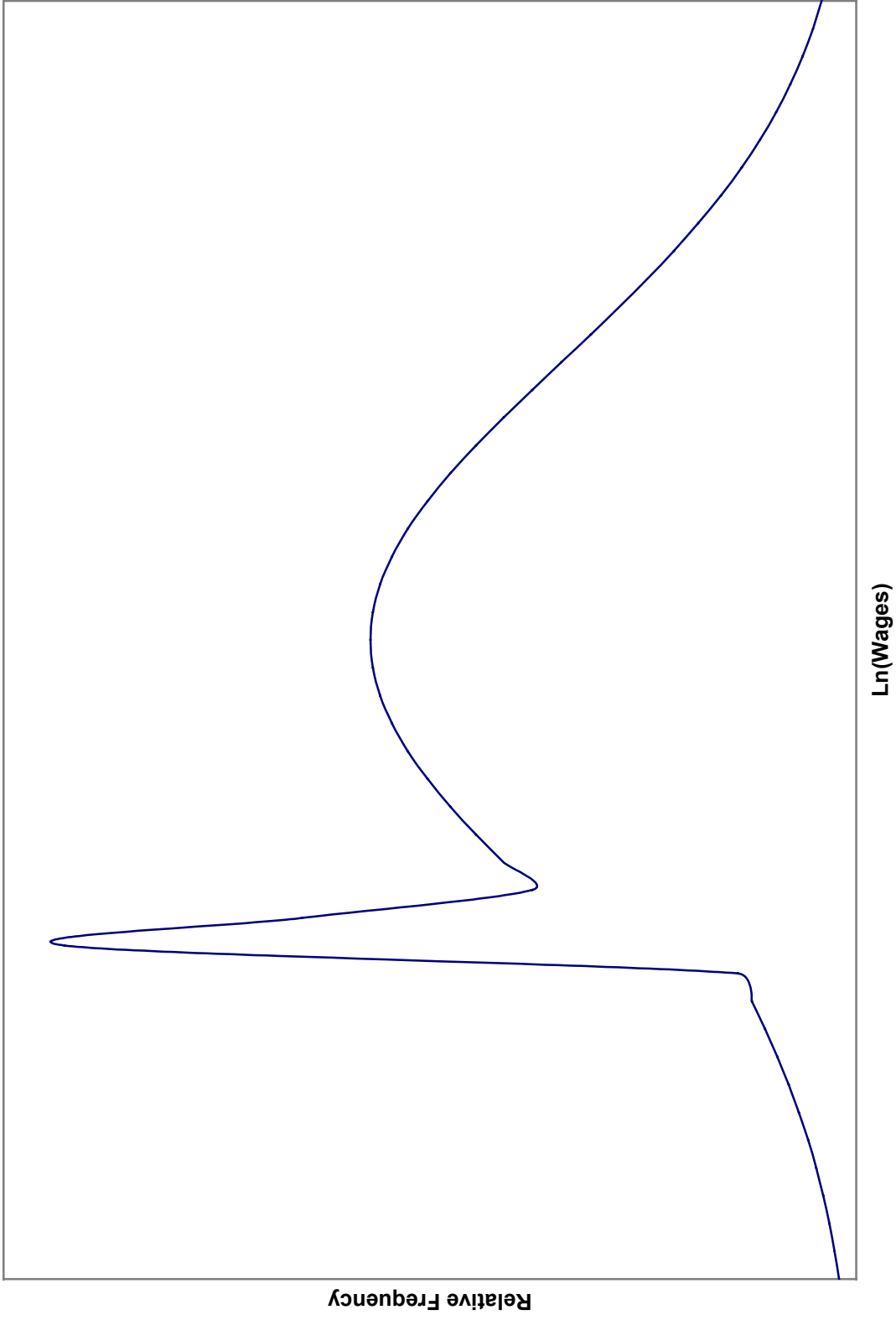Figure 2. Wages in Massachusetts and New Jersey Brush Industries

Figure 3. Capital per worker in Massachusetts and New Jersey Brush Industries

**Figure 4. Observed Wage Distribution
with an Effective Minimum Wage**

Relative Frequency

Ln(Wages)

**Figure 5. Implied Wage Distribution
with an Effective Minimum Wage**

Ln(Wages)

Relative Frequency

- Wage-Increase
- Disemployment
- Normal Dist.