V. Delivery System Efficiency: Empirical Results

A. Determinants of the Employers' Costs of Insurance

1. Jurisdiction-wide Results

Table 7 reports partial results of the regression analysis described in the previous section.[50] Specifically, this table reports results with respect to the equation's control variables.[51] As can be seen, these results are generally consistent with our expectations. The two benefit variables are positively and significantly related to the workers' compensation costs, as is the injury rate. Similarly, the relationship between employer costs and long-term disability claims as a share of total claims is also positive and significant, as expected, suggesting that differences in the administration of long-term disability benefits have an impact on costs that is distinct from the effect of variation in cash benefits as prescribed by statute. Of all the variables for which we had strong *a priori* expectations, only the coefficient for union density was not statistically different from zero, although it was positively signed, as expected.

Consistent with other empirical research (Thomason, Schmidle, and Burton 2001), the coefficient on the state fund dummy variable is positive and statistically significant, indicating that the costs of workers' compensation are higher in those states with a competitive state fund than in jurisdictions that do not have a competitive fund. Finally, only two of the coverage dummies were statistically significant. As expected, the employers' costs of workers' compensation was higher in jurisdictions that extended coverage to employers regardless of size, than in jurisdictions that excluded small employers. Costs were also higher in those states and provinces that allow workers the choice of jurisdiction in which to initiate a claim.

Table 7
Results of Regression Predicting Adjusted Manual Rate for Entire Market

Variable	Coefficient	Standard Error	Absolute T-ratio
ln(Cash Benefits)	0.13922	0.03643	3.82
ln(Injury Rate)	0.61097	0.08454	7.23
Medical Costs	0.10940	0.02072	5.28
Union Density	0.38071	0.41970	0.91
LTD Claims as % of Total	2.10019	0.28698	7.32
Competitive State Fund	0.11058	0.05033	2.20
Compulsory Coverage	0.04657	0.17877	0.26
No Waivers	0.00414	0.03311	0.13
No Size Exemption	0.12458	0.05857	2.13
Farmworkers	-0.02082	0.05473	-0.38
Household & Casual Workers	0.39877	0.43228	0.92
Government Employees	-0.03028	0.16660	-0.18
No Occupational Exemption	0.04840	0.06729	0.72
Filing Choice	0.11339	0.05165	2.20
Occupational Disease	-0.11948	0.09252	-1.29

2. Industrial Sectors Results

Tables 8 through 10 report the results of regression analyses predicting the employers' costs of workers' compensation insurance for the three subsectors described earlier: manufacturing, construction, and "other" firms. It is important to note that the independent variables in these regressions are identical to those used in the total market regression and are therefore based on total market data. For example, the cash benefit variable measures benefits paid to the average claimant in the total market and not to the average claimant working in manufacturing or the construction industry. As such these regressions are subject to an errors-in-variable problem so that the coefficients estimates are likely biased. Nevertheless, the results of these regressions provide useful information regarding differences in the relative costs of delivering benefits among these subsectors.

As can be seen, these results are substantially similar to those reported for the total market in Table 7. The only differences are for two of the coverage variables. The data indicate that the coefficient for the size exemption recommendation is statistically insignificant in the regression predicting the adjusted manual rate for construction firms. On the other hand, the coefficients for the occupational disease variable are now negative and statistically significant in both the manufacturing and construction regression equations, but not in the equation predicting employer costs for "other" firms.

Table 8
Results of Regression Predicting Adjusted Manual Rate for Manufacturing Firms

Variable	Coefficient	Standard Error	Absolute T-ratio
ln(Cash Benefits)	0.19734	0.03682	5.36
ln(Injury Rate)	0.64253	0.08543	7.52
Medical Costs	0.09915	0.02094	4.73
Union Density	0.22198	0.42416	0.52
LTD Claims as % of Total	1.94077	0.29003	6.69
Competitive State Fund	0.06669	0.05086	1.31
Compulsory Coverage	0.07850	0.18066	0.43
No Waivers	0.02681	0.03346	0.80
No Size Exemption	0.15292	0.05920	2.58
Farmworkers	-0.04108	0.05531	-0.74
Household & Casual Workers	0.40604	0.43686	0.93
Government Employees	0.00487	0.16836	0.03
No Occupational Exemption	0.05004	0.06800	0.74
Filing Choice	0.14394	0.05220	2.76
Occupational Disease	-0.21184	0.09350	-2.27

Table 9
Results of Regression Predicting Adjusted Manual Rate for Construction Firms

Variable	Coefficient	Standard Error	Absolute T-ratio
ln(Cash Benefits)	0.11246	0.03997	2.81
ln(Injury Rate)	0.65827	0.09027	7.29
Medical Costs	0.13744	0.02250	6.11
Union Density	0.23990	0.46136	0.52
LTD Claims as % of Total	1.65110	0.21441	7.70
Competitive State Fund	0.14485	0.05536	2.62
Compulsory Coverage	-0.11121	0.19668	-0.57
No Waivers	-0.01977	0.03649	-0.54
No Size Exemption	0.03088	0.06390	0.48
Farmworkers	0.01406	0.06023	0.23
Household & Casual Workers	0.35162	0.47617	0.74
Government Employees	0.02803	0.18367	0.15
No Occupational Exemption	0.05284	0.07412	0.71
Filing Choice	0.15737	0.05713	2.75
Occupational Disease	-0.20773	0.10199	-2.04

Table 10
Results of Regression Predicting Adjusted Manual Rate for Other Firms

Variable	Coefficient	Standard Error	Absolute T-ratio
ln(Cash Benefits)	0.16047	0.03659	4.39
ln(Injury Rate)	0.49637	0.08265	6.01
Medical Costs	0.10522	0.02060	5.11
Union Density	0.22476	0.42240	0.53
LTD Claims as % of Total	1.51842	0.19631	7.73
Competitive State Fund	0.11368	0.05069	2.24
Compulsory Coverage	0.09451	0.18007	0.52
No Waivers	-0.00464	0.03341	-0.14
No Size Exemption	0.18356	0.05851	3.14
Farmworkers	-0.04832	0.05515	-0.88
Household & Casual Workers	0.42346	0.43596	0.97
Government Employees	-0.06448	0.16816	-0.38
No Occupational Exemption	0.04954	0.06786	0.73
Filing Choice	0.13113	0.05231	2.51
Occupational Disease	-0.07324	0.09337	-0.78

It is likely that institutional arrangements in the construction industry, a high-risk industry dominated by small and transitory employers, are responsible for the former result. However, the findings for the occupational disease variable are somewhat surprising in that the data suggest that jurisdictions in which occupational disease is comprehensively covered have lower costs than jurisdictions in which it is not. One would expect that by covering more risks, a state or province would increase costs. That said, it is interesting that this variable is significant in manufacturing and construction, since occupational disease risks are probably greater for firms in those sectors than for "other" firms, i.e., retail and wholesale trade establishments and service sector employers.

B. Efficiency: Ontario Relative to Other Jurisdictions

1. Jurisdiction-wide Results

As previously indicated, differences among jurisdictions in delivery system efficiency are measured using a set of dummy variables that identify each state and province in our sample. The ratio of Ontario workers' compensation costs to the costs of the workers' compensation program in another North American jurisdiction may be expressed as:

$$\frac{C_o}{C_*} = \exp\left[\ln C_o - \ln C_*\right] \qquad (4)$$

where Co is the costs of workers' compensation in Ontario and C* is the costs of workers' compensation in another North American Jurisdiction. Substituting from equation (3) and assuming that $E[\varepsilon_{it}] = 0$, the right-hand side of equation (4) may be expressed as:

$$= \exp\left[\sum_k \beta_k X_{ko} + \beta_o - \sum_k \beta_k X_{k*} - \beta_*\right] \qquad (5)$$

Assuming that the values of the other independent variables (e.g., cash benefits, medical costs, the injury rate, etc.) are equal in the two jurisdictions, i.e., that $\boldsymbol{X}_{ko} = \boldsymbol{X}_{k*}$, then equation (5) reduces to:

$$= \exp\left[\beta_o - \beta_*\right] \qquad (6)$$

Thus, it is possible to calculate the ratio of the costs of workers' compensation in Ontario relative to their costs in another North American jurisdiction by finding the exponential of the difference between the coefficient for the Ontario dummy and the coefficient of the other jurisdictional dummy. Importantly, this ratio controls for inter-jurisdictional costs differences that are due to differences in the generosity of cash or medical benefits, the underlying risk of injury, the administration of long-term disability benefits, union density, and the other variables included in our regression analysis. In other words, this ratio indicates the costs of workers' compensation in Ontario relative to the costs in another jurisdiction after controlling for other factors affecting costs, which means the ratio is a measure of relative delivery system efficiency.

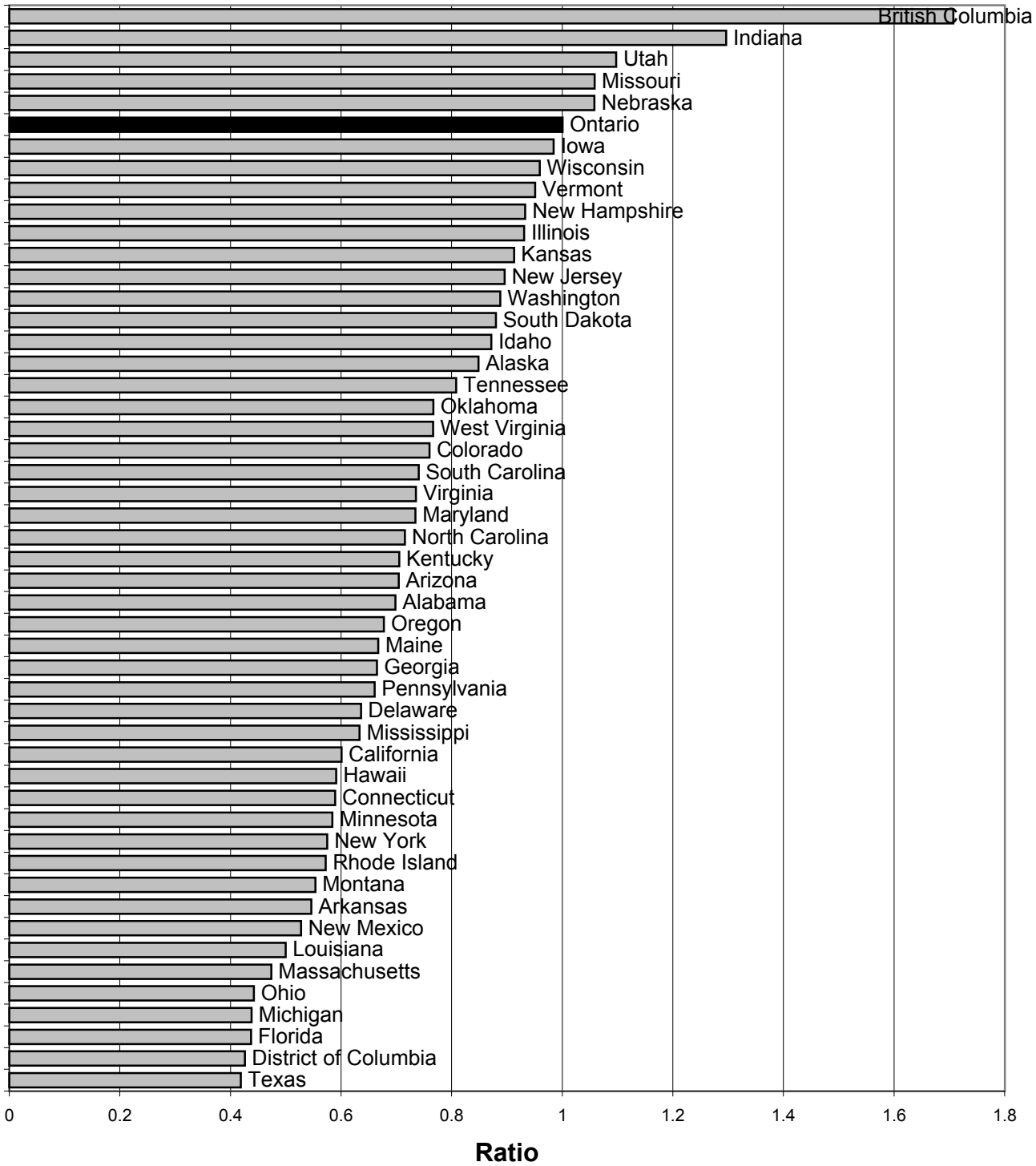
If for example, Ontario and Pennsylvania had identical values for all control variables (such as the levels of cash and medical benefits), and the costs of workers' compensation insurance was lower in Ontario than in Pennsylvania, then we would attribute the lower costs to superior delivery system efficiency in Ontario. The degree of relative superiority of delivery system efficiency in Ontario to Pennsylvania is measured by the exponential of the difference of (1) the coefficient of the Ontario dummy variable and (2) the coefficient of the Pennsylvania dummy variable, where the dummies are included in a regression that also includes all the control variables.

Figure 26 depicts relative delivery system efficiency of each jurisdiction in our sample. Relative efficiency is defined as explained in the previous paragraph: the ratio of the costs of workers' compensation in Ontario to the costs of workers' compensation in the other jurisdiction, after controlling for all other factors influencing cost. This means that jurisdictions that are more efficient than Ontario will have a ratio that is greater than one, since costs in Ontario, after controlling for other factors, are greater than costs in those other jurisdictions; the greater the ratio the more efficient the jurisdiction. Similarly, jurisdictions that are less efficient than Ontario will have ratios that are less than one; that is, the smaller the ratio, the less efficient the jurisdiction. By definition, the costs ratio for Ontario is equal to one. This means that jurisdictions near the top of Figure 26 are the most efficient, while jurisdictions near the bottom are the least efficient.

The dark bar at the top of the figure depicts Ontario, whose delivery system efficiency ratio is – by definition – equal to one. As can be seen, these data indicate that, after controlling for other factors affecting employer costs, the delivery system efficiency of the workers' compensation insurance is higher in Ontario than it is in all but five other jurisdictions in our sample. British Columbia is the most efficient – the dummy variable in Ontario is almost 180 percent of the corresponding dummy variable for British Columbia. Texas is the least efficient – the dummy variable in Ontario is a little over 40 percent of the corresponding dummy variable in Texas.

These results suggest that one reason Ontario workers' compensation costs are relatively low is because the WSIB is substantially more efficient than most other North American jurisdictions.

Figure 26
Relative Efficiency of Delivery System, 1975-1995,
Total Market



2. Industrial Sectors

Figures 27 through 29 present data on the delivery system efficiency of the Ontario workers' compensation program compared to the delivery system efficiency of the workers' compensation programs in other jurisdictions for each of the three industrial subsectors. As can be seen, the data indicate that the relative efficiency of the Ontario program is greater for manufacturing and "other" firms than for firms in the construction industry. Ontario ranks 7th and 5th in relative efficiency out of the 50 jurisdictions in our sample with respect to employer costs for manufacturing and other firms, while it ranks 15th in efficiency for construction firms.

C. Adjustments for Self Insurance

One of the more significant differences between Canadian and U.S. workers' compensation programs is the availability of the self-insurance option. While there are self-insured firms (including self-insured governmental organizations) in both nations, large U.S. employers are generally free to self insure rather than purchase coverage from a private carrier or a state insurance fund while, by law, only a select group of Canadian may exercise the self-insurance option.[52] In other words, most Canadian firms lack the self-insurance option that is available to large U.S. employers.[53]

Due to economies of scale in the production of workplace safety, large firms typically have a loss experience that is more favorable than that of smaller firms. In addition, these larger firms, which incur the entire costs of workers' compensation benefits paid to injured workers either because they are self-insured or because they are perfectly experience-rated, are likely to have greater incentives to reduce their loss experience than firms that are not self-insured. For both reasons, we expect that firms that opt to self-insure will have a favorable loss experience relative to those that purchase coverage in the market.

Figure 27
Relative Efficiency of Delivery System, 1975-1995,
Manufacturing Firms

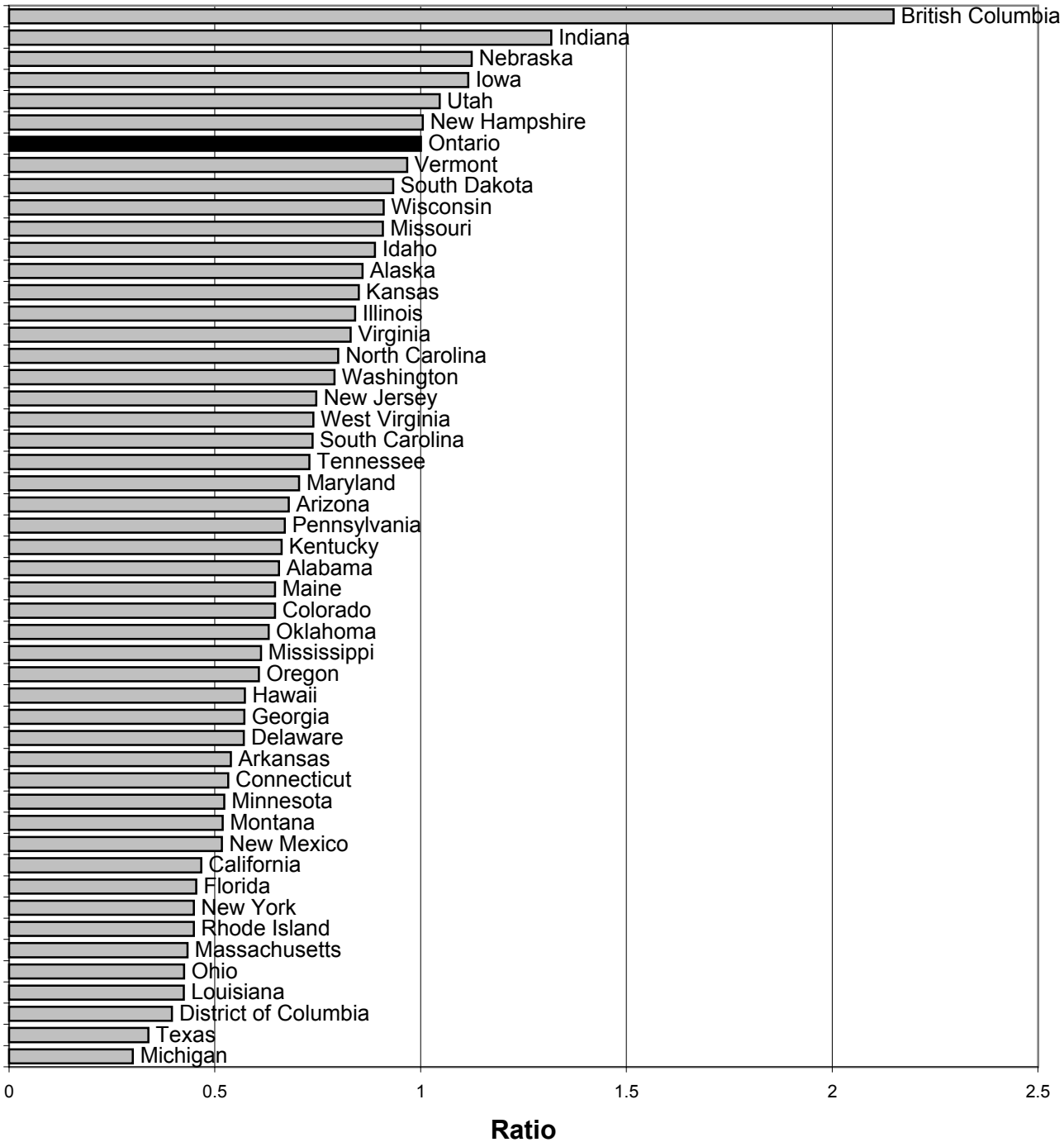


Figure 28
Relative Efficiency of Delivery System, 1975-95
Construction Firms

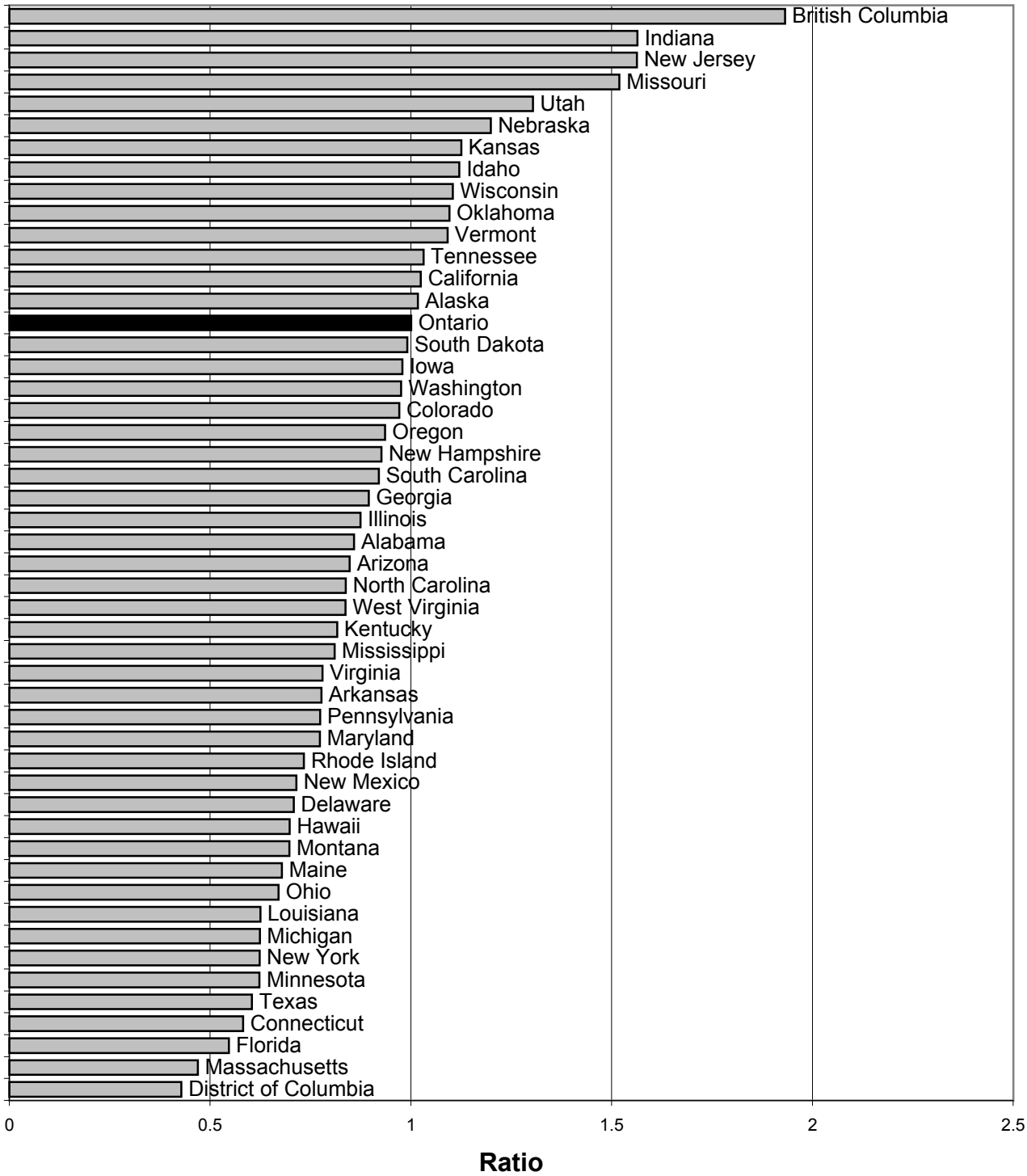
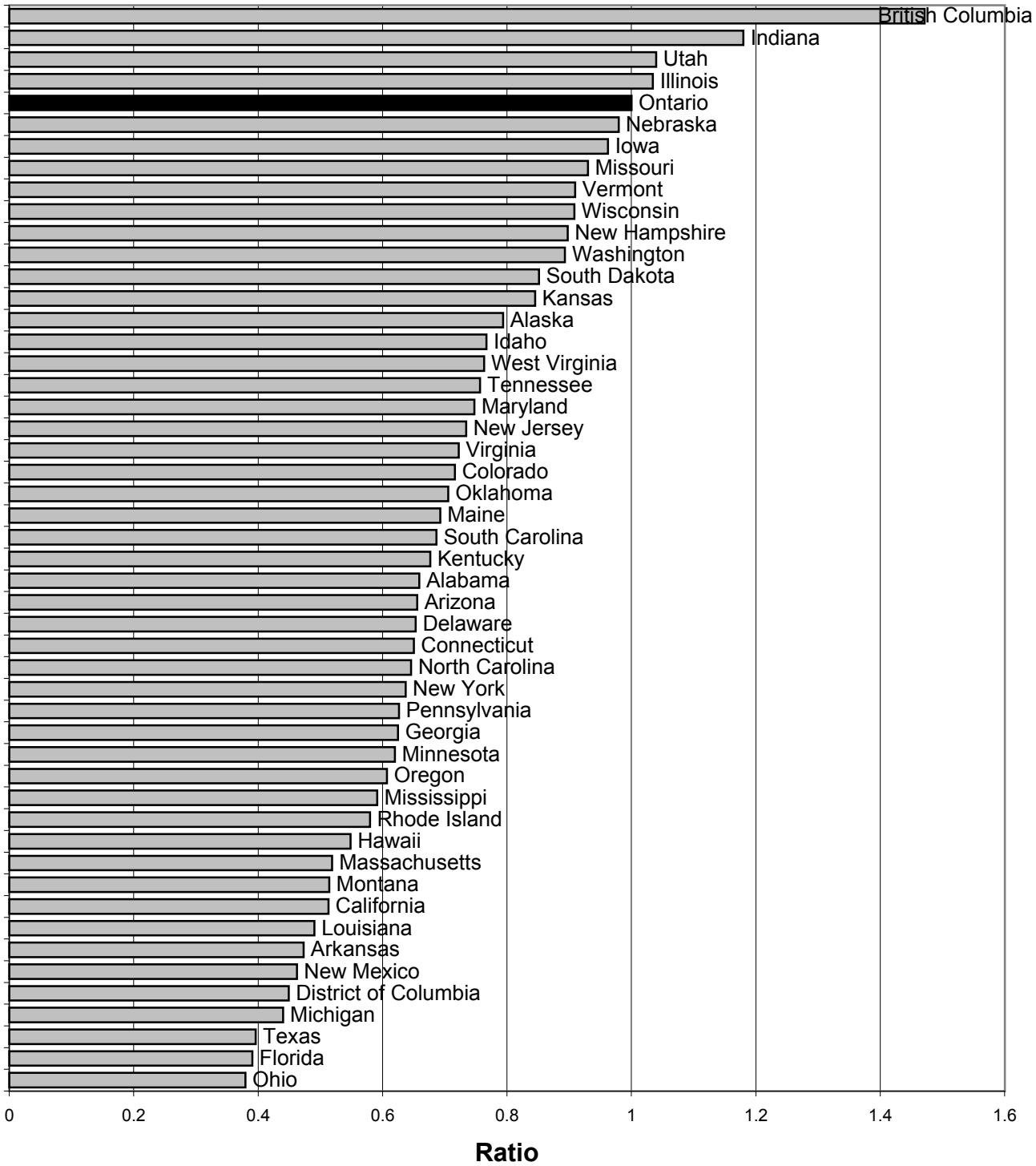


Figure 29
Relative Efficiency of Delivery System, 1975-95
Other Firms



Unfortunately, due to the lack of available data on workers' compensation costs for self-insured firms, our costs estimates (the adjusted manual rates) are based solely on the costs incurred by non-self insured firms. If, as expected, self-insured employers have lower compensation costs than non-self insured employers, *ceteris paribus*, then our estimates of workers' compensation costs in jurisdictions that permit self-insurance are biased; specifically, we over estimate costs in those jurisdictions that permit self-insurance and the greater the proportion of firms that are self-insured, the more biased are our estimates.

In our earlier study, we attempted to estimate the impact of the self-insurance in the United States using a three-stage procedure. First, using only U.S. jurisdictions, we estimated a regression equation that was similar to the one described earlier, but that also included a variable measuring workers' compensation benefits paid by self-insured employers in a jurisdiction as a proportion of total benefits paid. Second, the resultant regression equation estimates were used to predict adjusted manual rates under two assumptions: (1) all U.S. jurisdictions prohibit employers from self-insuring and (2) current policy. Third and finally, the ratio of predicted costs under the assumption of no self insurance to predicted costs under current policy were then multiplied by adjusted manual rates to obtain new costs estimates.

However, in that study we noted that the regression estimates from the first stage of our estimation procedure are probably biased because costs are likely endogenous with the determinants of the extent of self insurance. In other words, the employer's decision to self-insure or to purchase insurance is probably itself determined by the costs of workers' compensation coverage in the insurance market; the higher the costs of insurance, the more likely it is that the firm will self-insure. If so, then we might expect that the coefficient for a variable measuring the extent of self-insurance in a regression equation predicting employer costs will be biased upward, so that the extent to which costs are affected by the self-insurance option will be over estimated. This would result in our underestimating costs in jurisdictions that allow employers to self insure.

In this study, we use a different approach, which we hoped would provide more accurate estimates of the relative costs of delivering jurisdictions in Ontario. Specifically, we use three-stage least squares regression to estimate the employers' costs of workers' compensation and benefits paid by self-insured employers as a proportion of total benefits paid, controlling for endogeneity between self insurance and costs.

1. Regression Specification

(a) Adjusted Manual Rates. Because we lacked data on one of the predictors of the extent of self insurance for the period 1975-1979, as discussed below, the data set used in these analyses has fewer observations (n = 751) than the data set used in the previous section.

The equation predicting adjusted manual is identical to that described in the previous section with one exception: we dropped all of the coverage variables except the dummies for size exemption and no filing choice due to perfect collinearity with the jurisdiction dummies.

(b) Self insurance. As indicated, because we may expect that employers will be more likely to self-insure as the costs of workers' compensation insurance increase, we estimate the proportion of benefits paid by self-insured employers as a function of the adjusted manual rate. Two exogenous dummy variables are also included to identify the system of equations: a variable indicating whether the jurisdiction allows employers to choose whether or not to self insure and a variable indicating whether the jurisdiction allows employers to organize a self-insured group, i.e., a group of firms that may be unable to meet the fiscal criteria necessary to qualify for self-insurance individually, but that are able to qualify as a group. Unfortunately, data for the latter variable were only available for years after 1979. We expect both of these variables, which increase the opportunity for firms to self-insure, to be positively related to the extent of self-insurance in a jurisdiction. We also include a dummy variable indicating whether the jurisdiction has a competitive state fund.

Two sets of regressions were estimated: a single equation predicting adjusted manual rates as a function of the proportion of benefits paid by self-insured employers and a system of two equations where costs and the extent of self-insurance are endogenous.

2. Results

The results of the OLS regression equation estimating employer's costs after controlling for the extent of self insurance are shown in Table 11. As can be seen the results for the other regressors are comparable to those in Tables 7 to 10. The coefficient for the proportion of self-insured benefits is positive and statistically significant, as expected, supporting the hypothesis that low-cost employers are more likely to self-insure than high-cost employers.

Figure 30 depicts the employers' cost of workers' compensation in Ontario relative to the costs in other jurisdictions. A comparison of this figure with Figure 26 shows that after controlling for the extent of self insurance, the efficiency of Ontario's drops relative to the efficiency of other jurisdictions, from the 6th most efficient to the 8th most efficient.

The results of the three-stage regression analysis are presented in Table 12. Panel B reports the coefficient estimates for the equation predicting the proportion of benefits paid by self-insured employers. These data support our prior hypotheses, i.e., that higher compensation costs increase the number of employers who opt to self-insure as will public policies that allow employers more opportunity to self-insure. The cost equation results are contained in Panel A and are similar to those previously reported, with one important exception, the self-insurance coefficient is no longer statistically different from zero. Together these results suggest that insurance costs are more likely to affect the decision to self-insure rather than the other way around.

Figure 31 depicts the relative efficiency estimates produced by the three-stage regression analysis. These estimates suggest that Ontario is the 7th most efficient jurisdiction. This is comparable to the OLS estimates depicted in Figure 26, which did not control for the self-insurance option. The difference (6th rather than 7th) is probably due to the difference in the study period used for analysis (1975 to 1995 rather than 1980 to 1995).

Table 11
Results of OLS Regression Predicting Adjusted Manual Rate, Controlling for Self-Insurance

Variable	Coefficient	Standard Error	Absolute T-ratio
ln(Cash Benefits)	0.13177	0.03798	3.47
ln(Injury Rate)	0.63433	0.09517	6.67
Medical Costs	0.12333	0.02339	5.27
Union Density	-0.44876	0.42329	-1.06
LTD Claims as % of Total	1.35150	0.30583	4.42
% Self-insured	0.00446	0.00129	3.45
Competitive State Fund	0.10122	0.05513	1.84
No Size Exemption	0.11218	0.09269	1.21
Filing Choice	0.22201	0.09948	2.23

Table 12
Results of 3SLS Regression Predicting Adjusted Manual Rate
Controlling for Self-Insurance

Variable	Coefficient	Standard Error	Absolute T-ratio
ln(Cash Benefits)	0.12857	0.03616	3.56
ln(Injury Rate)	0.62077	0.09042	6.87
Medical Costs	0.14509	0.06484	2.24
Union Density	-0.16448	0.74821	-0.22
LTD Claims as % of Total	1.17181	0.38926	3.01
% Self-insured	0.00332	0.01767	0.19
Competitive State Fund	0.09404	0.08490	1.11
No Size Exemption	0.12097	0.11166	1.08
Filing Choice	0.22093	0.10269	2.15
Panel B: Self Insured Proportion Equation			
ln(Adjusted Manual Rate)	5.77558	2.41476	2.39
Group Self Insurance	1.71045	0.73726	2.32
Individual Self Insurance	37.61892	4.13357	9.10
Competitive State Fund	4.85244	1.51276	3.21
No Size Exemption	2.10650	2.66264	0.79
Filing Choice	-3.01087	2.43775	-1.24

Figure 30
Relative Efficiency of Delivery System Controlling for Self-Insurance, OLS Regression, 1975-95, Total Market

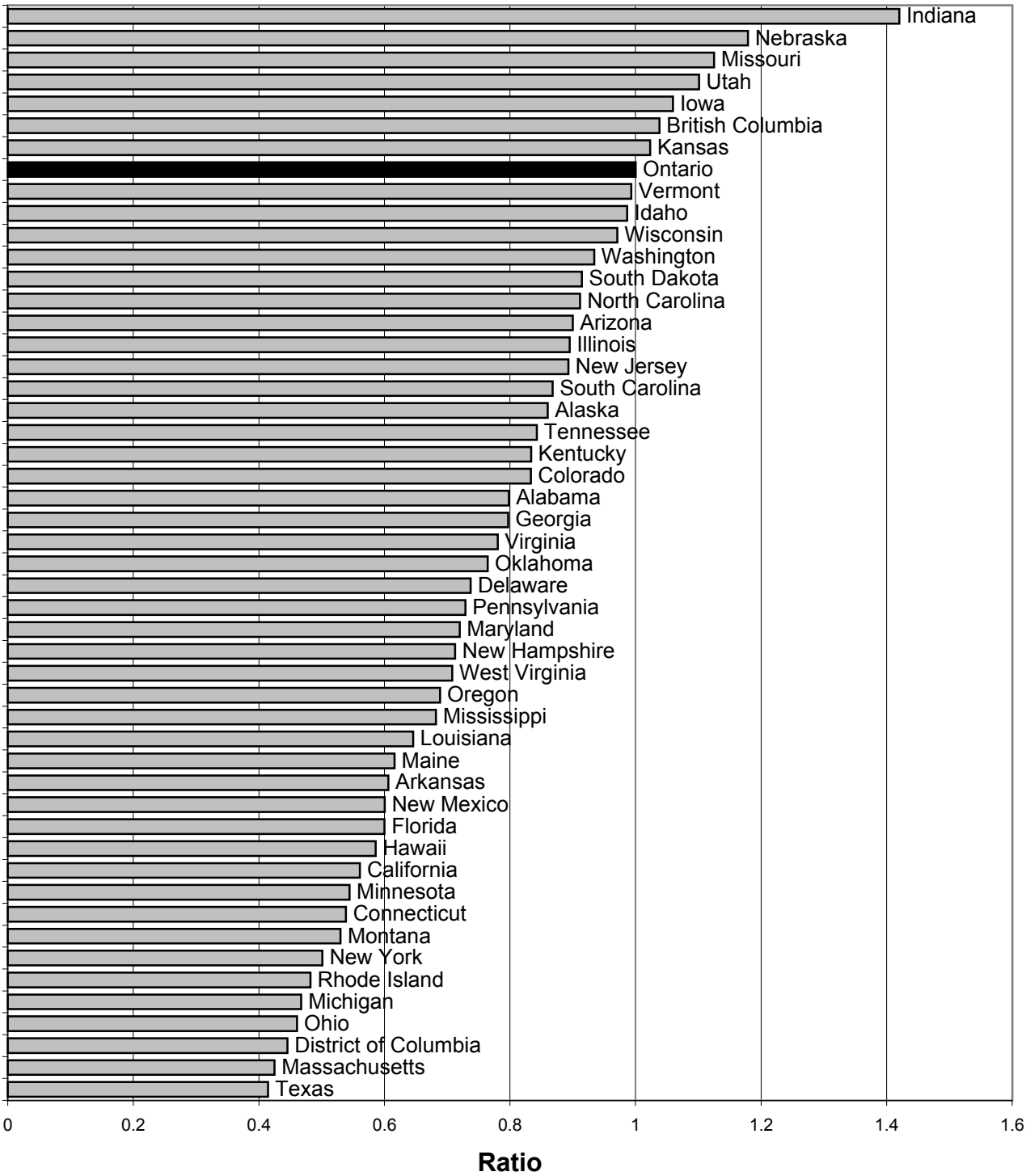


Figure 31
Relative Efficiency of Delivery System, Controlling for Self-Insurance Option, 3SLS Regression, 1975-95, Total Market