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John W. Budd* Yijiang Wang†

*University of Minnesota,

†University of Minnesota,

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Abstract

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JOHN W. BUDD and YIJIANG WANG*

Some critics of proposed legislative labor policy changes contend that laws favoring labor would adversely affect business investment. Research on labor policy, however, often assumes that investment is fixed. The authors present a sequential bargaining model in which labor policies that increase labor's bargaining power and reduce management's options during strikes are predicted to reduce investment. The results of an analysis of provincial data on investment for 1967 to 1999 indicate that strike replacement bans and protections for workers who refuse to handle struck work did indeed reduce new investment, especially within the first few years after the policy change. Particularly sensitive was building construction investment, which declined by about as much when a labor policy benefiting labor was enacted as it would be expected to decline in a recession.

In response to a proposed ban on strike replacements in the federal sector of Canada, the Canadian Chamber of Commerce (1995:67) argued that "investors would be given a powerful incentive to either avoid or flee the jurisdiction." An Ernst and Young report commissioned by the Council of Ontario Construction Associations surveyed employers' beliefs about the likely impact of proposed Ontario labor law changes. In this survey of 251 Ontario businesses, 84.5% of respondents agreed that the proposed changes would affect their future investment plans in Ontario (Council of Ontario Construction Associations 1992). Similar reactions to proposed labor policy changes are observed in the United States. Respondents to these types of surveys have an obvious self-interest in exaggerating the strength of their conviction, but even if the responses are exaggerated, they underscore the importance of incorporating investment decisions into models and analyses of legislative labor policies.

However, the research literature has generally overlooked investment decisions when modeling and analyzing labor policies. In this article we try to help remedy this neglect by analyzing the effect of various labor policies on investment. This is an important extension to the existing litera-

*John W. Budd is Industrial Relations Landgrant Term Professor and Yijiang Wang is Associate Professor, both at the Industrial Relations Center, Carlson School of Management, University of Minnesota. They thank the Carlson School of Management's McKnight–Business and Economics Research Grants Program for financial support.

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ture, because previous studies have typically assumed investment is fixed. A clear example is the research on banning strike replacements. In standard private information bargaining models, such restrictions theoretically increase wage outcomes (for example, Cramton, Gunderson, and Tracy 1999; Farès and Robert 1996). Empirical research and public policy debates use this modeling framework as a foundation. However, the model below demonstrates that capital investment may adjust to the passage of strike replacement legislation and to other labor policies, possibly causing declines in workers' wages.

In our model, investors choose the amount of capital to invest in a firm, and after this investment is known, the firm and union bargain over the wage rate to be paid to the employees. Labor policies such as strike replacement restrictions affect the expected utilization of capital and returns on capital. Naturally, investment responds to the passage of such policies; it declines when new policies in favor of labor are adopted.

The second part of this article uses Canadian provincial data on investment for 1967 to 1999 to empirically analyze the extent to which investment responded to labor policy changes. Previous empirical research has examined the relationship between various labor policies and wages (Budd 1996; Cramton, Gunderson, and Tracy 1999), strike activity (Budd 1996; Cramton, Gunderson, and Tracy 1999; Gunderson, Kervin, and Reid 1989; Gunderson and Melino 1990), and employment (Budd 2000), but we are unaware of any analyses of how investment responds to labor policies.[1]

Theoretical Framework

Consider a single-firm model with a conventional production function with two inputs, capital $K \geq 0$ and labor $L \geq 0$. Capital is sunk once it is invested. Deviating from the tradition of neoclassical economics that assumes a fixed marginal productivity of labor, we model the productivity of labor as state-dependent. This state dependence is captured by a parameter θ $(0 \leq \theta \leq 1)$, with the firm's production function being $f(K, \theta L)$. The magnitude of θ is postulated to vary with legislated labor policies.

Consider the example of strike replacement restrictions. The baseline situation is normal production—regular employees working without the interferences of a strike or other work action, so that $\theta = 1$. In contrast, when workers are on strike and all strike replacements are banned by law, labor productivity (θ) approaches zero. If replacements are allowed, $0 < \theta < 1$ would be true under two likely conditions. First, for several reasons—notably, the fact that specific human capital can be accumulated only in a long-term employment relation—replacement workers are not as productive as regular workers. Second, the productivity of replacement workers is positive, even if less so than for regular workers, so having them is better than not having them (if this were not the case, employers would not argue against replacement bans). Whether θ is closer to 0 or 1 is an empirical question and likely varies with technology, specific labor market conditions (for example, the degree to which labor with the requisite kinds of skills and knowledge is available from the market), and the applicable labor law provisions. For example, inexperienced replacement workers, jobs that require extensive firm-specific knowledge, and restrictive strike replacement laws are all predicted to decrease the magnitude of θ.

The firm's objective is to maximize profit, which is the difference between output and the costs of capital and labor. Labor at this firm is represented by a union that maximizes a utility function $U(w, L)$, where w is the wage. For simplicity, we normalize the units of labor to one. The first-best solution is for the two parties to choose the optimal amount of capital to jointly maximize their total gain. This requires that workers do not strike, for any loss due to a

[1]As referenced below, there is both theoretical and empirical research on unionization and investment, which we use as a foundation for this article.

strike is a net social cost. The absence of strikes implies that $\theta = 1$, which describes baseline productivity, with fully productive regular workers. The first-best capital level satisfies the standard optimization requirement that the marginal productivity of capital equals the marginal cost of capital.[2]

However, in our model, there is no central planner to maximize total social welfare, and we therefore consider a sequential process. The firm and the worker are both selfish players, with the former maximizing profit and the latter utility. Furthermore, capital investment and wage bargaining (strike decisions) are made sequentially in the following order. Investors first determine the level of K to invest at time 0. After K is sunk, the firm and union engage in Nash bargaining over the wage at time 1. If the two sides can reach an agreement, production proceeds at time 2 with $\theta = 1$ and the worker paid according to the agreement.

If the two sides cannot reach an agreement at time 1, the worker will strike at time 2. In that event, the striking worker will work for another employer and receive his or her alternative market wage. Meanwhile, the firm will hire replacements (if allowed) at the market wage with productivity θ, where $0 < \theta < 1$. The value of θ is smaller the more restrictive is the replacement law. In the extreme case, when replacements are completely prohibited by law, $\theta = 0$. Perfect and complete information is assumed, meaning that information on the payoff structure and on all previous moves is transparent and symmetric for both parties.

The result of Nash bargaining at time 1, that is, how the firm and union eventually divide the total wealth, depends on two factors: the breakup (or threat) points of the two parties, and their relative bargaining power. The firm's threat point is its profitability during a strike, which is determined by the value of θ, and therefore by the restrictiveness of labor policy (given all other technological and labor market conditions influencing the value of θ). Labor's threat point is the alternative market wage. As long as the total revenue produced by the firm and worker exceeds the combined value of the firm's alternative profitability and the worker's alternative wage, no strike should occur and the two parties should bargain over how to divide the surplus left over after each party receives its minimum payment.[3]

The standard Nash bargaining solution is that the surplus is divided according to relative bargaining power. The resulting wage is then equal to the alternative wage plus labor's share of the surplus. Let $0 < \beta < 1$ be labor's relative bargaining power, and therefore labor's share of the surplus. As with θ, the value of β may be affected by labor policy. If the union is very strong and labor policy is favorable toward labor, β is close to 1 and the union captures nearly all of the surplus. If the union is weak and labor policy favors management, β is close to 0 and the union captures very little of the surplus, so the negotiated wage is close to the market wage.

To complete the model, recall that investors choose the amount of sunk investment at time 0 before wage bargaining occurs at time 1. We assume that the investors anticipate the bargaining result at time 1. Thus, the time 0 optimization problem is to choose a level of K to maximize the firm's profits at time 1 given the Nash bargaining wage. This is a function of both θ and β. The solution to this maximization problem in our sequential bargaining model yields an optimal investment level smaller than the (non-sequential) first-best investment level.[4] Given the possibility of $\theta < 1$ because of a

[2]We assume that the technical conditions are all satisfied for an interior solution of optimal L and K.

[3]With perfect information, the two sides will engage in efficient bargaining and reach an agreement, and there is never a strike at time 2. Nonetheless, the model needs to specify what happens in the event of a strike at time 2 in order to identify each side's threat point.

[4]This result is demonstrated more formally in Budd and Wang (1999).

strike at time 2, profits in the sequential bargaining case are less than in the optimal, centrally-planned case for each level of capital. This is sufficient for the optimal level of investment to fall below that in the case of first-best investment. This result is consistent with that obtained by Baldwin (1983), Grout (1984), and van der Ploeg (1987), in which unions cause underinvestment when labor contracts are of shorter duration than the productive life of capital. Underlying these results is investors' expectations that unions will exploit "the valuable hostages of large sunk investment" (Simons 1944:8), which makes it optimal for investors to adjust their investment level downward *ex ante*.

But consider the effects of labor policy changes on investment. Banning the use of all replacements means that $\theta = 0$. More generally, implementing restrictions or limitations on the use of replacements decreases θ. Additionally, strike replacement bans are widely believed to increase labor's bargaining power, which in the model is an increase in β. A policy that weakens existing legal restrictions on unions' abilities to engage in secondary boycotts enhances union bargaining power (increases β) and reduces firms' options during a strike (decreases θ). Proposed changes to the current doctrine on the legality of various forms of picketing would have quite similar effects.

Mandatory strike vote policies require a strike vote before a strike can occur. Employer-initiated voting policies provide employers with the option of requiring the union's rank and file membership to vote on the company's final offer before the union is allowed to strike the company. Both of these policies potentially increase the firm's bargaining power (decrease β). If a newly unionized firm and the union are not able to negotiate a first contract, first contract arbitration policies force the two parties to submit their dispute to binding arbitration. It is widely accepted that unions have significant difficulties mounting an effective strike when trying to negotiate their first contract, so this arbitration policy increases labor's bargaining power. Last, the ability to decertify a union enhances the firm's bargaining power and increases its options during a strike. Policies that prohibit decertification activity during a strike, therefore, increase union bargaining power (increase β) and decrease the firm's options during a strike (decrease θ).

If the only effect of labor policies were on bargaining at time 1, legislation that strengthens workers' bargaining power (β) and makes a strike more costly to employers (θ) would make workers better off. This scenario is likely what the advocates of these laws envision. However, our model emphasizes that investors can rationally anticipate these effects and, before the bargaining is started at time 1, adjust their investment level downward in response to new labor policies that strengthen workers' bargaining power.[5] In the remainder of the article, we use data on investment from the 10 Canadian provinces to test these predicted effects of labor policies on investment adjustment.

Provincial Investment Data and Empirical Specification

An empirical analysis of the relationship between investment and labor policy requires variation in labor policies. Private sector U.S. labor laws are very stable across time and location, providing minimal scope for empirical investigation. In contrast, Canadian labor policies are generally established at the provincial level. While the foundations of labor relations are similar across provinces (incorporating, for example, the principle of exclusive representation), there is significant labor policy variation across both time and provinces (Adams

[5]Although the focus of this article is on investment adjustment in response to labor policies, it is worthwhile to note that a downward adjustment of investment can reduce wages. In our model, lower investment in time 0 reduces the amount of the surplus to be divided in time 1. A strike replacement ban, for example, will reduce rather than increase wages if this reduced surplus outweighs labor's ability to win a larger share (Budd and Wang 1999).

1994; Carter et al. 2002). If this variation is exogenous, it provides a natural experiment for testing the effects of these labor policies. We therefore analyze provincial Canadian laws on strike replacements, refusals to handle the work of a struck employer, decertification petitions, and first contract arbitration. The effective dates for these laws are listed in Appendix Table A1.

Two strike replacement policies are analyzed: a ban on replacements, and reinstatement rights. A strike replacement ban forbids employers from hiring someone to do bargaining unit work during a legal strike and also restricts the use of existing employees. The second, and weaker, strike replacement policy analyzed includes two policies: permanent replacement bans and reinstatement rights. Permanent strike replacement laws prohibit the use of permanent strike replacements, but not temporary replacements, while reinstatement rights provisions grant striking workers the right to return to their jobs. Though worded differently, these two laws have the same effective implication for strike replacements, and subsequently we will refer to both policies as reinstatement rights.[6]

Another strike-related scenario relates to employees working for an employer that receives products from a struck company. In the absence of legislative protections, an employee who refuses to handle these products could generally be disciplined. Some provinces explicitly protect workers from being disciplined in these situations, and this is the third policy analyzed below. Once a union is certified as a bargaining agent, it generally loses this status only through a decertification election. The fourth policy analyzed is the explicit prohibition on filing decertification petitions with the provincial labor board during a strike. Last, first contract arbitration policies mandate the submission of any disputes regarding the negotiation of a first contract to binding arbitration rather than allowing the parties to strike.

The two strike replacement policies restrict management's ability to use various types of replacement workers during a strike, so these policies are hypothesized to lower investment. Protections for struck work refusals also potentially reduce management's ability to maintain production during a strike and are predicted to reduce investment. Prohibiting decertification petitions during a strike and providing for first contract arbitration both reduce management's options for trying to avoid unionization and are therefore hypothesized to decrease investment.

As in the empirical research on unions and investment, we use regression analyses to estimate how investment activity is related to the variables of interest, in this case indicators for the presence of these five labor policies, and various controls. To undertake these analyses, we constructed a data set on annual investment activity in each of the 10 Canadian provinces between 1967 and 1999. These data series extend back farther than 1967, but 1967 to 1999 is the longest period for which complete data are available once lagged control variables are included. This data set consists of 330 observations in a balanced panel of 10 provinces and 33 years. More complete details on data sources and construction are contained in the Data Appendix.

Previous empirical research on investment has used a variety of dependent variables. Firm-level analyses of unionization and investment include the following dependent variables: the log of the ratio of investment in plant and equipment to sales (Bronars, Deere, and Tracy 1994; Cavanaugh 1998), the log of annual capital investment (Denny and Nickell 1991, 1992;

[6]Reinstatement rights policies effectively ban permanent strike replacements, since employees are granted the right to return to their jobs with priority over replacement employees. These permanent replacement bans/reinstatement rights policies are weaker than the more comprehensive strike replacement ban, however, because the latter also restricts the use of temporary replacements and existing employees. Between 1985 and 1995, the U.S. Congress considered, but did not pass, at least four proposals to limit the use of permanent strike replacements.

Hirsch 1992), and the ratio of investment to capital stock (Bronars, Deere, and Tracy 1994; Fallick and Hassett 1999). In an aggregate analysis using Canadian industry-level data, Odgers and Betts (1997) focused on the net investment rate (net new investment normalized by the capital stock). Since our data are aggregated, we follow Odgers and Betts (1997) and use the net investment rate as the dependent variable.[7] To this end, we construct the net investment rate from Statistics Canada constant-dollar measures of gross fixed capital formation (new investment), depreciation, and end of year capital stock. Depreciation and the net capital stock are calculated by Statistics Canada using delayed (beta) depreciation (see Statistics Canada 1994). In addition to the overall net investment rate, we consider the net investment rate for two investment subcategories: building construction, and machinery and equipment.[8] Note carefully that these are types of investment, not industries.

Turning to the independent variables, we follow Odgers and Betts (1997) by estimating a hybrid model that captures both the accelerator and neoclassical investment models. As in Odgers and Betts's analysis, we construct accelerator terms as the change in real provincial gross domestic product normalized by the capital stock. For the neoclassical portion that emphasizes the cost of capital, we take a reduced form approach. Odgers and Betts constructed the user cost of capital as a function of the price of capital goods, the corporate tax rate, the interest rate, and depreciation rates. We control for the price of capital goods (including interest rates and depreciation) using year effects. The provincial unemployment rate and average weekly earnings are also included as reduced form indicators of the price of capital goods.[9] Because corporate cash reserves affect corporate investment decisions, we also include the growth rate in corporate profits. The final reduced form indicator of the price of capital is the corporate tax rate (the ratio of provincial corporate taxes to corporate profits).

The extensive literature on the effect of unionization on investment emphasizes the need to control for union density. Odgers and Betts (1997) found a nonlinear relationship between unionization and investment, so we use a linear spline for union density with a single knot at the median density rate.[10] To capture the provincial labor climate, we calculate the total number of workers involved in strikes for the previous five years in each province (normalized by provincial employment). To account for differences in provincial industrial structures, we also include the fraction of manufacturing employment and fraction of public administration employment. In addition to year effects, we include province fixed effects to control for province-specific differences in investment, and province-specific time trends to allow each province to have its own trend.

Sample means and standard deviations for the various dependent and independent variables are reported in Table 1. The mean net investment rate ($\times$ 100) for all industries and all components is 3.074, which is similar to the 0.027 average rate reported in Odgers and Betts (1997) across industries for 1967 to 1987. The net investment rate is higher for the machinery and equipment subcomponent than for the building construction subcomponent. The sample fractions for the labor policy indicators show that nearly 10% of the province-year observations had a strike replacement ban in place, while another 21% provided for reinstatement rights (recall that this

[7]Analyses using the log of new investment as the dependent variable, as in Denny and Nickell (1991, 1992) and Hirsch (1992), yield a similar pattern of results.

[8]Investment for all components equals the sum of building construction, machinery and equipment, and engineering construction.

[9]For example, a booming labor market might be associated with more expensive capital goods because of higher wage costs and increased demand for capital goods.

[10]The labor policy results are not sensitive to the exact union density specification.

includes permanent strike replacement bans). The struck work refusal protections policy is the most frequent, occurring 43% of the time. The remaining two policies are in effect between 28% and 37% of the time. As an alternative indicator of the state of provincial labor policy, we computed a score by adding up the five indicator variables for each province-year. The average score is 1.392.

Net Investment Rate Results

Table 2 presents the regression results using the net investment rate (×100) as the dependent variable. We follow Odgers and Betts (1997) by including the contemporaneous accelerator term as well as four lags. As in their results, we find that the lagged terms are often stronger than the contemporaneous term. Recall from the previous section that we control for the user cost of capital in a reduced form fashion via various other controls and year-specific fixed effects. As described above, the two strike replacement policies, the struck work refusal protection provisions, the decertification restriction laws, and first contract arbitration policies are all hypothesized to be associated with lower investment activity. We also posit that the relationship will be weakest for machinery and equipment investment, since this type of investment is more mobile, and also that the relationship will be strongest for building construction because it is fixed.

The baseline regression results are reported in columns (1), (3), and (5) of Table 2. For all components (column 1), only the strongest labor policy, the general strike replacement ban, is statistically significant at conventional levels. More specifically, the –0.746 coefficient implies that the net investment rate (×100) is 0.746 less when a province bans the use of strike replacements than when there is no ban, *ceteris paribus*. Relative to the mean rate of 3.074, this 0.746 reduction is equal to nearly a 25% reduction in the net investment rate. Consistent with our expectations that the labor policy results would be strongest for building construction and weakest for machinery and equipment, four of the five policy coefficients are significantly negative for building construction (column 3) whereas none are for machinery and equipment (column 5). We also estimated log investment models, which resulted in the same pattern: only the strong replacement ban is statistically significant in the aggregate model, three of the five policy coefficients are negative and statistically significant for building construction, and none are statistically significant for machinery and equipment.[11]

Although the labor policies have the potential to affect nonunion establishments, they most directly bind unionized establishments. One may expect, therefore, that the effect on investment is stronger when union density is higher. Columns (2), (4), and (6) present the regression results of adding a high-union-density interaction with each labor policy indicator to the baseline specification. High union density is defined as above the median union density for that year. For aggregate investment (column 2) and building construction (column 4), no statistically significant differences are uncovered between provinces with below-median union density and those with above-median union density. In the machinery and equipment regression (column 6), the high-union-density interaction for the strike replacement ban policy is statistically significant and implies that the effect of this policy on investment is greater (more negative) in high-density province-years.[12]

[11]Consistent with other research using a log investment specification, we omit the accelerator terms and include log capital stock and log employment variables to control for scale differences across the provinces. As yet another measure of investment activity, we also compiled Statistics Canada data on the value of building permits by province and constructed a building permits rate analogous to the net investment rate (building permits value normalized by the beginning of period capital stock). In regressions that use the same control variables as in Table 2, the strike replacement ban is negatively related to both commercial and industrial building permits at the 10% level of significance.

[12]Taken at face value, the 2.743 strike replacement ban coefficient in column (6) implies that the effect

Table 1. Annual Provincial Investment Data, 1967–99: Summary Statistics. (Standard Deviations in Parentheses)

Variable	*Mean*
Net Investment Rate,[a] All Industries, All Components (× 100)	3.074 (1.848)
Net Investment Rate,[a] All Industries, Building Construction (× 100)	3.062 (1.861)
Net Investment Rate,[a] All Industries, Machinery and Equipment (× 100)	4.045 (3.360)
Labor Policy Indicators	
Strike Replacement Ban	0.096 (0.294)
Reinstatement Rights or Permanent Replacement Ban (and no replacement ban)	0.213 (0.407)
Protections for Struck Work Refusals	0.434 (0.495)
No Decertification Petitions During a Strike	0.366 (0.482)
First Contract Arbitration	0.283 (0.448)
Labor Policy Score (sum of the five labor policy indicators)	1.392 (1.073)
Accelerator[b]	0.017 (0.026)
Striking Workers, Provincial Total for Previous Five Years (÷ employment)	0.086 (0.093)
Union Membership Density (one year lag)	0.258 (0.057)
Fraction Manufacturing Employment (× 100)	12.427 (5.477)
Fraction Public Administration Employment (× 100)	6.729 (1.510)
Provincial Corporate Taxes to Profits Ratio (one year lag)	0.116 (0.036)
Corporate Profits Growth Rate (1992 dollars; one year lag)	0.053 (0.231)
Provincial Unemployment Rate (one year lag)	0.090 (0.041)
Log Provincial Average Weekly Earnings (1992 dollars; one year lag)	6.213 (0.113)
Provincial Average Weekly Earnings Growth Rate (1992 dollars; one year lag)	0.009 (0.024)
Sample Size	330

Source: See text.

[a]The net investment rate is net investment (new investment less depreciation) normalized by the beginning of year capital stock.

[b]The accelerator is the change in provincial gross domestic product normalized by the capital stock.

of this ban is positive in low-union-density province-years. Since only three provinces have enacted this legislation, the natural experiment provided by the variation in these policies may not be rich enough to sufficiently answer this high-union-density question because the interacted term is relying on variation within these three provinces for identification.

Table 2. Regression Analysis of the Net Investment Rate, 1967–99.

	All Components		*Building Construction*		*Machinery & Equipment*	
Variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Strike Replacement Ban	–0.746*	–0.174	–0.995**	–0.635	0.224	2.743**
	(0.381)	(0.537)	(0.447)	(0.559)	(0.843)	(1.148)
Strike Replacement Ban × High Union Density	—	–0.734	—	–0.691	—	–3.399**
		(0.681)		(0.735)		(1.400)
Reinstatement Rights (and no replacement ban)	–0.381	–0.446	–0.858**	–0.939**	–0.357	0.256
	(0.275)	(0.374)	(0.293)	(0.395)	(0.599)	(0.758)
Reinstatement Rights × High Union Density	—	0.444	—	0.310	—	–0.562
		(0.397)		(0.372)		(0.816)
Protections for Struck Work Refusals	0.004	0.240	–1.106**	–1.268**	–0.150	0.458
	(0.434)	(0.456)	(0.414)	(0.465)	(0.916)	(1.059)
Protections for Struck Work × High Union Density	—	–0.370	—	0.482	—	–0.527
		(0.382)		(0.328)		(0.932)
No Decertification Petitions During a Strike	0.028	–0.008	–0.589	–0.420	1.761	1.738
	(0.643)	(0.633)	(0.585)	(0.585)	(1.409)	(1.477)
No Decertification Petitions × High Union Density	—	0.168	—	–0.253	—	0.097
		(0.322)		(0.291)		(0.797)
First Contract Arbitration	–0.233	–0.255	–0.804**	–0.553	–0.712	–2.041*
	(0.355)	(0.593)	(0.334)	(0.436)	(0.775)	(1.074)
First Contract Arbitration × High Union Density	—	0.083	—	–0.227	—	1.906*
		(0.611)		(0.466)		(1.137)
Accelerator	9.512**	9.596**	9.631**	9.760**	21.707**	21.846**
	(3.468)	(3.421)	(3.819)	(3.871)	(7.103)	(6.929)
Accelerator (one year lag)	16.354**	16.291**	10.734**	11.014**	38.973**	39.037**
	(4.099)	(4.108)	(3.952)	(4.064)	(7.120)	(7.150)
Accelerator (two year lag)	14.810**	14.663**	13.076**	12.772**	32.170**	34.259**
	(3.964)	(4.018)	(4.009)	(4.054)	(9.484)	(9.716)
Accelerator (three year lag)	10.798**	11.211**	8.282**	8.000**	32.017**	34.767**
	(4.124)	(4.079)	(3.791)	(3.777)	(8.097)	(8.264)
Accelerator (four year lag)	11.229**	11.505**	10.728**	10.384**	23.833**	25.417**
	(4.234)	(4.305)	(3.666)	(3.683)	(7.810)	(7.741)

Continued

A complicating factor in interpreting these results is the fact that provincial labor law changes often include a package of policy changes. For example, Quebec enacted both a strike replacement ban and a first contract arbitration provision at the same time. As shown in Appendix Table A1, the five policies analyzed here have varying effective dates, so it is not unreasonable to expect that they are separately identified. But to the extent that other minor changes are implemented at the same time, the individual estimates in Table 2 should be interpreted with caution.[13] Nevertheless, we do not believe that this possibility appreciably detracts from the analysis, because our main objective is to test whether investment responds

[13]If the five policies analyzed here are enacted as part of a broader package of reforms that all favor labor, then the individual estimates in Table 2 potentially overstate the impact of individual policies. If the policies are enacted as part of a broader package that includes a mixture of policies that favor labor and management, then the individual estimates likely understate the magnitude of individual policy changes.

Table 2. Continued.

	All Components		*Building Construction*		*Machinery & Equipment*	
Variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Striking Workers Rate	–0.108	–0.0004	–2.927**	–3.103**	1.830	1.610
(previous five year total)	(1.216)	(1.211)	(1.200)	(1.196)	(2.669)	(2.652)
Union Density Spline	1.210	1.759	0.114	–1.143	–4.102	–1.545
(less than median)	(6.738)	(6.799)	(6.420)	(6.755)	(12.203)	(12.404)
Union Density Spline	13.139**	13.589**	2.519	2.038	13.014	14.832
(greater than median)	(5.227)	(5.253)	(5.087)	(5.200)	(9.694)	(9.816)
Fraction Manufacturing	–0.411**	–0.389**	–0.070	–0.084	–0.249	–0.273
Employment (× 100)	(0.114)	(0.116)	(0.138)	(0.141)	(0.258)	(0.268)
Fraction Public Admin.	–0.099	–0.099	0.238	0.181	1.391**	1.361**
Employment (× 100)	(0.229)	(0.236)	(0.269)	(0.277)	(0.483)	(0.483)
Corporate Taxes to Profits Ratio	–8.451**	–8.330**	–1.124	–0.614	–9.107*	–10.276**
(one year lag)	(2.684)	(2.748)	(2.441)	(2.463)	(4.860)	(4.993)
Corp. Profits Growth Rate	–0.778*	–0.862*	–0.651	–0.623	–0.964	–1.036
(1992 dollars; one year lag)	(0.452)	(0.458)	(0.437)	(0.448)	(0.945)	(0.965)
Provincial Unemployment Rate	–11.149	–13.283	–21.130**	–20.752**	–18.373	–18.607
(one year lag)	(8.091)	(8.406)	(9.719)	(9.944)	(15.277)	(15.376)
Log Provincial AWE	–2.561	–3.309	12.315**	12.591**	–33.556**	–33.901**
(1992 dollars; one year lag)	(3.670)	(3.843)	(3.776)	(3.791)	(7.672)	(7.914)
Prov. AWE Growth Rate	12.809**	13.229**	7.435	7.861	9.170	7.744
(1992 dollars; one year lag)	(6.218)	(6.378)	(6.759)	(6.869)	(10.944)	(10.925)
Province Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes	Yes	Yes
Province-Specific Time Trends	Yes	Yes	Yes	Yes	Yes	Yes
R squared	0.762	0.766	0.772	0.775	0.689	0.694
Sample Size	330	330	330	330	330	330

Dependent variable: real net investment rate (× 100). Standard errors (in parentheses) are robust with respect to arbitrary forms of heteroskedasticity.

Source: See text.

*Statistically significant at the .10 level; **at the .05 level.

to labor policy; isolating the magnitude of individual policies is not the primary concern.

To this end, we construct an alternative indicator for the state of provincial labor policy by summing the five policies to create a score that can range between 0 and 5 for each province-year.[14] The results for regressions of the net investment rate in which the five individual policies are replaced by this summary score measure are reported in Table 3. The same control variables from Table 2 are included in these regressions, but space constraints prevent us from reporting the coefficients. These results support the conclusions of Table 2: there are modest estimated effects of labor policy on overall investment, but large reductions in building construction investment. Moreover, these estimated effects are of a meaningful magnitude. For example, between recession and boom, the unemployment rate in Ontario shifts by about five percentage points. In columns

[14]The results in Table 2 for building construction are consistent with this simple summation, as four of the five policy estimates in column (3) are in the neighborhood of one, indicating that all of the policy changes have roughly similar effects.

Table 3. Labor Policy Score Results, 1967–99.

	All Components		*Building Construction*		*Machinery & Equipment*	
Variable	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
Labor Policy Score	–0.272*	–0.307*	–0.908**	–0.969**	0.033	0.033
	(0.150)	(0.168)	(0.174)	(0.182)	(0.320)	(0.362)
Labor Policy Score × High Union Density	—	0.050	—	0.089	—	–0.0002
		(0.091)		(0.074)		(0.224)
Control Variables from Table 2	Yes	Yes	Yes	Yes	Yes	Yes
R squared	0.761	0.761	0.771	0.772	0.684	0.684
Sample Size	330	330	330	330	330	330

Dependent variable: real net investment rate (× 100). Standard errors (in parentheses) are robust with respect to arbitrary forms of heteroskedasticity.

Source: see text.

*Statistically significant at the .10 level; **at the .05 level.

(1) and (3) of Table 3, this implies that the overall and building construction net investment rates (× 100) in a boom are 0.608 and 1.042 points higher, respectively, than in a recession. As such, the labor policy score coefficients in Table 3 indicate that a one unit change in this score (adding one policy) reduces overall investment by half of the predicted reduction in a recession—and, in the specific case of building construction investment, by nearly the *full* predicted reduction in a recession.

Time-Varying Results

A concern with this natural experiment methodology is that the policy changes must be exogenous for the regressions to produce reliable inferences. If, for example, violent strikes caused a provincial government to restrict the use of replacements and also caused business to reduce investment, then the legislation is not exogenous. We attempt to control for this specific scenario by including a provincial strike activity variable (which is negative and statistically significant in the building construction models). A more general approach would be to instrument for the policy changes, but lacking suitable instruments, we instead analyze whether investment systematically changes just before a legislative labor policy change. In particular, if labor policy is endogenous, we would expect to see investment activity significantly lower just before the policies are enacted. Table 4 therefore presents the regression results adding dummy variables indicating 1–3 years prior to the start of each policy. Of the 15 coefficients of interest (five policies, three measures of investment), only two are negative and statistically significant. There do not appear to be statistically significant negative changes in investment just prior to the start of these labor policies.

The regression specifications reported in Table 4 also allow the effect of each policy to vary over time. More specifically, each policy variable is decomposed into two dummy variables: one indicating 0–3 years after the policy starts and the other indicating the period more than three years after the policy. The negative effect of the strike replacement ban on building construction reported in Table 2 is revealed in column (2) of Table 4 to be concentrated primarily in the first few years after the policy's start. The point estimate for the policy's effect after three years is still negative, but of only half the magnitude of the 0–3 year estimate and not statistically significant. The reinstatement rights and protections for struck work refusal laws are estimated to have more persistent effects

Table 4. The Net Investment Rate: Time-Varying Policy Effects.

Variable	*All Components (1)*	*Building Construction (2)*	*Machinery & Equipment (3)*
Strike Replacement Ban			
1–3 Years Prior to Policy	0.542	0.724*	0.469
	(0.426)	(0.430)	(0.829)
0–3 Years after Policy	–0.369	–1.174**	0.171
	(0.424)	(0.530)	(0.869)
More Than 3 Years after Policy	–0.919*	–0.812	–0.133
	(0.508)	(0.600)	(1.267)
Reinstatement Rights (and no replacement ban)			
1–3 Years Prior to Policy	–0.329	–0.529*	–0.989
	(0.328)	(0.303)	(0.703)
0–3 Years after Policy	–0.166	–0.908**	–1.091
	(0.348)	(0.367)	(0.794)
More Than 3 Years after Policy	–0.252	–1.362**	–0.455
	(0.438)	(0.445)	(0.910)
Protections for Struck Work Refusals			
1–3 Years Prior to Policy	–0.819	0.416	–1.892*
	(0.629)	(0.622)	(1.089)
0–3 Years after Policy	–1.218**	–1.377**	–0.700
	(0.612)	(0.593)	(1.282)
More Than 3 Years after Policy	0.297	–1.052**	–0.214
	(0.520)	(0.496)	(1.077)
No Decertification Petitions During a Strike			
1–3 Years Prior to Policy	–0.061	0.147	2.085*
	(0.587)	(0.629)	(1.079)
0–3 Years after Policy	0.398	0.433	1.195
	(0.636)	(0.671)	(1.331)
More Than 3 Years after Policy	–0.438	0.478	1.182
	(0.759)	(0.718)	(1.494)
First Contract Arbitration			
1–3 Years Prior to Policy	0.162	0.367	0.074
	(0.425)	(0.384)	(0.792)
0–3 Years after Policy	–0.331	–0.343	–0.840
	(0.425)	(0.430)	(0.985)
More Than 3 Years after Policy	0.011	–0.776	0.535
	(0.486)	(0.508)	(1.093)
Control Variables from Table 2	Yes	Yes	Yes
R squared	0.779	0.780	0.702
Sample Size	330	330	330

Dependent variable: real net investment rate (× 100). Standard errors (in parentheses) are robust with respect to arbitrary forms of heteroskedasticity.

Source: See text.

*Statistically significant at the .10 level; **at the .05 level.

on building construction investment, lasting beyond the initial three-year period.

It is more complicated to repeat this time-varying analysis for the regressions that use the summary labor policy score measure rather than the five individual labor policy variables. In particular, we need to identify the periods before and after any change in the labor policy score, and these periods sometimes overlap in provinces with

multiple changes. As such, the magnitude of the labor policy score in the all components regression is similar to that reported in Table 3, but is not statistically significant. The labor policy estimate on building construction investment remains strong and statistically significant, with no evidence of time-varying effects.

Investment and Union Density

While the results for union density are not the focus of this article, they are worth mentioning given the previous literature on unionization and investment. Ogders and Betts (1997) found a nonlinear, negative relationship between the net investment rate and unionization. We tried various nonlinear representations of union density in the regressions of Table 2, such as quadratic terms and linear splines with various knots. A linear spline with a single knot at the median density rate fit best, and it is used in the results reported in Table 2. A quick review of the linear spline coefficients in Table 2 reveals very few negative point estimates and no negative estimates that are statistically significant. In fact, the only statistically significant estimates imply that the overall net investment rate is *larger* when union density is high (above the median).

Why the difference between our results and those of Odgers and Betts (1997)? Our analyses use province-level data, whereas Odgers and Betts analyzed industry-level data. When we aggregate by province, the low-union-density and high-union-density industries are averaged out. As a result, union density in the provincial data set used here ranges between 7.8% and 42.2%. In contrast, while Odgers and Betts did not report the union density range, nearly a third of their industry-year cells had union density rates in excess of 50%. They therefore had a much greater range of union densities in their data. Thus, province-level data may not be as well suited as industry-level data for analyzing the relationship between union density and investment. Nevertheless, it is worth noting that the previously estimated negative relationship in other studies is not apparent when we compare provinces.

Conclusion

While the business lobby claims that labor policy changes favoring labor, such as restrictions on the use of strike replacements, will reduce investment, previous research on labor policy has often implicitly assumed that investment is fixed. In this article, we develop a sequential bargaining model in which a firm chooses a profit-maximizing investment level knowing that unions will exploit "the valuable hostages of large sunk investment" (Simons 1944:8). As in the models of Baldwin (1983), Grout (1984), and van der Ploeg (1987), this sequential bargaining model implies that unions cause underinvestment when labor contracts are of shorter duration than the productive life of capital. The theoretical contribution of this model is to show that labor policies that increase labor's bargaining power and reduce management's options during a strike are also predicted to reduce investment.

Labor policies pertaining to strike replacements, struck work refusals, and decertifications during strikes have been subjected to policy debates in Canada and the United States in recent years, and a more sophisticated analysis that includes investment decisions is warranted. To this end, we assembled an annual data set on Canadian provincial investment for 1967–99. Our estimates, using an empirical model that incorporates both accelerator and neoclassical determinants of investment, indicate that strike replacement laws and protections for workers who refused to handle struck work reduced new investment, especially within the first few years after the policy change. The effects were particularly large for building construction, a result that seems sensible since this form of investment is less mobile or transferable than machinery and equipment. In fact, the estimates imply that enacting a labor policy that benefits labor is comparable to a recession in terms of reduced building construction investment. This category

represents about one-quarter of economy-wide business investment.

Since major labor policy changes, such as strike replacement legislation, are often enacted as part of a larger labor relations reform package, it remains difficult to precisely estimate the elasticities for specific policies. Nevertheless, the evidence appears to support the more general hypothesis that investment responds to labor policy changes. This echoes other research that finds that foreign direct investment is affected by industrial relations factors and by regulations impinging on the employment relationship (Cooke 1997). As the world economic system becomes increasingly integrated, debates over labor policies are likely to grow. Investment decisions should be incorporated into these debates.

Data Appendix

To construct the net investment rate, we obtained annual data on new investment, depreciation, and the capital stock, arranged by province, by special order from Statistics Canada's Investment and Capital Stock Division (for details, see their publication CS13–568, *Fixed Capital Flows and Stocks*). Values of monthly building permits were obtained from CANSIM (matrix 137) (see CS64-001, *Building Permits*) and converted to annual measures.

The provincial gross domestic product, corporate taxes, and corporate profits measures were obtained from various issues of the Statistics Canada publication *Provincial Economic Accounts* (CS13–213-PIB). Series for 1961–1993 and 1992–1999 were spliced together using the overlap to index-link and adjust the earlier series. Provincial unemployment rates were calculated from labor force and employment series (see CS71-001, *The Labour Force*). These data are available monthly on CANSIM for 1966–94 (CANSIM matrices 2074–2096) and 1976–99 (matrices 3452–70), and the pre-1976 data were spliced onto the later series using the 1976 overlap.

Manufacturing and public administration employment data (see CS72-002, *Employment and Earnings*) were similarly obtained from CANSIM for 1983–99 (matrices 4299–4425) and 1966–83 (matrix 1714). Monthly provincial average weekly earnings are from CANSIM for 1983–99 (matrices 4302–4428) and 1966–83 (matrices 1433–93) (see CS72-002, *Employment and Earnings*). All of these series were spliced together using the 1983 overlap to adjust the earlier series.

The union density rates were constructed using data on union membership and the previously described provincial employment series. Continuous measures of provincial union membership are not available for 1966–99, so these were constructed using three sources and adjusting two of the series using the available overlap. Data for 1966–95 are available from the Corporations and Labour Unions Returns Act (CALURA) Annual Reports (CS 71–202) and from Mainville and Olineck (1999). Unpublished data for 1986–90 from the Labour Market Activity Survey (LMAS) are available from Statistics Canada, as are data for 1993–99 from the Labour Force Survey (LFS). The LMAS and LFS are household surveys, so these data were used when available. For the remaining years, the CALURA data—which are obtained from union surveys—were used and adjusted using the available overlap with the household surveys. Information on the number of workers involved in strikes (involving at least 500 workers) each year in each province between 1960 and 2000 was kindly provided by the Workplace Information Directorate of Human Resources Development Canada (for details, see their publication *Strikes and Lockouts in Canada*).

The policy variables were constructed from the dates presented in Appendix Table A1. These dates were obtained using the text of each bill amending existing provincial statutes as reported in the annual Legislative Reports for each of the provinces.

Appendix Table A1
Labor Policy Variable Codings, 1967–1999

Strike Replacement Ban	
Quebec	February 1978 to December 1999
British Columbia	January 1993 to December 1999
Ontario	January 1993 to October 1995
Reinstatement Rights/Permanent Replacement Ban (and no replacement ban)	
Ontario	November 1970 to December 1992
	November 1995 to December 1999
Manitoba	January 1985 to December 1999
Prince Edward Island	May 1987 to December 1999
Alberta	December 1988 to December 1999
Saskatchewan	November 1994 to December 1999
Protections for Struck Work Refusals	
Saskatchewan	January 1967 to December 1999
Alberta	January 1972 to December 1999
Manitoba	January 1972 to December 1999
Nova Scotia	August 1972 to December 1999
Newfoundland	February 1978 to December 1999
British Columbia	January 1993 to December 1999
No Decertification Petitions During a Strike	
Quebec	January 1967 to December 1999
Ontario	January 1967 to December 1999
New Brunswick	April 1972 to December 1999
Manitoba	January 1973 to December 1999
First Contract Arbitration	
British Columbia	February 1974 to December 1999
Quebec	February 1978 to December 1999
Manitoba	July 1982 to December 1999
Newfoundland	July 1985 to December 1999
Ontario	May 1986 to December 1999

Source: Authors' calculations from Provincial Legislative Reports.

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