LOBBYING FOR MINIMUM WAGES

** WORKING VERSION **

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ABSTRACT. Using a common agency lobbying framework this paper illustrates how the level of a binding minimum wage reflects the interaction between economic and political factors and under what circumstances the policymaker will be induced through lobbying to increase the minimum wage. Specifically, when the elasticity of labor demand is large, so the minimum wage 'bite' is strong, lobbying is successful in inducing the policymaker, who cares about political contributions, to set the minimum wage in accordance with her political preference; a more business (labor) friendly policymaker reduces (increases) the minimum wage. However, the paper also shows the conditions under which lobbying will reverse the ideological preference of the policymaker and induce a business (labor) friendly government to increase (reduce) the minimum wage. Empirical analysis on a panel data for ten Canadian provinces over the 1965-2013 period gives considerable support for theoretical predictions. Preferred panel data regression specifications, controlling for unobserved province and year effects, and various province specific, time varying factors, indicate that real minimum wage decreases in skill-adjusted union density and a measure of political ideology, and increases with technological progress. Larger labor demand elasticity reinforces the influence of political ideology in the presence of lobbying.

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1. INTRODUCTION

The determinants of minimum wages have received very little attention from economists, with most minimum wage research focused on analyzing its (dis)employment and welfare effects. In the empirical analysis of these effects, economists take the minimum wage as an *exogenously* determined policy; it is not a policy that arises as an economic equilibrium from the workings of a competitive labor market.[1] A form of a labor market price-floor, minimum wage is determined in a *political equilibrium* [2] with various normative policy goals.[3] For example, to maximize the minimum wage workers' earnings, the minimum wage should be set at the point where labor demand elasticity is unitary. Being a political issue, however, the process of setting the minimum wage could be influenced by special interest groups (SIGs) and policymaker's political preferences, with the rate potentially set above or below the optimal one with respect to labor demand elasticity.

In this paper I illustrate how minimum wage is determined in a political equilibrium by SIGs directly lobbying the policymaker. I adapt the general common agency lobbying framework from Grossman and Helpman [2001], where principals are interpreted as SIGs - a union representing skilled workers and an association of industry firm owners - who are lobbying the policymaker, their common agent, responsible for setting the minimum wage. In that framework, I introduce the political ideology which distinguishes a more labor friendly policymaker from a business friendly one. I also develop a tractable way of formulating the level of unionization in the labor market. Furthermore, I specify functional forms for the production function and workers' skill distribution. These innovations allow me to derive a closed form solution for the equilibrium minimum wage and novel, testable predictions of minimum wage determination in the presence of lobbying and political ideology.

Initially, I show that if the policymaker only cares about the welfare of both workers and business owners she will not introduce a binding minimum wage. Specifically, if the impact of the minimum wage on the weighted sum of workers' income and business profits is always negative, a

[1] For a good overview of the history of the minimum-wage controversy see Leonard [2000].
[2] This is in the spirit of Besley and Case [2000]'s view that "There is little doubt that policy choice is purposeful action and can rarely be treated as experimental data." See also Zavodny [1998] for an examination of political endogeneity reason why an increase in minimum wage might not lead to adverse employment effects.
[3] For example, enabling single parent families to lift their household out of poverty, preventing 'unfair' wages, or guaranteeing a nominal income floor in order to compress earnings inequality and alter the distribution of income.

policymaker has no incentive to introduce a wage floor in the economy, regardless of her political ideology.[4] However, I also show that lobbying can change this incentive. When the policymaker cares about political contributions - which take the form of a payment commitment conditional on the minimum wage imposed - the presence of lobbying can induce her to introduce the minimum wage in spite of the negative effect aggregate income.

Several past papers analyzed the influence SIGs have on the the minimum wage and labor policies that increase the cost of production cost. Cox and Oaxaca [1982] and more recently Sobel [1999] examine the involvement and significance of unions and industry organizations in trying to affect the minimum wage policy. Sobel also considers the incentive politicians have to exploit the short-run earnings curve and time minimum wage changes to pre-election periods, irrespective of their ideology. He suggests that short-run and long-run labor demand elasticities play a role in affecting political incentives for when (pre-election) and how (in smaller steps) to change the minimum wage. Saint-Paul [2000] shows how the minimum wage is a tool for employed insiders of one societal group to exclude the low skilled workers in the same group from the labor market and employment. Aidt and Hwang [2008] focus on a broaded concept of labor market policies and how lobbying by unions and firm organizations affects labor standards. [5]

Although these papers all emphasize the role of SIGs and provide some support for their importance in determining minimum wages, they do not explicitly model the political mechanism by which SIGs exert political influence.[6] This paper's innovation over past literature is the explicit mechanism by which SIGs influence the policymaker's setting of minimum wage setting. Minimum wage derived in the political equilibrium (Section 2.3), shows how policymaker's political ideology interacts with economic factors (labor demand elasticity, union density, production technology) in determining the minimum wage in the presence of lobbying by SIGs. This makes it possible to

[4]Labor market distortions from a binding minimum wage are independent of the policymaker's ideology, i.e., how labor vs. business friendly she is.

[5]There are other papers on the political economy of minimum wages that focus on legislators' voting behavior and election concerns, centered on the U.S.. See Bloch [1993], Levin-Waldman [1998], Waltman and Pittman [2002] and references therein for some of these papers. Also, Epstein and Nitzan [1999] is another type of political-economic theory approach to minimum wage determination.

[6]Besides Aidt and Hwang [2008] who take the common agency approach to (international) lobbying.

answer questions such as when would a conservative,[7] business-friendly policymaker increase the minimum wage or a labor-friendly refrain from doing so.

First, the model naturally predicts that the policymaker will follow her ideology when setting the minimum wage. This is the case, however, only when labor demand elasticity is large enough. With labor demand elasticity being large, the benefit of lobbying against (for) the minimum wage by firm owners (the union) is greater since a given minimum wage increase has a larger negative (positive) effect on industry profits (unionized workers' income). With stronger negative effect on profits the stakes for lobbying are higher. Lobbying is then successful in inducing the policymaker to set the minimum wage in accordance with her ideological preference for profit relative to labor income. Accordingly, a more business (labor) friendly policymaker reduces (increases) the minimum wage in the presence of lobbying because that increases profits (income of unionized labor).

However, I show that lobbying can also *reverse* the ideological preference of the policymaker and induce a business (labor) friendly government to increase (reduce) the minimum wage. When labor demand elasticity is small, firms' lobbying effort against a minimum wage increase will be lower because lobbying is costly while the stakes are not high given that minimum wage has a small 'bite'. Union, on the other hand, always benefits from an increase in minimum wage and even with a business-friendly policymaker, union lobbying effort is relatively more effective. Then, a business-friendly policymaker is less resistant to increasing the minimum wage.

Second, minimum wage increases with the average skill level of unionized workers, i.e., the more representative the union is of high skilled workers. The intuition is that higher skilled union workers' income rises when minimum wage increases because their marginal product rises as low skilled non-union workers become unemployed. This result contrasts with past literature intuition that the minimum wage increases monotonically with union membership and/or union density. Under this hypothesis, a larger union means a politically stronger union which is then able to put more pressure on the government to increase the minimum wage. In this paper, however, a smaller union composed of more high skilled workers induces the government to increase the minimum wage through lobbying and benefits from such a policy by making the unskilled labor more expensive to hire, reducing their employment and in turn raising the marginal product of its members.

[7] A "conservative" in the parlance of North American politics.

Third, minimum wage also increases when industries, possibly the labor intensive ones which are more likely to lobby against a minimum wage, become more productive. When the marginal productivity of labor rises, workers at all skill levels become more productive and firms can afford to keep lower skilled workers for which the minimum wage was previously binding employed.

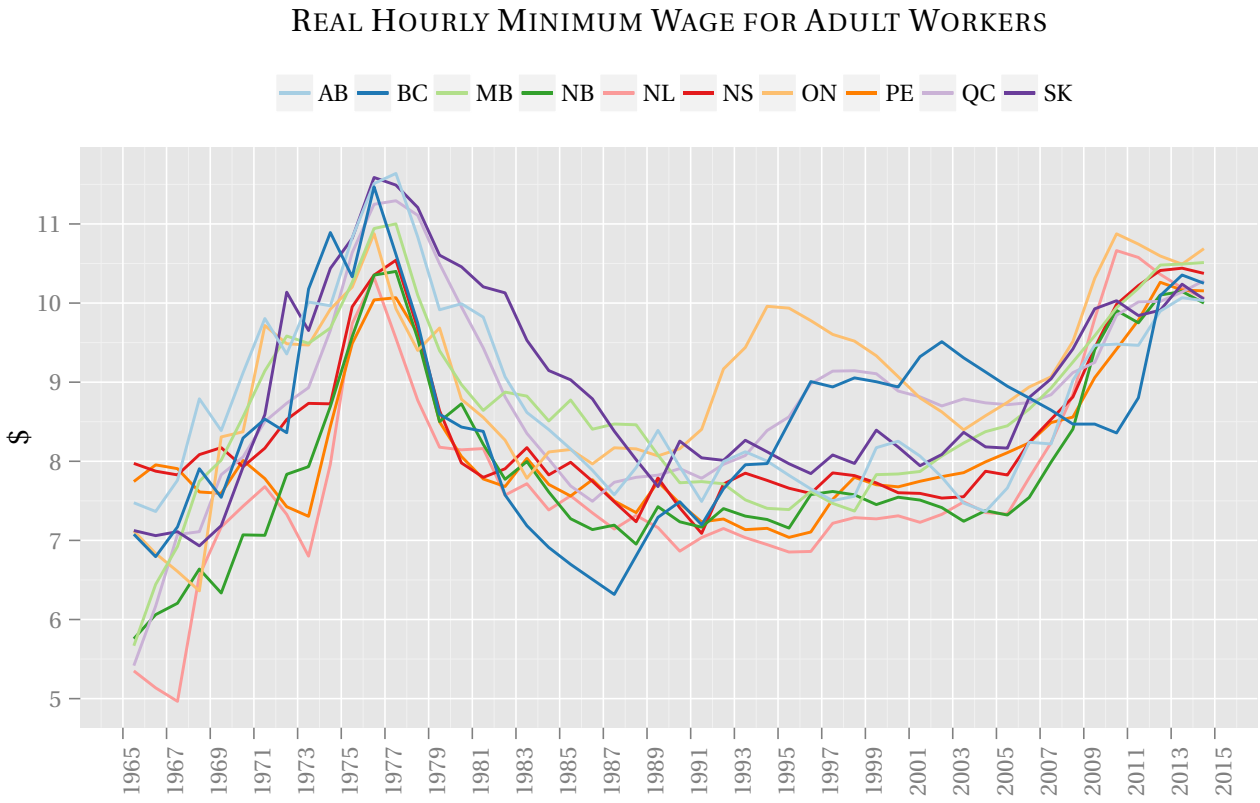

Figure 1. Real minimum wages across ten Canadian provinces, 1965-2013. Real minimum wages are expressed in 2013 constant dollars. Data: Labour Program Canada, Minimum Wage Database.

Three studies examining minimum wage determination across Canadian provinces are relevant to this paper. In an empirical study Blais et al. [1989] estimated the responsiveness of provincial governments to political pressure groups in raising the minimum wage during the 1975-1982 period. Considering the relative importance of unions, small businesses, youths and women as SIGs, they find that all of these variables have negative effects on minimum wage.

Dickson and Myatt [2002] study Canadian minimum wages variation over the 1977-1996 period. They too consider the relative strength of interest groups (unions, youths, big and small businesses),

but they also examine the influence of political ideology, controling for unemployment rate, unemployment insurance, election timing and inflation, which I also employ in my empirical analysis. Their results differ somewhat from Blais et al. [1989]. The unionization rate has a positive coefficient, although not very significant, while the strongest result comes from provincial political ideology variables; as expected minimum wages are higher under left-wing governments.

Finally, Green and Harrison [2010], and more recently Green [2014], contend that the political economy of minimum wages in Canada can best be explained in terms of voters' ideas of fairness. They propose a model in which voters are guided by the income distribution to determine the fair value of the minimum wage.[8] Specific to their study is that the interest group model emerges as a special case, allowing for an empirical test and comparison between three models: competing SIGs, constrained altruism, and fairness. Models are evaluated on ten Canadian provinces over the 1969-2005 period. Their empirical investigation results do not reject the 'fairness model' in which the voters try to ban unfairly low wages; minimum wage is a function of both the median unskilled wage, used as a proxy for the comparison market wage, and minimum wages in other provinces.[9]

Unlike the U.S. studies which analyzed cross-sectional data, Canadian focused studies exploit provincial minimum wage variation and estimate the determinants with panel data regressions. However, besides Green and Harrison [2010] who try to account for SIGs in their theory, there is a lack of theoretical foundation in Canadian literature for SIGs influence on minimum wages. In this paper I provide both a theoretical basis for SIGs and ideological influence on minimum wages and empirically evaluate the predictions on a panel data of Canadian provinces.

Lobbying over minimum wage is very prominent across Canadian provinces. Although direct monetary contributions cannot be observed,[10] student and labor unions frequently expend a

[8]Their basic goal is to explain the forces that lie behind four main patterns of Canadian minimum wages, some of which can be observed from Figure 1: (1) general rise in the minimum wage; (2) regional co-movement of minimum wages; (3) the highest minimum wages are correlated with the rule of left-wing parties; (4) the convergence of minimum wages between highest and lowest minimum wage provinces.

[9]A notable addition to their paper is the *qualitative* evidence they present about minimum wage setting, gathered thought interviews with provincial Ministers. A conclusion reached from these interviews is that labor mobility is not an important decision factor. As one Minster put it: "Minimum wage jobs are not mobile." [Green and Harrison, 2010, p.8] However, inter-provincial comparisons are important in minimum wage setting. I check for this in my own estimation.

[10]For example, unions in Canada, as SIGs with considerable lobbying resources, are not required to track and disclose their spending on political activities, social causes and various other transactions, such as salaries over $100,000 or contracts with private companies, to the Canada Revenue Agency which would make it publicly available. This is in contrast to United States and United Kingdom rules.

significant amount of time and resources to lobby provincial governments for minimum wage increases. Likewise, employers' associations such as food, restaurant and independent businesses lobby to try to stop the minimum wage from increasing whenever the prospect was introduced.

Furthermore, as indicated by Baker et al. [1999], the Canadian setting has unique advantages for studying minimum wages. Being determined provincially, minimum wages in Canada exhibit substantial heterogeneity in the level and frequency of changes over the 1965-2013 period, shown in Figure 1, for which I test the theoretical predictions of the model. Panel regressions of the most preferred specification accounting for province and time fixed effects give considerable support to these predictions. The significance and the sign on variables of interest are in line with the theory.

The paper proceeds in the following way. Section 2 presents the theoretical model and derives its predictions. Section 3 empirically evaluates these predictions and section 4 summarizes and concludes.

2. Theory of Lobbying Influence on Minimum Wage Determination

In a general common agency lobbying model, principals as SIGs compete for influence over a single policymaker, their common agent, who sets the level of the minimum wage. Principals have an incentive to design and offer political contribution schedules (e.g., campaign contributions) to induce the agent to take their interest into account and thereby influence her policy choice.[11]

2.1. **The Economy.**

Following the basic setup of Grossman and Helpman [2001], a small open economy consists of two competitive industries, for example textiles and pharmaceuticals, denoted by T and P, respectively. We can think of one industry, say T, as being more labor intensive.[12]

N workers in the labor force have different skill levels. Their ability determines the amount of 'effective labor' supplied; a worker with the skill level a supplies a times 'effective labor'. I assume

[11] Formal models of common agency were initially developed by Bernheim and Whinston [1986a,b] and most notably applied by Grossman and Helpman [1994] and Dixit et al. [1997a]. Other applications of common agency to endogenous policy formation include: commodity taxation (Dixit [1996]), environmental policy (Aidt [1998]), local public goods (Persson [1998]), fiscal federalism (Bordignon et al. [2008], Esteller-Moré et al. [2012]), and capital levy problem (Marceau and Smart [2003]). Previously, Rama and Tabellini [1998] used the common agency approach in the minimum wage context, although they analyzed different issues of jointly determining trade and labor market policies. See Martimort [2006] for a more extensive overview of theory and literature on common agency as a form of multi-contracting mechanism design.

[12] Names play no real role. What matters is distinguishing politically organized industry that is actively lobbying as a SIG from the one that is not. In that sense, the number of industries does not matter either. Having 'only' 2 industries in the economy serves a purpose of simplifying the analytical part and clearly distinguishing members of organized interests.

that workers' skills are distributed according to the Pareto distribution over a support interval $a \in [1, \infty]$. The lowest skill level 1 is associated with the unskilled or 'raw' labor. Let $\Phi(a)$ be the fraction of workers with ability less than or equal to a and $N\Phi'(a)$ the total number of workers with the skill level a. The Pareto skill CDF and PDF are,

$$\Phi(a) = 1 - \left(\frac{1}{a}\right)^z \quad \text{and} \quad \Phi'(a) = \frac{z}{a^{1+z}}, \quad \text{for } a \geqslant 1,$$

respectively, where $z > 1$ is the shape parameter governing the skill level distribution. Dispersion increases monotonically as z decreases. The lower (higher) the z the heavier (less heavy) the upper tail of the distribution and the proportion of high-skilled workers is greater (lower).

Workers are perfectly substitutable after adjusting for their skill level. If $e_i(a)$ is the number of employed workers of ability a by industry i, then amount of effective labor employed by i is[13]

$$E_i = \int_1^\infty a e_i(a) \mathrm{d}a, \quad \text{for } i = T, P.$$

Each industry cares about effective labor employed and uses capital and sector-specific technologies, A_T and A_P in production. Accordingly, I set up industries' production functions as follows:

$$F(E_i) = A_i^{1-\alpha} E_i^\alpha, \quad \alpha < 1, \quad \text{for } i = T, P. \tag{2.1}$$

Capital used in production is in fixed supply, normalized to 1 and it is assumed that industry P is more capital intensive, so $A_P > A_T$. Each produced good is traded on a world market and its price is taken as given. For future reference, given the production function, the absolute value of wage elasticity of effective labor demand is

$$\varepsilon = \left| \frac{\partial E}{\partial w_E} \frac{w_E}{E} \right| = \frac{1}{1-\alpha}. \tag{2.2}$$

I formulate unionization as governed by the skill distribution. There is one union in the economy which represents workers at the higher end of the skill distribution. Suppose there is a cutoff skill level, denoted a_U, above which all workers are members of the union.[14] Figure 2 depicts the PDF of

[13] We can imagine that instead of employment, the 'raw' labor input of firms is hours of work. Multiplying by the ability a would still give the aggregate efficiency units of labor hired E_i.

[14] This is done for simplicity and to facilitate a connection between theoretical implications and empirical analysis. I discuss this more in sections 2.3 and 3. Same intuition can be obtained following Grossman and Helpman [2001]

Pareto distributed skills with the cutoff value for union workers. Then, total units of effective labor

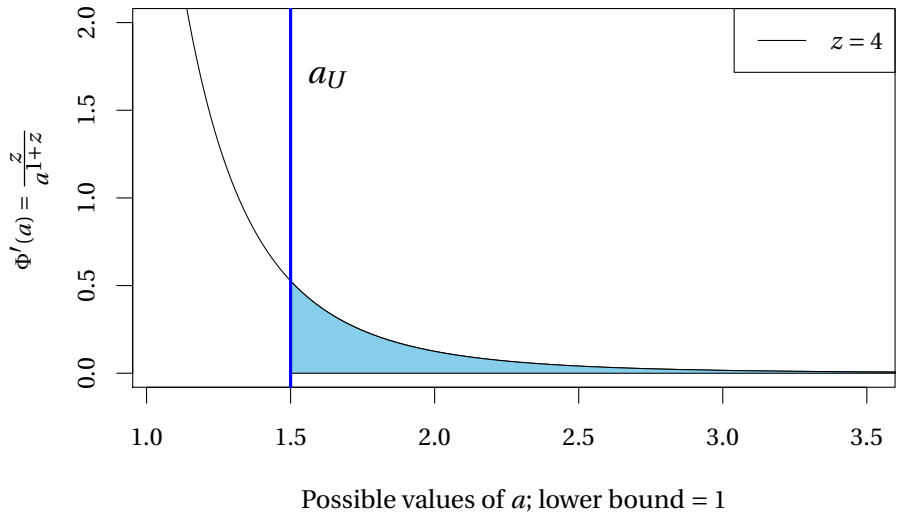

Figure 2. Skills are Pareto distributed and above the cutoff level a_U (represented by the shaded area) all workers are members of the union. In that way union represents higher skilled workers.

among unionized employed workers are

$$E_U = N\int_{a_U}^{\infty} a\Phi'(a)\mathrm{d}a = \frac{Nz}{z-1}a_U^{1-z}. \tag{2.3}$$

This formulation might appear somewhat counterintuitive but, given that the union is a politically organized SIG, the point is that political representation of labor is skewed toward higher skilled workers. Besides, even though unionization rates[15] vary across occupations and job characteristics, it is an empirical regularity that workers with higher educational attainment and those employed in higher skilled industries are associated with higher unionization rates.[16]

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general approach, defining a continuous function $\phi(a) = \frac{\theta\Phi_U(a)}{\Phi(a)}$, where θ is the fraction of workers represented by the union and making sure $\phi'(a) > 0$.

[15]Technically, a distinction should be made between workers who are *members* of a union and those who are *covered* by a union negotiated contract (collective agreement), but are not members. This distinction might matter empirically based on the type of data available. Sometimes, workers who are covered by a collective agreement, but are not actually members of a union are still considered as unionized.

[16]Although unionization rate differs between industries, it tends to rise with the skill level. As indicated by Pencavel [2014], compared to a private sector one, public sector union will be more representative of higher skilled employees. Higher public sector unionization indicates a growing influence of higher skilled unionized workers. In the private sector, low and unskilled workers are almost never unionized. See Galarneau and Sohn [2013] for the Canadian context.

2.2. **Political Equilibrium.** Suppose that two SIGs compete for influence: (1) the association of capital owners in industry T and (2) the union of workers with abilities skewed toward the high end.[17] The lobbying game has three stages. In the first stage, each SIG offers the policymaker an optimal, non-negative political contribution schedule. In the second stage, the policymaker observes all contributions received and sets the minimum wage level that maximizes her objective function. In the third stage, equilibrium in the labor market arises and production takes place. I solve for the equilibrium by backward induction.

2.2.1. *Labor Market Equilibrium With a Minimum Wage.* From the labor market equilibrium we can examine political forces that determine the minimum wage w_M, and the incentives to lobby for or against its increase. More detailed derivation and expressions of the labor market equilibrium are provided in Appendix A. Here I only show the equilibrium wage for a unit of effective labor is a function of the minimum wage $\hat{w}_E(w_M)$. From the full-employment condition we can obtain

$$\hat{w}_E(w_M) = \alpha^{\frac{1}{z+\alpha-z\alpha}} \left[\frac{Nz}{(z-1)\mathscr{A}}\right]^{\frac{\alpha-1}{z+\alpha-z\alpha}} w_M^{\frac{(1-z)(\alpha-1)}{z+\alpha-z\alpha}}, \tag{2.4}$$

where the shorthand $\mathscr{A} = \left[A_T + A_P\right]$ is used for simplicity throughout the paper. Observe that $\hat{w}_E(w_M)$ is increasing in w_M. Together with the function for the lowest employable skill level $a_M(w_M)$, we have two functions that determine the income levels of all groups in the economy as a function of w_M and thus give a stake to various interest groups to compete for the influence over the minimum wage policy.

Another relevant point is that a binding w_M can be set such that the least employable worker has the skill level greater than the lowest unionized skill, that is $a_M(w_M) > a_U$, illustrated in Figure 5 in Appendix A. Inevitably some unionized workers will loose their employment in that case. Thus, a very high minimum wage can potentially reduce the union's membership as well. Since this would conflict with the union's goal of maximizing its members' income, it is more sensible to look for an interior solution when $a_M(w_M) < a_U$.

[17] These are exogenously established organizations and I abstract from the 'collective action problem'. The presence of both types of organizations and their lobbying activities are present in many countries around the world. Although it is assumed that the owners in the other industry and the rest of the workers are unorganized, it is straightforward to introduce them as additional SIGs that also compete for influence over the minimum wage.

2.2.2. *Lobbying Contributions and First Order Condition.* The government's objective when setting the minimum wage is to maximize the sum of aggregate welfare, $W(w_M)$, and SIGs' political contributions, c_T and c_U for textile association and the union respectively. Thus, the government's objective function takes the linear form $G(w_M) = W(w_M) + \lambda_C(c_T + c_U)$, with λ_C as a fixed positive weight put on total contributions received from the lobbyists. With the minimum wage in place, I formulate the aggregate welfare in the economy in the following way:

$$W(w_M) = \lambda_L \underbrace{w_E(w_M)E[w_E(w_M)]}_{labor\ income} + \lambda_S \underbrace{\left[\Pi_T[w_E(w_M)] + \Pi_P[w_E(w_M)]\right]}_{profits}. \tag{2.5}$$

λ_L (λ_S) is the weight the policymaker assigns to labor income (profits) and assume $\lambda_L + \lambda_S = 1$.[18]

These different weights capture the possibility that policymakers of different political orientations have stronger preference for labor income relative to profit income. A left-wing policymaker could be expected to favor labor income over profits, and opposite for the right-wing one. The weights can be used to control for the type of government in power for a given period of time. The preference for the political contributions, λ_C, does not a priori have to be different between the more labor or business friendly policymakers and it is held constant.[19]

In order to influence the policymaker's decision, both SIGs are simultaneously and independently offering the policymaker a contribution c, a binding payment conditional on the minimum wage level set. Thus, the union and firm association design their contributions as schedules, denoted as $c_U = C_U(w_M)$ and $c_T = C_T(w_M)$, to maximize their members' net-of-contribution labor income and industry profits, respectively. These contribution schedules are non-negative and differentiable when positive. Following the common-agency literature, a schedule that satisfies those properties is a *truthful contribution schedule*, formally defined as

$$C_l(w_M, b_l) = \max[0, W_l(w_M) - b_l], \quad \text{for } l = T, U, \tag{2.6}$$

[18]If all individuals have identical and homothetic preferences, aggregate welfare is proportional to aggregate income in the economy, which is equal to the sum of total labor income and industries' profits.

[19]Although there are no explicit re-election concerns here, we can think of policymaker's ideology (λs) as reflecting her constituents' ideology, as in a principal-agent relationship. Then, the presence of λ_C can be interpreted as coming from the lack of perfect monitoring, reflecting the policymaker's own preference or want of re-election campaign funding.

where b_l is a given welfare anchor, chosen optimally by each lobbying group l.[20] Reducing the contribution by b_l makes sense, since by doing so a SIG retains some of the gains from lobbying, without breaking the truthfulness condition. Also, Bernheim and Whinston [1986a] and Dixit et al. [1999] prove that a truthful contribution schedule is part of each principal's best-response set and therefore does not involve any cost in playing that strategy.[21] The shape of the truthful contribution function matches the shape of the SIG's welfare function and so it exactly reflects the marginal impact of a change in the minimum wage. The change in contribution compensates for the change in the minimum wage so that the welfare of SIG members stays constant. It is basically a costless requirement for the contribution schedule to remain truthful.

Suppose that a binding minimum wage $w_M > \hat{w}_E$ is set, such that $a_M(w_M) < a_U$ as discussed above. Then, the equilibrium minimum wage policy satisfies the necessary first-order condition for maximizing the policymaker's objective function G,[22]

$$W'(w_M) + \lambda_C \left[C'_T(w_M) + C'_U(w_M) \right] = 0. \tag{2.7}$$

First, using the Envelope theorem properties of the profit function

$$W'(w_M) = \left((1-\varepsilon)\lambda_L - \lambda_S \right) w'_E(w_M) E(w_M) \tag{2.8}$$

where ε is the absolute value of the wage elasticity of effective labor demand, derived in eq. (2.2).[23] Since the labor share parameter $\alpha < 1$ in the production function, we have $\varepsilon \geqslant 1$. Then, from eq. (2.8), when the minimum wage increases, some loss in employment occurs and the value of output declines. Regardless of the values λ_L and λ_S, an increase in minimum wage reduces total aggregate income. For larger values of ε the reduction in aggregate income is greater.

The implications of having $\lambda_C > 0$ and thus active lobbying in the model are clear. Because the minimum wage reduces aggregate income, the policymaker would never choose to introduce or increase it in the simple equilibrium with no lobbying. This negative aggregate income effect of the minimum wage increase can be offset only with political contributions.

[20] Although it is implicitly present, for notational simplicity I suppress b_l in the remained of the paper.
[21] See also Dixit et al., 1997b, p. 759 for a discussion and justification for using truthful contribution schedules.
[22] Throughout the paper, the prime notation $'$ denotes partial, first derivative of $f(x)$, i.e., $f'(x) = \frac{\partial f(x)}{\partial x}$.
[23] A more detailed derivation of this expression is in Appendix B.

Second, because the contribution schedules are truthful, we can substitute $C'_T(w_M) = W'_T(w_M)$ and $C'_U(w_M) = W'_U(w_M)$ in the policymaker's FOC. For the textile industry, a higher minimum wage increases the cost of effective labor and reduces profits. Then, given that $W_T(w_M) = \Pi_T[w_E(w_M)]$ the marginal contribution is

$$C'_T(w_M) = W'_T(w_M) = \Pi'_T[w_E(w_M)]\,w'_E(w_M) = -E_T[w_E(w_M)]\,w'_E(w_M). \tag{2.9}$$

Union members' labor income as a function of the minimum wage is given by $W_U(w_M) = w_E(w_M)E_U$, with E_U as total effective labor of all employed unionized workers. It is worth pointing out that this is an *aggregate* supply of effective unionized labor in the economy, not just in comparison with a particular industry, such as textiles whose owners are acting as a second lobbying SIG. Some of the unionized labor is employed in the pharmaceutical industry, and these may as well be the most skilled workers. For a binding minimum wage such that $a_M(w_M) < a_U$, the supply of effective unionized labor E_U is not a function of w_M and the union's marginal contribution is

$$C'_U(w_M) = W'_U(w_M) = w'_E(w_M)E_U. \tag{2.10}$$

As long as $a_M(w_M) < a_U$, if a minimum wage is increased union members' aggregate income will rise because the decline in total employment increases their marginal product.

Substituting eqs. (2.8) to (2.10) into the policymaker's first-order condition eq. (2.7) that any binding minimum wage has to satisfy and further simplifying, we obtain:

$$\lambda_C\Big[E_U - E_T(w_M)\Big] = \big(\lambda_S - \lambda_L(1-\varepsilon)\big)E(w_M) \tag{2.11}$$

Notice that the incomes of lobbying SIGs, the union's earnings and textile firms' profits, receive a higher weight than the incomes of politically unorganized workers firm owners.[24] Therefore, lobbying SIGs are given more consideration when setting the minimum wage. The left-hand side of eq. (2.11) represents the marginal increase in the joint welfare (income) of the two lobbying SIGs. The first term in the brackets captures the increase in income for unionized workers while the

[24] Namely, if $G = \lambda_L W_N + \lambda_L W_U + \lambda_S W_T + \lambda_S W_P + \lambda_C[C_T(w_M) + C_U(w_M)]$, where W_N is simply the welfare (income) of the non-unionized workers, the first-order condition is $G' = \lambda_L W'_N + \lambda_S W'_P + (\lambda_S + \lambda_C)W'_T + (\lambda_L + \lambda_C)W'_U = 0$, where I simply suppressed (w_M) for notational simplicity. The lobbying industry T owners and unionized workers receive a higher weight than the non-lobbying workers and industry P owners.

second indicates by how much income drops for capital owners in industry T. The right-hand side shows how much total income declines when w_M is increased. To evaluate political and economic variables that determine w_M I derive an explicit closed-form solution from eq. (2.11).

Before doing so, however, notice first that when industry T's demand for effective labor is greater than the aggregate supply of effective labor among unionized higher skilled workers, i.e., $E_T > E_U$, a binding minimum wage cannot emerge in the political equilibrium. The intuition is that if the LHS of eq. (2.11) is negative, *reducing* the minimum wage would reduce the LHS thereby increasing the SIGs' joint welfare. The policymaker benefits from such a policy move since it induces a larger contribution from both SIGs and also increases the RHS, the aggregate income in the economy.[25]

An example of an economy where $E_T > E_U$, is a developing country where an industry such as textiles is large and unionized labor small, such as in Bangladesh. The garment and textile industry in Bangladesh is the engine of the national economy, accounting for 80% of manufacturing exports and employing over 4 million workers, mostly women. Around 2.3 million people in the country's workforce belong to a trade union. Workers in Bangladesh's textile and garment industry, however, were until very recently forbidden to unionize and are still actively discouraged by the industry owners and the government.[26] As a result, only around 5 percent of all garment workers in Bangladesh are unionized.

In Bangladesh total employment by the textile industry is greater than aggregate unionized labor, with the composition of existing union members skewed toward the high skilled male workers in other industries. A minimum wage covering the garment industry was introduced as a part of the 2006 Labour Act and was increased only twice since,[27] after being substantially eroded by high inflation and each time after considerable delay under the influence of textile factory owners.

[25] See also Grossman and Helpman [2001, Ch. 8] for a discussion of a first order condition similar to eq. (2.11).

[26] The political influence of the textile industry owners is well documented and widely recognized. For example, 60% of members of Bangladesh's Parliament are involved in the business while about 10% directly own garment factories. Restrictions on forming trade unions in the garment industry were lifted only in 2013. Prior to that workers were required to obtain permission from owners before they could unionize. Factory owners also sit on regulatory agencies' councils and boards, including the minimum wage one. See [Yardley, 2013].

[27] Prior to 2006 legislation there was an across the board minimum wage in place since 1994. However it was not increased until the 2006 law change. Since 2006, the minimum wage structure applying to the garment industry was increased in 2010 and 2013. It is however questionable whether this minimum wage structure is binding, with some reports indicating that nearly 40% of garment factories are paying below the minimum wage.

In contrast, in a country such as Canada it is not unreasonable that (1) the demand for effective labor by any one industry that mainly employs low skilled workers (e.g. textile, retail, food, etc.) will not exceed the aggregate supply of effective unionized labor in the economy and (2) that precisely these industries' owners would be politically organized to lobby against minimum wage increases.

Consequently, the focus here is on the case when $E_U > E_T$ and a binding minimum wage can exist in a political equilibrium. Intuitively, the union is a clear winner from a higher minimum wage because its members' earnings increase; minimum wage induced unemployment increases the unionized workers' marginal product while no ensuing job loss falls on their members. Only non-unionized low skilled workers experience loss in employment. The textile firms are clear losers in terms of lost profits. Given that $E_U > E_T$ the benefit to the union from pushing w_M higher is greater than firms' lost profits and the net effect on the SIGs' joint income is positive.[28]

2.3. **Solution and Comparative Statics.** The equilibrium solution for the minimum wage when $a_M(w_M) < a_U$ is given in Proposition 1.

Proposition 1. *The equilibrium minimum wage in the political equilibrium of the lobbying game is*

$$\hat{w}_M^{\frac{z-1}{z+\alpha-z\alpha}} = \frac{a_U^{z-1}\left[\left[2\lambda_S - \varepsilon\lambda_S - 1 + \varepsilon\right]\mathscr{A}^{\frac{(z-1)(1-\alpha)}{z+\alpha-z\alpha}} + \lambda_C \frac{A_T}{\mathscr{A}^{\frac{1}{z+\alpha-z\alpha}}}\right]}{\lambda_C \left[\frac{Nz}{z-1}\right]^{\frac{(1-\alpha)(z-1)}{z+\alpha-z\alpha}} \alpha^{\frac{1-z}{z+\alpha-z\alpha}}}. \tag{2.12}$$

Proof. To obtain the closed form solution for the equilibrium minimum wage simply insert eq. (A.5) for $E_T(w_M)$, eq. (A.6) for $E(w_M)$ and eq. (A.7) for E_U into the FOC eq. (2.11). This gives

$$a_U^{1-z}\left[\frac{Nz}{z-1}\right]^{\frac{(1-\alpha)(z-1)}{z+\alpha-z\alpha}} \mathscr{A}^{\frac{(z-1)(\alpha-1)}{z+\alpha-z\alpha}} \alpha^{\frac{1-z}{z+\alpha-z\alpha}} \hat{w}_M^{\frac{z-1}{z+\alpha-z\alpha}} = \frac{\lambda_S - \lambda_L + \varepsilon\lambda_L}{\lambda_C} + \frac{A_T}{\mathscr{A}}$$

After simplifying and rearranging, the equilibrium minimum wage is as given in eq. (2.12). To obtain eq. (2.12) recall that $\lambda_S + \lambda_L = 1$. Then, $\hat{w}_M$ can easily be expressed in terms of λ_S or λ_L only. □

Equation (2.12) can tell us how the underlying political and economic (labor market) conditions of a particular jurisdiction matter for a minimum wage determined in a political equilibrium. To

[28] This effect is reinforced by the policymaker's preference for political contributions. With a high λ_C the preference for contributions overrides the negative effect of lower aggregate income and increased unemployment. Even with lobbying, politics would never set w_M above a certain maximum level. This occurs in the Case 2, when the minimum wage is set such that $a_M(w_M) > a_U$. Figure 5 illustrates this situation. Since only union workers satisfy the total demand for labor when $a_M(w_M) > a_U$, only union workers stand to to lose their job with a higher minimum wage.

facilitate the derivation of comparative statics and empirical estimation in the next section, I take the logarithm of eq. (2.12). Thus

$$\ln \hat{w}_M = (z+\alpha-z\alpha)\ln a_U + \left[\tfrac{z+\alpha-z\alpha}{z-1}\right]\ln\left[\left[2\lambda_S-\varepsilon\lambda_S-1+\varepsilon\right]\mathscr{A}^{\frac{(z-1)(1-\alpha)}{z+\alpha-z\alpha}} + \lambda_C A_T \mathscr{A}^{\frac{-1}{z+\alpha-z\alpha}}\right] - \left[\tfrac{z+\alpha-z\alpha}{z-1}\right]\ln\lambda_C + (\alpha-1)\ln\left[\tfrac{Nz}{z-1}\right] + \ln\alpha. \quad (2.13)$$

Comparative statics with respect to variables of interest are presented in the following corollaries.

Corollary 1. *Conditional on the level of labor demand elasticity, the minimum wage will decrease or even increase when the policymaker becomes more business friendly.*

$$\frac{\partial \ln \hat{w}_M}{\partial \lambda_S} = \frac{z+\alpha-z\alpha}{z-1} \times \frac{2-\varepsilon}{2\lambda_S-\varepsilon\lambda_S-1+\varepsilon+\lambda_C A_T \mathscr{A}^{-1}} \lessgtr 0 \quad \textit{when} \quad \varepsilon \gtrless 2. \quad (2.14)$$

Proof. This follows directly from the partial derivate of eq. (2.13) w.r.t. λ_S. Notice that the first term and the denominator of the second term are always positive and the sign depends only on ε. First, recall that the Pareto distribution parameter $z > 1$, but for the distribution to have a second and third moment it should be $z > 3$. For political ideology it is the case that $\lambda_S = (1-\lambda_L) < 1$ always. To convince oneself of the second claim recall that $\varepsilon = \frac{1}{1-\alpha}$, where $\alpha \in (0,1]$ implies $\varepsilon \geqslant 1$. Then, for any given λ_S let $f(\varepsilon,\lambda_S) := 2\lambda_S + \varepsilon(1-\lambda_S) - 1$. Since $f(\varepsilon,\lambda_S)$ is increasing in ε, we have that $f(\varepsilon,\lambda_S) > 0,\ \forall \varepsilon > 1$. □

Parameter λ_S captures the policymaker's preference for profits relative to labor income, i.e., how business-friendly she is. If the value of ε is large (small), in this case greater (lower) than 2, the minimum wage will decrease (increase) when λ_S increases.

From eq. (2.9) we know that a higher minimum wage decreases profits as it raises the cost of effective labor. When labor demand elasticity is large, a given increase in w_M has a more negative effect on profits. There are two effects on labor income: low skilled workers' income drops as a result of the disemployment effect, while the income of remaining employed workers, including unionized higher skilled ones, increases as they do not experience any unemployment and the marginal product of their effective labor is higher. The profit income always decreases. When the policymaker cares more about the loss in profits, lobbying against minimum wage by the industry

association is more advantageous. Then, the more business friendly the policymaker is, the more successful the lobbying effort by firm owners is and the more likely she is to reduce the minimum wage or at least refrain from increasing it.[29] For a given large ε, lobbying is able to induce the policymaker to set the minimum wage in accordance with her ideological preference for profits relative to labor income.

Corollary 1, however, also delivers a counterintuitive prediction. When the elasticity of labor demand is low, lobbying can overturn the ideological effect and even a business friendly policymaker would be willing to increase the minimum wage. For smaller ε, an increase in w_M has a smaller disemployment effect and the decline of aggregate income is also lower. The policymaker might be more business friendly, but she still receives a lobbying contribution from the union to increase the minimum wage while the 'return' on the lobbying effort against an increase is now lower.

Analogously, given that $\lambda_S = 1 - \lambda_L$ it is straightforward to show that

$$\frac{\partial \ln \hat{w}_M}{\partial \lambda_L} = \frac{z + \alpha - z\alpha}{z-1} \times \frac{\varepsilon - 2}{1 - 2\lambda_L + \varepsilon\lambda_L + \lambda_C A_T \mathscr{A}^{-1}} \gtrless 0 \quad \text{when} \quad \varepsilon \gtrless 2.$$

Parameter λ_L captures the policymaker's preference for workers' income. Equation (2.10) shows that a marginal increase in w_M increases unionized workers' income. When ε is large an increase in minimum wage has a stronger 'bite'; disemployment effect falling on the low skilled workers is greater, causing a larger increase in unionized workers' marginal product. Therefore, when the policymaker is more labor-friendly and ε is relatively large, the union has a stronger incentive to lobby *for* a higher minimum wage.

Lobbying is costly too. Because a minimum wage increase has a negative effect on aggregate income and with large ε the disemployment effect on the low skilled workers is greater, political contribution offered by the union to offset these negative effects has to be higher. The more labor friendly the policymaker is, the more she cares about lobbying union's income and more successful the union is in its lobbying effort. (See the discussion below the FOC eq. (2.11) and footnote 24.) Observe again that when labor demand elasticity is large, the policymaker sets the minimum wage

[29] Although there were no cases of minimum wage being lowered in Canada, regarding the real minimum wage there were extended periods during which the nominal rate was not changed and its value was simply eroded by inflation.

in accordance with her ideological preference for labor income over profits, even though this will decrease the employment and earning of lower skilled, non-unionized workers.

What is most clear from Corollary 1 is that ε determines how high the lobbying game stakes are.

Corollary 2. *The effect of political ideology on the minimum wage is influenced by* ε.

$$\frac{\partial}{\partial \varepsilon}\left(\frac{\partial \ln \hat{w}_M}{\partial \lambda_S}\right) = -\frac{1}{\varepsilon^2} \times \frac{2-\varepsilon}{\lambda_S(2-\varepsilon)-1+\varepsilon+\lambda_C A_T \mathscr{A}^{-1}} - \frac{z+\alpha-z\alpha}{z-1} \times \frac{1+\lambda_C A_T \mathscr{A}^{-1}}{\left(\lambda_S(2-\varepsilon)-1+\varepsilon+\lambda_C A_T \mathscr{A}^{-1}\right)^2}. \tag{2.15}$$

Proof. This result follows directly from the partial derivate of Corollary 1 w.r.t. ε and the fact that $\varepsilon = \frac{1}{1-\alpha}$. □

Corollary 2 describes the effect of labor demand elasticity on the influence of policymaker's ideology when changing the minimum wage. It is not immediately clear in which direction this effect goes. Given that the second term is always negative, if $\varepsilon \leqslant 2$ the derivative is negative, but for $\varepsilon > 2$ the direction of the derivative is not immediately obvious. A positive sign would indicate that elasticity reinforces the effect of ideology on the minimum wage in the presence of lobbying; as elasticity increases, the ideology effect on the minimum wage is stronger. A clearer understanding about the direction of this sign may come from the empirical estimation.

Corollary 3. *Minimum wage increases with the unionization cutoff skill level, given that the shape parameter of the Pareto distribution* $z > 1$.

$$\frac{\partial \ln \hat{w}_M}{\partial a_U} = \frac{z+\alpha-z\alpha}{a_U} > 0 \tag{2.16}$$

Proof. This result follows directly from the partial derivative of $\ln \hat{w}_M$ w.r.t. cut-off skill a_U and the fact that $z > 1$. □

The equilibrium minimum wage will rise when the lowest skill level necessary to be a union member increases. Intuitively, an increase in the necessary cut-off unionization skill level a_U increases the average skill level of unionized workers. Since the higher skilled unionized workers' income rises following an increase in the minimum wage, as long as $a_M(w_M) < a_U$ the more representative the union is of higher skilled workers, the more 'room' there is to push the minimum wage higher before it reaches the level for which $a_M(w_M) = a_U$. This can be seen from Figure 5.

Following an increase in a_U the skill composition of union's membership is more representative of higher skilled workers, but given the fixed number of workers in the economy N, the remaining *number* of unionized workers is lower. If we define union density by the number of unionized workers as a proportion of all workers, we can say that following an increase in a_U union density decreases. Therefore, minimum wage increases when union density decreases, i.e., a smaller union is more effective at increasing the minimum wage.

This prediction contrasts with some previous hypothesis about the effect of unionization on the minimum wage. A standard prediction is that greater union membership and/or union density should have a positive effect on the w_M level; a larger union means a politically stronger union, which can then exert more pressure on the government to increase the minimum wage. In the current model, this effect is captured by the first term in the LHS bracket of eq. (2.11).

The theory here, however, also interprets unionization adjusted for the skill level. It highlights that a smaller union with higher average skill level can also induce the w_M to increase. Only the non-unionized low skilled workers are at the risk of becoming unemployed following an increase in the minimum wage. As the average skill level of unionized workers increases, the union composed of high skilled workers benefits from a higher minimum wage because it makes unskilled labor more expensive to hire, reduces their employment and raises the marginal product of its members.

Corollary 4. *The minimum wage increases when the lobbying industry T becomes more productive.*

$$\frac{\partial \ln \hat{w}_M}{\partial A_T} > 0. \tag{2.17}$$

Proof. This result follows directly from the partial derivate of $\hat{w}_M$ w.r.t. technology A_T. □

The interpretation is that when the lobbying industry T becomes more productive the marginal productivity of industry labor is higher. With a minimum wage in place then, firms can afford to keep some lower skilled workers, for which the minimum wage was binding, employed. Then, industry T will not necessarily oppose a hike in the minimum wage, because it does not immediately result in the loss of employment for the lower skilled workers; a decline in total employment would raise the marginal product, i.e., the cost of other workers. In what follows these comparative static results will be empirically evaluated.

3. Empirical Analysis and Results

The theoretical predictions are evaluated with panel data regressions. The dataset for ten Canadian provinces contains relevant economic and political variables over the 1965-2013 period. This is the longest, consistent time series available for minimum wages across Canadian provinces and the longest one used compared to past studies of minimum wage determinants. I also consider regressions starting with 1976, when the Canadian Labor Force Survey (LFS) in its current modern form started, allowing for more precise labor force control variables. As will be show, the main results for the most preferred specification do not differ considerably for these two periods.

Being determined at the provincial level, we observe considerable variation across ten independent jurisdictions setting their own minimum wage, within the same broad political, institutional and legal framework.[30] The resulting provincial variation in the timing, levels and frequency of minimum wage changes over the last 49 years, enumerated in Figure 3, provides a good foundation for a panel data analysis of minimum wage determinants. During that time, all but one year (1983) saw minimum wages increase in Canada, (Figure 3b). In total, Canadian provinces increased the nominal minimum wage 359 times over the 1965-2013 period, some more often than others (Figure 3a). In the next four subsections I briefly describe the main variables of interest: real minimum wage, political ideology, union density, technological progress and labor demand elasticity. Details on various control variables are presented in the Appendix. Section 3.5 discusses regression specification and presents results.

3.1. **Real Minimum Wage** (w_M)**.**

The dependent variable of interest is the (logarithm of) provincial real hourly minimum wage (RMW). Although RMW is available on a monthly frequency, in order to match the observations on explanatory and control variables I calculate the RMW at a yearly frequency as the weighted average of monthly minimum wages in a given year, with weights being the number of months in a year that a particular minimum wage was in effect. All nominal dollar variables are deflated by the provincial CPI.[31] Table 1 provides summary statistics for the RMW at yearly frequency for each province, where heterogeneity across provinces is visible.

[30] Besides Québec, and to some extent Alberta, the rest of the provinces share the same cultural attitudes as well.

[31] Although some provinces legislate special, lower rates for some classes of workers, such as students or liquor servers, the focus here is on the minimum wage for adult workers. Shannon and Beach [1995] shows that very few workers are covered by these rates.

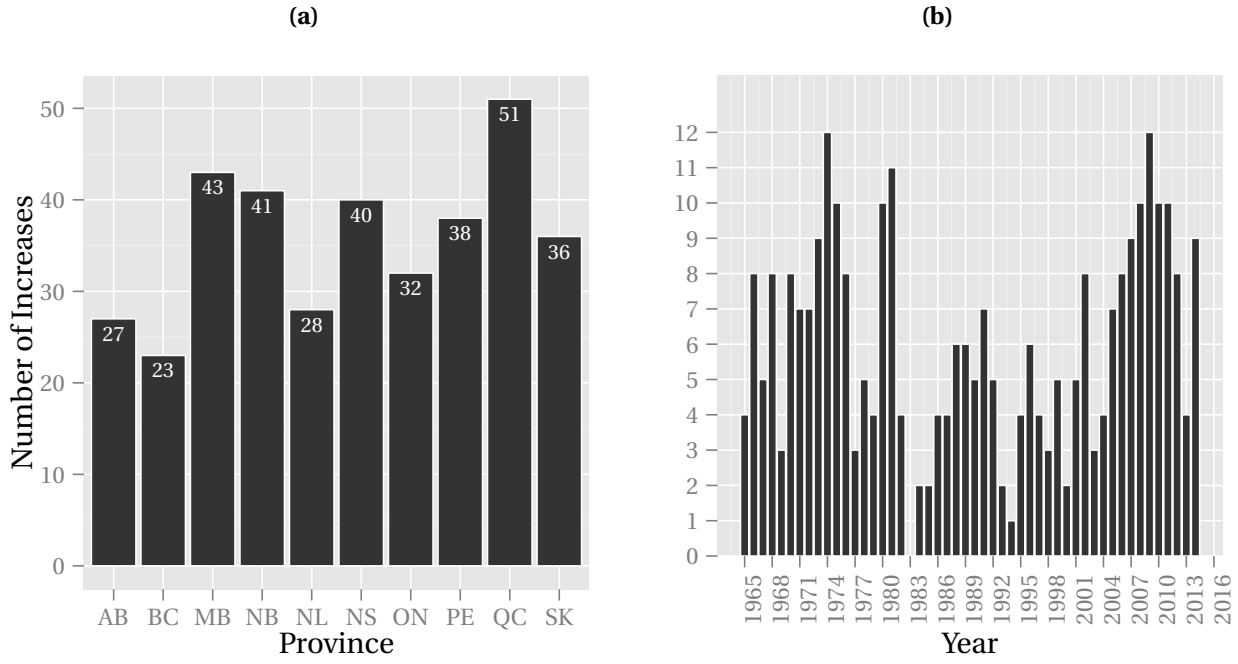

Figure 3. The diagram on the left shows the number of nominal minimum wage increases for each Canadian province in the 1965-2013 period. It shows provincial heterogeneity in the frequency of minimum wage changes. The right diagram shows the distribution of nominal minimum wage increases for all ten provinces over the same period i.e., the number of times all provinces increased the minimum wage in a given year. Note that these aggregates are calculated for the monthly observation of nominal minimum wage changes. Data: Labour Program Canada, Minimum Wage Database.

From Figure 1 observe that RMWs were rising in all provinces until the late 1970s, indicating that nominal minimum wages (NMW), as the actual policy under provincial governments' control, were being raised faster than inflation. Furthermore, Figure 3b shows NMW raised frequently until the late '70s. The 1980s saw RMWs decline across all provinces, a result of NMWs not being changed very often, remaining (almost) flat for several years which allowed the inflation to erode their value.

As noted by Baker et al. [1999], the 1990s is the beginning of substantial provincial heterogeneity in minimum wage policies, with increased frequency and magnitude of changes compared to the '80s. In some provinces NMW started to rise substantially and frequently (such as B.C.) while in others it did not increase for several years (such as Ontario). Since the late 2000s, RMWs have been converging across provinces, although they are still slightly lower than their peak in the mid 1970s.

3.2. **Political Ideology (PI).** A crucial variable in the theoretical model is the policymaker's ideological position with respect to economic issues, i.e., her preference for profits over labor income.

Table 1. Summary statistics for the hourly real minimum wages over the 1965-2013 period. Real values expresssed in 2013 dollars using the CPI for the respective province and year.

Statistic	N	Mean	St. Dev.	Min	Median	Max
Newfoundland and Labrador (NL)	49	7.745	1.300	4.966	7.348	10.664
Prince Edward Island (PE)	49	8.107	0.884	7.038	7.781	10.263
New Brunswick (NB)	49	8.319	0.944	7.089	7.905	10.542
Nova Scotia (NS)	49	7.871	1.147	5.757	7.543	10.400
Quebec (QC)	49	8.756	1.196	5.417	8.741	11.293
Ontario (ON)	49	8.987	1.077	6.362	9.068	10.878
Manitoba (MB)	49	8.594	1.147	5.668	8.471	11.001
Saskatchewan (SK)	49	8.905	1.234	6.931	8.393	11.587
Alberta (AB)	49	8.721	1.139	7.365	8.254	11.638
British Columbia (BC)	49	8.480	1.213	6.317	8.470	11.469

Note: Yearly Frequency. For the source see Figure 3

Either she is more business friendly (λ_S) or more labor friendly (λ_L). The expectation is that minimum wages will be increasing under more labor friendly governments. The theory, however, does not preclude that a business friendly policymaker also increases the minimum wage, under the condition that the labor demand elasticity is not large and in the presence of lobbying.

In constructing the measure of policymaker's ideology I follow the methodology of Bjørnskov and Potrafke [2012], who measure political ideology based on the idea that the ideological position of parties, and in turn provincial parliaments and governments, changes over time as different factions of a given provincial party are in power. An ideological score i_{rt} on a right-left scale, with 1 being right-wing and -1 left-wing, is assigned to party r based on its leader in year t. The party leader signals the faction in power and is the Premier of the province if that party is in power. This enables parties "to take up more than a singular point on the left-to-right line" over time. [ibid, p.147] For each province, the time series of the parliament's political ideology is then constructed as

$$[\text{Political Ideology}]_{pt} = \frac{\sum_r i_{rt} S_{rpt}}{\sum_r S_{rpt}},$$

where S_{rpt} is the number of seats party r has in province p in year t. With a change in party leadership (faction) and/or election, there is a change in the provincial parliament's political ideology.

This measure of political ideology follows entirely standard features of a left-right political divide on economic issues in Canadian provinces. (See Cross and Young [2002] and Dyck [1991].) I calculate this measure over the 1965-2013 period and illustrate it in Figure 4.

Previous papers on minimum wage determination across Canadian provinces have identified the evidence of political ideology effect based on dummy variables corresponding to right or left wing governments being in power, with identification coming from the underlying assumption that parties on the right are less supportive of minimum wage increases and converse for those on the right. In Canadian provincial politics, however, a Liberal party government does not necessarily imply a labor friendly government,[32] and a more nuanced coding of political ideology is required. The more flexible measure of political ideology employed in this paper, which permits provincial parties' and parliaments' ideological position to change over time, allows for stronger identification of the ideology effect on minimum wage changes, coming from greater province specific ideology variation over time. See Appendix D for more details and discussion of these issues.

3.3. **Labor Demand Elasticity (ε).** The production function in eq. (2.1) gives the wage elasticity of effective labor demand as $\frac{1}{1-\alpha}$, where α is the labor share of income. I compute this elasticity measure for each province by calculating the share of labor compensation in the provincial GDP (at factor cost), following the preferred estimation and adjustments for α discussed in Gollin [2002] and Morel [2006]. In the estimation, the elasticity measure is interacted with the political ideology to evaluate the cross-partial derivative in Corollary 3. See Appendix E for more details on ε calculation.

3.4. **Union Density and Technology (UD and A).** The effects on minimum wage of the skill adjusted union density and the technological parameter are also empirically tested. We expect that after adjusting for the union's skill composition, union density will have a negative relationship with the minimum wage. (See the discussion following Corollary 3.) Provincial unionization rates have been declining in some provinces since 1965, especially in the most populous ones, Ontario, Québec and British Columbia. This is mostly due to growing employment, while union membership has been stagnating.

[32] For example, the Liberal Party of British Columbia is more business friendly and opposed minimum wage increases for years, compared to Ontario Liberal Party that is a classic left leaning, consistently more labor friendly. Liberal and conservative parties are not directly comparable across provinces and cannot all be put under the same 'wing' throughout the whole period under study here.

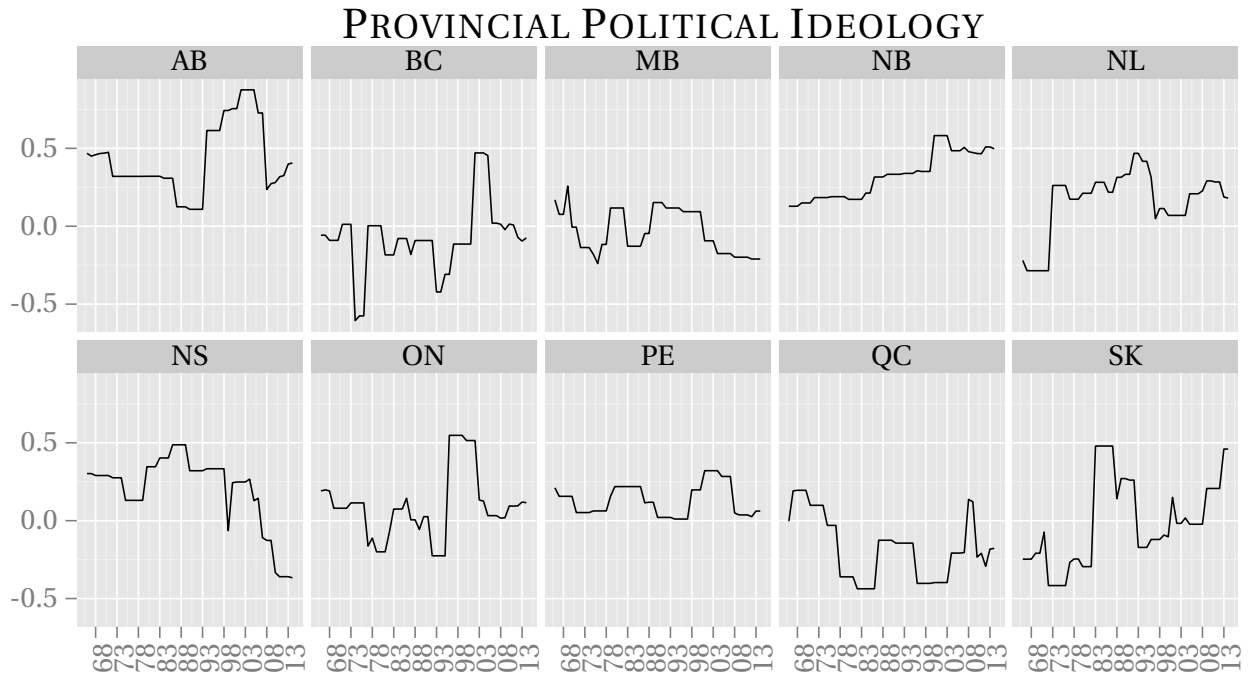

Figure 4. Political ideology depicts the ideological position of provincial parliaments. With a focus on economic issues, the ideological scale is bounded by -1 for left-wing socialists, and 1 for right-wing conservatives. The ideological score of each party in a given year is based on its leader indicating which party faction is in power. For example, the Conservative Party can have the score 1/3 denoting Red Tory leaders in Canadian politics, the standard right-of-center score 2/3 or a far right position 1, for example during Mike Harris (ON) or Ralph Klein (AB) rule. The Liberal Party's standard score is 0, the business-friendly faction is at 1/3, while the social faction is at $-1/3$. NDP is the most ideologically homogeneous of the major parties, but it is possible it shifts from its standard social-democratic, labor-friendly $-2/3$ to a far left, socialist position -1.

To make a skill adjustment, for every year I separate unionized workers in each province by sex and weight male and female workers by a measure of their relative productivity, i.e., the respective sex's average hourly earnings (AHE) normalized with respect to AHE over all employees in Canada. This is the ratio $\frac{AHE_{st}}{AHE_t}$, for $s = M, F$ and year t. Using Canada wide AHE, each male and female union worker carries the same respective weight in each province. By not using province specific AHE I avoid the likely positive effect of provincial unionization on provincial wages. Appendix F contains details on this adjustment.

A readily available measure of skill adjusted union density does not exist for Canadian provinces and such an adjustment choice is dictated by the availability of data. Nevertheless, the sex based adjustment captures the variation in the number of male and female union members since 1965 while the AHE weights capture the productivity-related characteristics for the male-female wage

differential.[33] This adjustment tends to reinforce the downward trend in union density given that union membership in the 1960s and '70s was composed of mostly male workers who were earning higher relative wages compared to female workers. By the 2000s the number of female union members caught up with male and the male-female wage gap had shrunk considerably.

The technology component A in the production function is interpreted and calculated as the province specific Solow residual. Specifically, for each province I calculate A as the residual of the Cobb-Douglas production function $Y_p = A_p E_p^{\bar{\alpha}_p} K_p^{1-\bar{\alpha}_p}$, where Y_p represents provincial real GDP, K_p is provincial capital stock, E_p is total provincial employment and $\bar{\alpha}_p$ is the provincial mean labor share over the 1961-2013 period.[34] Because we want to capture the effect of technological progress on minimum wage determination, when computing the Solow residual I do not hold K fixed, but make use of all the available data on provincial capital stock. Otherwise, the estimated parameter A would reflect all sources of growth other than the contributions of employment. See Appendix G for more calculation details.

3.5. **Regression Specification and Results.** Guided by the theoretical results in the section 2.3 and the nature of data, estimation is based on the following specification:

$$\ln w_{M,pt} = \alpha + \beta_1 UD_{pt} + \beta_2 A_{pt} + \beta_3 PI_{pt} + \beta_4 (PI \times \varepsilon)_{pt} + \beta_5 \varepsilon_{pt} + \boldsymbol{X}'_{pt}\boldsymbol{\gamma} + \theta_p + \mu_t + \nu_{pt} \tag{3.1}$$

The dependent variable is the log of real minimum wage. The main explanatory variables of interest, with coefficients β_1 to β_4, are respectively: skill adjusted union density UD, technology A, political ideology PI, and the interaction of ideology and labor demand elasticity $(PI \times \varepsilon)$. Linear approximation of minimum wage eq. (2.13) contains ε so I included it in the estimation, even though the parameter β_5 is not of primary interest.

To identify parameters on key theoretical variables I employ the method of fixed effects regression as an identification strategy to eliminate unobserved heterogeneity across provinces and years. The identification is obtained from within province-time variation. Preferred estimates include

[33] Male AHE weights are always > 1, while female are < 1. Albeit, this is an imperfect measure since some of the male-female wage gap can be explained by productivity-related factors, while the unexplained part can be due to different labor market decisions, unobserved skill measures or discrimination. See Gunderson [2006] for a review of male-female wage gap explanation in Canada.

[34] I make use of the longest possible time-series when computing the Solow residual, but in regressions I only use values starting with 1965 or later.

province fixed effects (θ_p) and year fixed effects (μ_t). The vector $\boldsymbol{X}$ includes various time-varying, province-specific economic and political variables that may also affect the w_M and should be accounted for. I discuss these controls and the reasons for their inclusion them with all the other regression results. Most of the right-hand-side variables are in logs[35] and all regressions report cluster robust standard errors, appropriate for panel-data. In Appendix J I also evaluate the same regressions with bootstrap based clustered standard errors.

Table 2 presents main regression results. Column (1) reports coefficient estimates for a simple pooled OLS specification. These results provide initial patterns in the data and give simple relationships between minimum wages and their theoretically derived determinants. The negative coefficient on union density, indicates that a falling skill-adjusted unionization rate will have a positive effect on minimum wages. Technological improvement, proxied by the Solow residual, will increase provincial minimum wages. Political ideology has a strongly negative coefficient, indicating that as the provincial government becomes more business friendly, real minimum wage would decrease. The coefficient on the interaction of ideology and labor demand elasticity is interpreted as the sign of the cross-partial derivative in Corollary 2. A positive relationship with the minimum wage reveals that larger elasticity reinforces the effect of ideology on the minimum wage.

Columns (2) and (3) of Table 2 include year and province fixed effects, respectively. *Year* fixed effects control for additional time varying factors that might have common influence on minimum wages across all provinces. These would include federal government's labor market and taxation policies or global economic shocks (recessions) that impact whole of Canada. The provincial unemployment rate and the teen share of working age population capture general labor market conditions affecting minimum wage workers and the possibility of adjusting the minimum wage.[36]

However, provinces could also differ in social values toward remuneration of low skilled labor, the proportion of workers earning a minimum wage, poverty rate or income inequality and redistribution preferences. Cross-provincial differences in labor market or business policies could also influence the possibility or frequency of minimum wage adjustment. *Province* fixed effects capture

[35] It is not possible to log the ideology and HHI variables, for example, because of negative and zero values.

[36] It is well documented that teenagers (age 15-19) are the group most likely to be working at minimum wage and be affected by its change. According to Galarneau and Fecteau [2014] 50% (31%) of teen employees in Canada were paid minimum wage in 2013 (1997). Gunderson [2014] indicates that "60% of minimum wage workers are teens or youths".

Table 2. Determinants of Real Minimum Wage for 10 Canadian provinces.

	Dependent Variable: Log(Real Minimum Wage)				
	Pooled OLS	Year FE	Province FE	Prov+Year FE	Prov+Year FE
	(1)	(2)	(3)	(4)	(5)
Log(Union Density)	$-.097^{***}$	$-.0003$	$-.189^{***}$	$-.077^{**}$	$-.105^{***}$
	(.023)	(.023)	(.033)	(.039)	(.039)
Log(Technology)	$.113^{***}$	$.056^{***}$	.073	$.136^{*}$	$.219^{***}$
	(.020)	(.018)	(.078)	(.070)	(.075)
Political Ideology	$-.386^{***}$	$-.235^{***}$	$-.263^{***}$	$-.168^{**}$	$-.178^{**}$
	(.084)	(.066)	(.078)	(.069)	(.081)
Political Ideology$\times\varepsilon$	$.283^{***}$	$.187^{**}$	$.224^{**}$	$.165^{**}$	$.170^{*}$
	(.093)	(.075)	(.090)	(.078)	(.091)
Log(ε)	.007	$-.077^{**}$	.071	$-.005$	.013
	(.039)	(.030)	(.057)	(.061)	(.065)
Log(Real Wage)	$.697^{***}$	$.129^{**}$	1.120^{***}	$.268^{***}$	$.309^{***}$
	(.052)	(.063)	(.068)	(.089)	(.081)
Log(Real Weekly E.I.)	$.144^{***}$	$.287^{***}$	.009	$.215^{**}$	$.252^{**}$
	(.035)	(.086)	(.037)	(.091)	(.111)
Log(lag Unempl. Rate)	$-.080^{***}$	$-.076^{***}$	$-.068^{***}$	.003	$-.086^{***}$
	(.014)	(.016)	(.013)	(.016)	(.026)
Log(lag Teen Pop. Share)	$.343^{***}$	$-.112^{**}$	$.374^{***}$	$-.023$	
	(.029)	(.056)	(.027)	(.066)	
Log(lag Teen Part. Rate)					$.430^{**}$
					(.190)
Log(lag Teen Empl. Rate)					$-.448^{***}$
					(.158)
Election Dummy	$-.004$	$-.002$	$-.005$	$-.003$	$-.003$
	(.009)	(.008)	(.008)	(.007)	(.008)
HHI	$-.355^{***}$	$-.189^{***}$	$-.602^{***}$	$-.406^{***}$	$-.288^{***}$
	(.077)	(.072)	(.094)	(.094)	(.107)
Constant	.041				
	(.167)				
Year dummies?	No	Yes	No	Yes	Yes
Province dummies?	No	No	Yes	Yes	Yes
Period	1965-2013	1965-2013	1965-2013	1965-2013	1976-2013
Observations	470	470	470	470	370
Adjusted R^2	.586	.999	.999	.999	.999
F Statistic	61.320^{***}	$8{,}446.000^{***}$	$17{,}552.000^{***}$	$8{,}626.000^{***}$	$9{,}459.000^{***}$

Note: *p<0.1; **p<0.05; ***p<0.01

Cluster Robust Standard Errors

such province-unique influences, provided they do not change over time. Although fixed effects reduce the variability in explanatory variables, including them helps avoid omitted variable bias.

The first four rows of columns (2) and (3) show that adding either of these two fixed effects does not change coefficients' estimated signs, while the only variables that change significance between the two regressions are the union density and technology. Given that standard tests for individual

and time effects reject removing them from the specification, in column (4) I include both year and province fixed effects in the regression.[37] These are the preferred specification estimates.

Coefficients on the first four variables of interest, union density, technology, ideology and its interaction with labor demand elasticity, have the expected sign. More so, compared to columns (2) and (3), they are all significant. Compared to column (1) they lose some significance, but unlike the pooled OLS regression these estimates are unaffected by the omitted variable bias coming from time and province constant variables.

The set of variables included in rest of Table 2 control for other, potentially important, determinants of w_M. These are province specific and time varying variables, so by accounting for them I further reduce omitted variable bias. From the bottom, the Herfindahl-Hirschman Index (HHI) and the election dummy variable control for provincial political influences other than ideology. HHI assesses party competition in a provincial parliament, capturing how concentrated is the distribution of party seat shares while also accounting for each party's ideological deviation from the overall parliament's ideological score. Given that construction[38], a value of HHI=0 indicates that one party holds all the seats in the parliament and has ideological monopoly on the government's policymaking.[39] HHI can also be indicative of a government having a majority or a minority of seats in the parliament. In terms of setting the minimum wage, the more legislative power is concentrated with one party the easier it is to change the minimum wage as the party in power faces no opposition and does not have to compromise with other parties in the legislature. A negative coefficient indicates that as HHI drops and party competition is lower, minimum wage increases.

The election dummy captures the potential effect of election years on the minimum wage increase; an incumbent provincial government would be inclined to raise the minimum wage during elections to take advantage of the short-run labor demand curve (as argued by Sobel [1999])

[37]The Lagrange Multiplier test for individual and/or time effects in panel model and the F test comparing the fixed effects and pooled OLS fits, strongly rejecting the null that OLS is a better fit and that no fixed effects are needed. Both indicate the presence of inter-provincial and time variation.
[38]See Appendix D for details on this calculation. Data sources for the rest of these variables are provided in Appendix I.
[39]It happened in New Brunswick during 1988-91 period, when the Liberal Party under Frank McKenna won all 58 seats in the legislature. Given that, the parliament's ideology was equivalent to the Liberal party's and HHI=0 in those years.

and to increase the reelection probability. While it is important to control for that possibility, in no specification did this election variable play a significant role in determining the minimum wage.[40]

The teen share of the working age population (ages 15-64) controls for the effect of supply of individuals most directly affected by minimum wage changes, i.e., the 'at risk' group. In the category of low-skilled workers, minimum wages have a significant 'bite' and affect a considerable proportion of Canadian teenagers. Yuen [2003] finds that "the minimum wage has a significant negative effect on the employment probability" of teens and youth. Brochu and Green [2013] shows strongest negative impact of the minimum wage on teenagers separation rate. Either positive or negative effect could have an intuitive interpretation. On the one hand, increasing the minimum wage could increase the employed teens' income, as well as that of other groups for which the minimum wage is relevant. On the other hand, a policymaker who cares about teens working would not want to negatively affect their job prospects by raising the minimum wage. It is lagged with the intuition that the policymaker can only observe teen workforce level for the past year and make a decision based on that information. Furthermore, it avoids the possible reverse causality effect on the labor market segment which a minimum wage increase affects the most. The same intuition applies to the lagged provincial unemployment rate, which captures overall provincial labor market conditions. In the preferred specification, column (4) with two-way fixed effects, neither teen share nor unemployment are significant for the minimum wage level.

Column (5) specification is based on the shorter time frame, 1976-2013, but uses more precise indicators of teen labor market, their labor force participation and employment rates, in addition to overall provincial unemployment rate. All three are now significant, indicating that higher unemployment and teen employment in a province negatively affects minimum wages, while more teenagers participating in the labor market has a positive effect.[41]

Including average weekly employment insurance (known as 'unemployment benefits' outside Canada) in the regression captures the effect of an institutional feature of provincial labor markets;

[40] Lagging the election dummy, designating the next calendar year as the election year, also did not show significance nor did it change other coefficient estimates. It has proven difficult to time minimum wage changes to election cycles in Canada, and these results are no exception. See Dickson and Myatt [2002].

[41] Reverse causality is a possibility here, with higher minimum wages negatively affecting teen employment rate, while encouraging higher teen participation rate in the labor force. These variables are in general slow to change on a yearly frequency and I also check regressions without lagged variables and the results remain in line with Table 2. See Appendix J.

it is an alternative minimum 'earnings' floor in a province, below which workers will not supply any labor. As discussed by Boeri [2012], it can be expected that as workers' outside option in the form of unemployment benefits increases, it will push the minimum wage higher.[42] The coefficient on this variable is indeed always positive and significant in most preferred estimations.[43] Real wage, measured as average hourly earnings, controls for the general level of wages in a province. It is expected that it will be positively associated with the price of low skilled labor in the province.

3.6. **Robustness Checks.** In Tables 8 to 10 (shown in Appendix J) I check for additional factors that could be influential when determining the minimum wage. Table 8 introduces measures of youth (ages 15-24) share of working age population in place of teen, labor demand shocks and a measure of provincial business cycle. See Appendices H and I for details on these variables. The first three columns are for the period starting in 1965, and last three starting with 1976. Youth workers are also affected by minimum wage changes, although maybe not to the same extent since they also includes university graduates. The result on the first four effects are robust to this change of the control group and the sign on youth share of working age population is the same as teen share.

Column (2) reverts to teen share, but introduces a measure of province specific labor demand shocks to control for employment shocks. Details on calculation of this variable are provided in Appendix I. The estimates of primary interest are not sensitive to this addition, while the negative sign on labor demand shock, although insignificant, indicates that real minimum wage is less likely to change when labor demand shocks are stronger. In column (3) instead of labor demand shocks I use a measure of the provincial business cycle, captured by the cyclical component of provincial real GDP. [44] This controls for the possibility that provincial governments increase minimum wages (only) during good economic times. The cyclical component of GDP can also capture the effects

[42] Dickson and Myatt [2002] speculate that more generous unemployment benefits would negatively affect a minimum wage increase since higher minimum wage would reduce employment, making it harder to qualify for benefits. An argument can be made for reverse causality as well, whereby higher minimum wage decreases the generosity of the unemployment insurance system if the minimum wage compresses the wage distribution.

[43] Although the Employment Insurance program in Canada is federally managed, parameters and characteristics of the system are based on sub-provincially established economic regions. Eligibility, benefit amount and duration are calculated based on the number of hours worked, unemployment rate and number of weeks with highest earnings in a particular economic region. The variation of parameters across regions creates variation in eligibility rates and benefit payments across provinces, which has been fruitfully used in other research, such as Lemieux and MacLeod [2000].

[44] Although, there could be some level of correlation across provinces through Canada wide recessions and federal governments and central bank's responses.

of fiscal stress on government's policies, especially those that affect the distribution of income, which minimum wage does. There is again no change in the first four effects of interest and the effect of business cycle measure is statistically insignificant. Columns (4)-(6) make the same three checks starting with 1976, with estimates comparable to column (5) in Table 2. The results are not significantly altered, and only the significance of interaction variables is weakened.

Table 9 shows the results from additional robustness checks of the primary Table 2 results, columns (4) and (5), using the control variables that other Canadian papers employed in their study of minimum wages. I evaluate the impact of adding three different control variables successively; average regional minimum wage, provincial corporate income tax for small businesses and a dummy indicating if the nominal minimum wage increased from the year before.[45]

By including the (log of) regional minimum wage, in column (1), and respectively column (4) for the shorter period, I control for the effect of minimum wage levels in other provinces. This is in line with Green and Harrison [2010] who argue that inter-provincial comparisons are important to provincial policymakers when setting their own minimum wage. They use three regions: Atlantic (NL, PEI, NS, NB), Central (ON, QC) and West (MB, SK, AB, BC). For each province, regional minimum wage in year t is computed as the average of all other provincial minimum wages in that region excluding that province. Inclusion of regional averages has no effect on other variables, especially those of main interest in the first four rows. Also, as in Green and Harrison [2010] the regional minimum wage has a positive sign, but unlike their estimates it has no significance here.[46]

The second variable I include in the preferred specification is the provincial corporate income tax rate on small business.[47] Green and Harrison [2010] consider this as "a measure of the political strength of minimum wage opponents" (see footnote 16 in their paper) and it's in line with Sobel [1999] investigation of business interest groups opposing minimum wage. In columns (2) and (5) the small business tax has a strong and positive association, although a weak effect. Somewhat surprising, but more important is that the main results are not substantially altered. Technology

[45] I compute the actual nominal minimum wage increase as $w_{M,t} - w_{M,t-1}$ and assign 1 if the difference is positive.
[46] Since their dependent variables is the log of nominal minimum wage I check that regression in my context, as in Table 10, and find the same results as for real minimum wage: positive coefficient, not significant and no change in first four variables of interest.
[47] The data on corporate tax rates for provinces was generously provided by Cahill [2007].

variable in column (2) looses significance, while the other estimates are in line with previous results. This would be more indicative of the importance of the time period being evaluated.

In the last row I check the results for the presence of a dummy indicating whether there was an increase in the *nominal* minimum wage last year. Brochu and Green [2013] use this control to capture equilibrium effects in their estimation of minimum wage impact on transition in and out of employment. Here the focus is on minimum wage adjustments and the presence of dummy avoids an immediate type of effect of other variables on minimum wage. It could also be the case that a nominal minimum wage increase in the past year reduces the possibility of a policymaker increasing it in the current year. The inclusion of this dummy seems to improve the overall fit of the primary specification. In columns (3) and (6), despite the nominal minimum wage dummy being highly significant, the cluster robust standard errors for the first four variables are in fact smaller. I also included all three of these controls in the primary specification simultaneously and the results are not substantially different from Table 2. In fact, the significance of union density, ideology and interaction variables all increase, while the only one that is weakened is the technology variable measured by the Solow residual. All keep the same theoretically predicted signs.

Table 10 replicates two-way fixed effects specifications from Table 2 with the dependent variable being the *nominal minimum wage*.[48] Columns (1) and (3) in Table 10 are directly comparable to (4) and (5) in Table 2. The results do not substantively change. In columns (2) and (4) I use labor market indicators for youths instead of teens and although those variables reverse the sign, the key effects of interest in the first four rows are comparable to previous estimates. The only variable that loses significance is the column (4) interaction of political ideology and elasticity in the shorter time period when controlling for youth labor market indicators.

Finally, although clustering standard errors on provinces allows for both autocorrelation within clusters and potential heteroskedasticity, due to the small number of provinces the cluster-robust standard errors could be biased downwards. Because of this I use the bootstrap procedure to check more accurately the cluster-robust inference. Appendix Table 7 replicates Table 2 columns (4) and (5) regressions with a wild cluster bootstrap proposed by Cameron et al. [2008]. Besides

[48]For consistency, I also use the nominal wage, nominal employment insurance and the Solow residual calculated using nominal values of capital and GDP.

union density, other key determinants of interest, especially the political ideology effects, are still significant at the 5% level, especially for analysis starting in 1976. The importance of the time period for inference could warrant further investigation.

4. Summary and Conclusion

In this paper I analyzed the political origins of minimum wage determination, taking into account the political influence of special interest groups, political ideology and various labor market factors. In general, the theory effectively relates the economic factors prevailing in a specific jurisdiction - the skill (income) distribution, the labor demand elasticity, the skill composition of union members and the unionization rate - and the government's political ideology with the competition for policy influence between SIGs whose income depends on the minimum wage set. Taken together, the theoretical results show that when the policymaker cares about lobbying contributions, the equilibrium minimum wage set will not be the one which maximizes aggregate welfare, but rather the one preferred by politically organized members of society. The SIGs are able to induce the level of minimum wage which benefits them at the expense of unorganized members of society: low skilled workers who lose their jobs and firm owners whose profits are reduced.

A particularly interesting insight that comes from the model is an explanation of when a more business-friendly policymaker would not necessarily oppose an increase in the minimum wage, despite always having a negative effect on profits, provided she receives lobbying contributions from the union. In addition, a novel insight is that a smaller union, composed of higher skilled workers, can be more effective at increasing the minimum wage. This prediction is contrary to a more usual expectation that a larger union is a politically stronger union, having more influence on the government to increase the minimum wage. In the current model setup, capital used in firms' production is assumed to be fixed. Relaxing this assumption, given that firms can substitute labor for capital in the long run, would likely have an effect on the elasticity of labor demand in the long run. I leave this extension for future research.

Theoretical predictions are verified empirically with evidence from Canadian provinces, taking advantage of the rich heterogeneity in their historical minimum wage evolutions. According to

robust panel data regression estimates, presented in Table 2 and Appendix J Tables, after controlling for unobserved province and year effects, real minimum wage is shown to decrease in skill-adjusted union density and a measure of political ideology. The latter means that as the provincial government becomes more labor-friendly the minimum wage will be higher.

Furthermore, the data show that this political ideology effect is reinforced by a large labor demand elasticity, which is compatible with the theoretical insight that lobbying is successful in inducing the policymaker to set the minimum wage in the direction of her political ideology preference when labor demand elasticity is larger. Finally, the minimum wage will also increase as a result of technological advancement, measured by province specific Solow residuals. Making workers more productive allows firms to employ the lower skilled workers for which the minimum wage was previously binding. These results do not prove very sensitive to a variety of different political and economic time varying factors across provinces, that could also influence minimum wages.

Studying what drives policy choices is of independent concern and interest. Neumark and Wascher [2004] showed that cross-country differences in labor market policies and institutions can affect the *impact* of minimum wages. It seems reasonable then that these differences would help us understand the variation in minimum wages themselves. More importantly, studying the determinants of policies that have a clear political dimension in their choice, like minimum wage, has practical merit. Boeri [2012] and Besley and Case [2000] have pointed out the relevance of assessing policy endogeneity for the empirical analysis of the disemployment and welfare effects of minimum wages. The next step could be to employ this model's estimates as a possible first stage in assessing the effect of the minimum wage on, for example, teen employment. Alternatively, if a political variable, such as ideology, is found to have an independent effect on policy determination and not on the outcome of that policy, it could prove useful as a candidate instrument to control for potential policy endogeneity. In general, accounting for important economic and political sources of minimum wage variation can improve the unbiased estimation of minimum wage effects. This would be a valuable extension of this research and I leave it for a future project.

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APPENDIX A. LABOR MARKET EQUILIBRIUM WITH A MINIMUM WAGE

Firms care about the units of effective labor employed and profit maximization. With w_E the cost of a unit of effective labor, the maximum level of profits that firms in each industry can attain are given by $\Pi_T(w_E)$ and $\Pi_P(w_E)$. Then, respective industries' labor demands can be obtained thorough the Envelope result,

$$E_i(w_E) = -\Pi_i'(w_E), \quad \text{for } i = T, P.$$

The total demand for effective labor is simply $E(w_E) = E_T(w_E) + E_P(w_E)$.

Since all workers are perfectly substitutable, in the competitive equilibrium the least skilled worker earns $\hat{w}_E$, i.e., his marginal output.[49] When a minimum wage is imposed such that $w_M > \hat{w}_E$, firms will not hire the least skilled worker since his marginal product does not cover the wage he *must* be paid. Imposing such a binding minimum wage leads to labor demand falling short of supply. Therefore, the least skilled hired worker will be the one with the skill level a_M such that

$$a_M w_E = w_M, \tag{A.1}$$

which implies that the a_M is a function of w_M. The full-employment condition is

$$E(w_E) = N \int_{a_M(w_M)}^{\infty} a\Phi'(a)\mathrm{d}a. \tag{A.2}$$

The right-hand side indicates that only workers with ability greater than a_M are employable. Equations (A.1) and (A.2) enable us to jointly solve for a_M and w_E as functions of w_M, with solutions denoted by $a_M(w_M)$ and $w_E(w_M)$, respectively. These two functions determine the income levels of all groups in the economy as a function of w_M and thus give a stake to various interest groups to compete for the influence over the minimum wage policy. Specifically, the unique solution to eq. (A.2) gives the equilibrium wage for a unit of effective labor

$$\hat{w}_E(w_M) = \alpha^{\frac{1}{z+\alpha-z\alpha}} \left[\frac{Nz}{(z-1)\mathscr{A}}\right]^{\frac{\alpha-1}{z+\alpha-z\alpha}} w_M^{\frac{(1-z)(\alpha-1)}{z+\alpha-z\alpha}}. \tag{A.3}$$

where the shorthand $\mathscr{A} = \left[A_T + A_P\right]$ is used for simplicity throughout the paper. Observe that $\hat{w}_E(w_M)$ is increasing in w_M. The minimum skill level of an employed worker is

$$a_M(w_M) = \left[\frac{Nz}{(z-1)\mathscr{A}}\right]^{\frac{1-\alpha}{z+\alpha-z\alpha}} \left[\frac{w_M}{\alpha}\right]^{\frac{1}{z+\alpha-z\alpha}}. \tag{A.4}$$

To facilitate deriving the minimum wage determined in the political equilibrium under the influence of lobbying SIGs, I express each industry's and the aggregate labor demands as well as union's labor supply in terms of minimum wage. I make use of eqs. (2.4) and (A.4) to do so. The demand for effective labor by industry $i = T, P$ as a function of w_M is

$$E_i(w_M) = A_i\left[\hat{w}_E(w_M)\right]^{\frac{1}{\alpha-1}} \alpha^{\frac{1}{1-\alpha}} = A_i \left[\frac{Nz}{(z-1)\mathscr{A}}\right]^{\frac{1}{z+\alpha-z\alpha}} \left[\frac{w_M}{\alpha}\right]^{\frac{1-z}{z+\alpha-z\alpha}}. \tag{A.5}$$

The total demand for effective labor as a function of w_M is

$$E(w_M) = E_T(w_M) + E_P(w_M) = \left[\mathscr{A}\right]^{\frac{(1-\alpha)(z-1)}{z+\alpha-z\alpha}} \left[\frac{Nz}{z-1}\right]^{\frac{1}{z+\alpha-z\alpha}} \left[\frac{w_M}{\alpha}\right]^{\frac{1-z}{z+\alpha-z\alpha}}. \tag{A.6}$$

With the minimum wage imposed in the economy, the expression for the total units of effective labor supplied by unionized workers has to be evaluated for two possible cases. In the first case, if the minimum wage is such that $a_M(w_M) < a_U$, then the supply of effective unionized labor is

$$E_U = N\int_{a_U}^{\infty} a\Phi'(a)\mathrm{d}a = N\int_{a_U}^{\infty} a\frac{z}{a^{1+z}}\mathrm{d}a = \left[\frac{Nz}{z-1}\right] a_U^{1-z}. \tag{A.7}$$

[49] Actually, the least skilled worker earns $\underline{a}\,\hat{w}_E$. The assumption made here is that the lowest skill level is $\underline{a} = 1$.

The other possibility is that $a_M(w_M) > a_U$, in which case E_U is

$$E_U(w_M) = N\int_{a_M(w_M)}^{\infty} a\Phi'(a)\mathrm{d}a = \left[\frac{Nz}{z-1}\right] a_M(w_M)^{1-z}. \tag{A.8}$$

These two cases are illustrated in Figure 5. Intuitively, in the first case, when the binding minimum wage is set low enough such that the lowest employed skill level (denoted a_M^1) is not greater than a_U, the supply of effective unionized labor remains as initially specified in eq. (2.3). In the second case describes the situation when w_M is set so high that unionized workers with the skill level in the range $[a_U, a_M^2)$ lose their employment. This goes against the union's interest since it reduces the earnings of its members and it is reasonable that those unionized workers who lose their jobs as a result of union's lobbying effort to increase the minimum wage, would have no incentive to remain members of the union any longer. In other words, there is no reason to remain union member after losing the 'unionized job'.

Therefore, the focus of the analysis on the interior solution in the first case when the union lobbies to increase the minimum wage as long as $a_M(w_M) < a_U$ is more sensible. Equations (A.5) to (A.7) can be used to derive the political equilibrium in the economy, for a given pattern of lobbying.

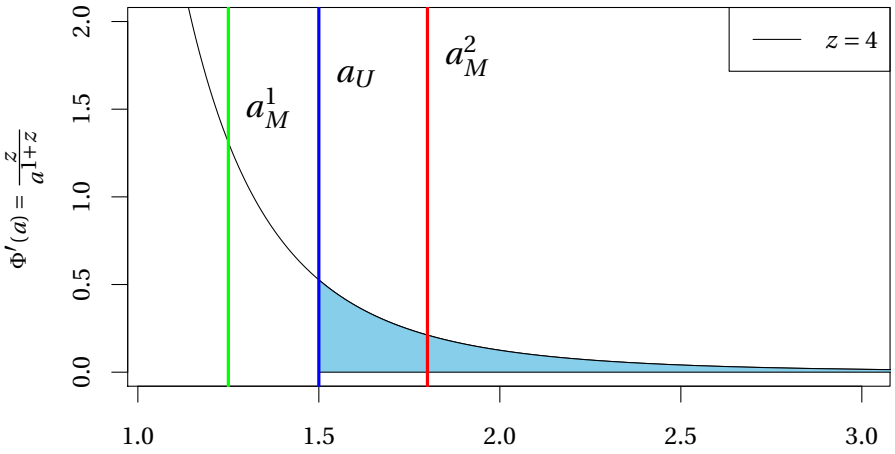

Figure 5. Skills are Pareto distributed and above the cutoff level a_U all workers are union members. The vertical (green) line $a_M^1 < a_U$ depicts the first case situation, and the vertical (red) line $a_M^2 > a_U$ case.

Appendix B. Lobbying Contributions and First Order Condition

To get the eq. (2.8)

$$\begin{aligned} W'(w_M) &= \lambda_L w_E'(w_M) E[w_E(w_M)] + \lambda_L w_E(w_M) E'[w_E(w_M)] w_E'(w_M) \\ &\quad + \lambda_S\left[\Pi_T'[w_E(w_M)] w_E'(w_M) + \Pi_P'[w_E(w_M)] w_E'(w_M)\right] \\ &= (\lambda_L - \lambda_S) w_E'(w_M) E[w_E(w_M)] + \lambda_L w_E(w_M) E'[w_E(w_M)] w_E'(w_M) \end{aligned}$$

from the policymaker's FOC, using the fact that $\Pi_i'[w_E(w_M)] = -E_i(w_E(w_M))$ for $i = T, P$.

APPENDICES NOT FOR PUBLICATION

APPENDIX C. SUMMARY STATISTICS FOR THE MAIN EXPLANATORY VARIABLES OF INTEREST

Table 3. Summary statistics for the adjusted provincial union density, 1965-2013. The observation for 1965 is missing because the provincial total employment is not available for that year

Statistic	N	Mean	St. Dev.	Min	Median	Max
Newfoundland and Labrador (NL)	48	35.600	7.637	20.250	33.490	47.340
Prince Edward Island (PE)	48	20.030	4.913	8.194	21.700	26.600
New Brunswick (NB)	48	25.860	2.354	21.970	26.490	30.010
Nova Scotia (NS)	48	27.400	3.888	21.860	28.900	34.150
Quebec (QC)	48	31.660	2.284	24.560	31.180	36.030
Ontario (ON)	48	25.660	3.088	20.970	27.180	29.070
Manitoba (MB)	48	27.500	1.999	23.110	27.790	30.610
Saskatchewan (SK)	48	22.440	3.375	15.520	23.700	26.590
Alberta (AB)	48	19.320	2.070	16.440	19.310	23.320
British Columbia (BC)	48	31.110	5.334	22.480	32.610	38.450

Note: Yearly Frequency. For the data source see Appendix F.

Table 4. Summary statistics for the provincial Solow residual (technological progress), 1965-2013.

Statistic	N	Mean	St. Dev.	Min	Median	Max
Newfoundland and Labrador (NL)	49	11.950	3.086	8.384	11.440	19.770
Prince Edward Island (PE)	49	13.170	1.567	9.658	13.930	15.150
New Brunswick (NB)	49	16.370	2.092	12.370	17.540	18.650
Nova Scotia (NS)	49	14.120	1.962	10.750	15.010	16.400
Quebec (QC)	49	15.990	1.028	13.910	15.690	17.880
Ontario (ON)	49	17.550	1.603	14.510	17.230	20.390
Manitoba (MB)	49	12.450	1.169	10.090	13.080	13.870
Saskatchewan (SK)	49	6.001	0.610	4.862	5.966	7.673
Alberta (AB)	49	7.461	0.810	5.901	7.673	9.035
British Columbia (BC)	49	15.100	1.270	12.500	15.140	17.100

Note: Yearly Frequency. For the data source see Appendix G.

APPENDIX D. POLITICAL IDEOLOGY AND HERFINDAHL–HIRSCHMAN INDEX CONSTRUCTION

D.1. **Provincial Political Ideology.** The political ideology variable is constructed following the approach of Bjørnskov and Potrafke [2012], who employ a variant of the following ideology scale for Canadian provincial parties, with minor differences. See their Figure 1 for comparison.

Corollaries 1 and 2, in section 2.3, indicate that the political ideology will have a different effect on the minimum wage when elasticity is large (>2) in the presence of lobbying. The real minimum wage would increase under a more labor friendly, left-of-center government such as the National Democratic Party and sometimes the Liberal Party, while Conservative governments would oppose an increase.

On the one hand, although the ideology score scale for Canadian provinces illustrates a standard ranking in the party space and ideological location regarding economic issues, there is always a question of a 'human element' in assigning the score. To keep a consistent scoring methodology, for each party the ideology score can change when the party leader changes, which indicates the possible change in the faction that leads a particular party. On the other hand, there are certain peculiarities of Canadian provincial politics that should

Table 5. Summary statistics for the provincial political ideology, 1965-2013.

Statistic	N	Mean	St. Dev.	Min	Median	Max
Newfoundland and Labrador (NL)	49	0.162	0.205	−0.286	0.212	0.468
Prince Edward Island (PE)	49	0.133	0.102	0.010	0.118	0.321
New Brunswick (NB)	49	0.198	0.237	−0.367	0.290	0.487
Nova Scotia (NS)	49	0.323	0.147	0.128	0.333	0.582
Quebec (QC)	49	−0.176	0.206	−0.437	−0.183	0.195
Ontario (ON)	49	0.092	0.217	−0.226	0.080	0.548
Manitoba (MB)	49	−0.034	0.141	−0.240	−0.094	0.257
Saskatchewan (SK)	49	−0.013	0.282	−0.417	−0.073	0.479
Alberta (AB)	49	0.429	0.229	0.108	0.321	0.876
British Columbia (BC)	49	−0.079	0.226	−0.606	−0.091	0.470

Note: Yearly Frequency. For the data source see Appendix D.

Table 6. Summary statistics for the labor demand elasticity (ε), 1965-2013.

Statistic	N	Mean	St. Dev.	Min	Median	Max
Newfoundland and Labrador (NL)	49	2.771	0.788	1.482	2.718	4.224
Prince Edward Island (PE)	49	2.752	0.316	2.345	2.633	3.678
New Brunswick (NB)	49	3.156	0.636	2.500	2.870	4.466
Nova Scotia (NS)	49	2.925	0.529	2.372	2.659	4.252
Quebec (QC)	49	2.879	0.256	2.497	2.842	3.400
Ontario (ON)	49	2.893	0.179	2.615	2.852	3.276
Manitoba (MB)	49	2.585	0.160	2.341	2.543	2.939
Saskatchewan (SK)	49	1.875	0.115	1.591	1.893	2.097
Alberta (AB)	49	2.052	0.187	1.697	2.042	2.539
British Columbia (BC)	49	2.841	0.338	2.368	2.803	3.726

Note: Yearly Frequency. For the data source see Appendix E.

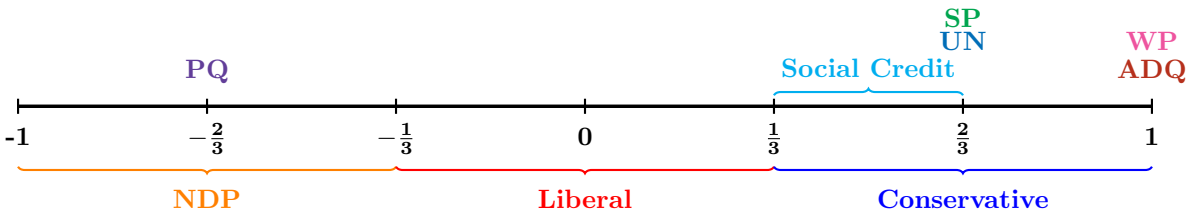

Figure 6. Canadian Provincial Parties Ideology Scale. PQ is Parti Québécois, UN is Union Nationale, ADQ is Action Démocratique du Québéc and SP is the Saskatchewan Party. The score of $-\frac{1}{3}$ is coded for NDP only in Saskatchewan during the Romanow years as the party leader.

be taken into account when expanding the measure of political ideology over this time period. In general, Canadian provincial parties are self-contained organizations and not necessarily connected to the federal party with the same name. Thus, membership in the provincial political party, for example Liberal, does not imply membership in the federal Liberal Party. The exception to this rule is the New Democratic Party.

In light of this, Canadian politics requires careful consideration when applying standardized party labels, as they are understood in Canadian federal politics or North American politics in general. For example, the Liberal Party in British Columbia is a conservative, center-right party. Its opposition to the minimum wage increase is visible from the flat nominal rate during the 2001-2010 period in Figure 7. Subsequent

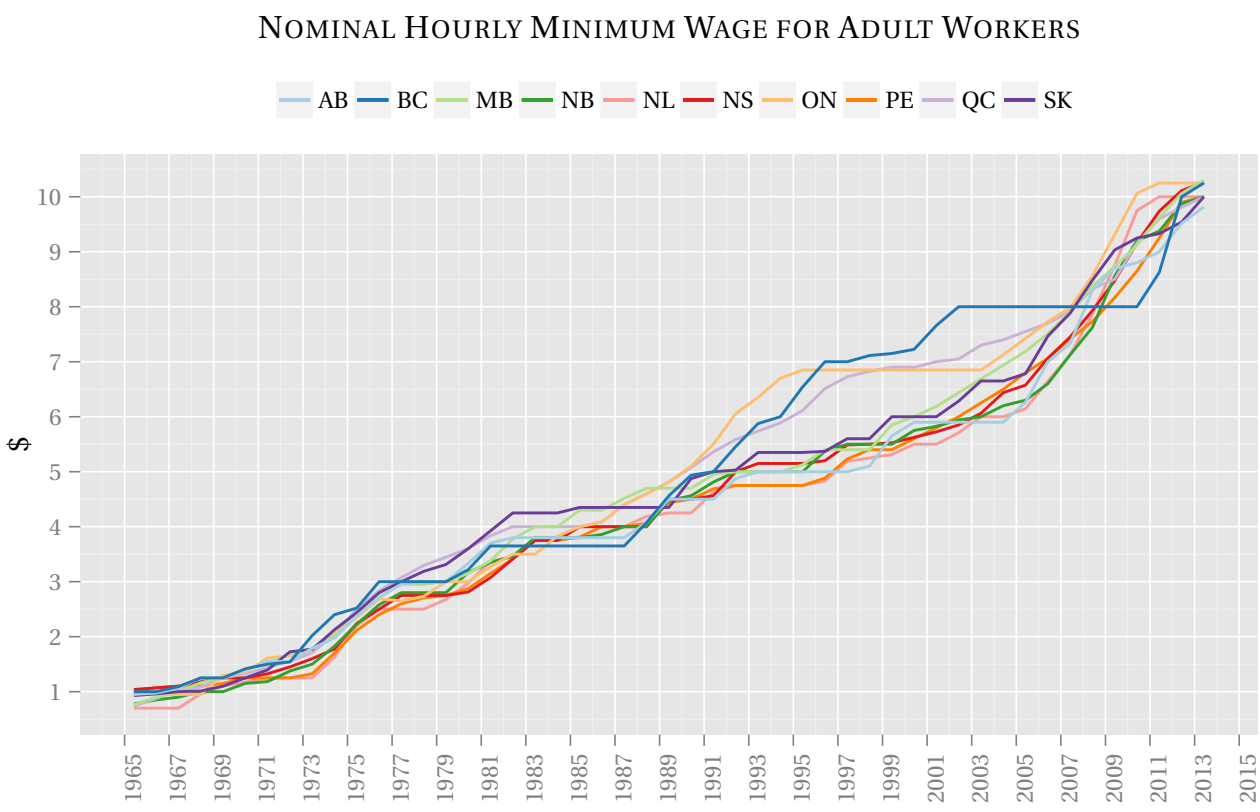

Figure 7. Nominal minimum wages across ten Canadian provinces, 1965-2013. These are calculated as the weighted average of monthly nominal minimum wages, with weights the number of months in a year that a particular nominal minimum wage was in effect. Data: Labour Program Canada, Minimum Wage Database.

increases are, however, not entirely incompatible since the theory does not preclude that even a business friendly government increases the minimum wage, under the condition that the labor demand elasticity is not large and lobbying for the increase is strong. Also, it is possible that with the change in leadership the party changes its ideological stance, as discussed above.[50] The conservative Social Credit party in B.C. also kept the nominal minimum wage unchanged for extended periods of time during late '70s and all of 1980s, allowing the real minimum wage to deteriorate sharply. Additionally, in the province of Québec the Liberal Party is often characterized as a free-market (center-right) party, in opposition to the social democratic Parti Québécois (center-left).

D.2. **Herfindahl–Hirschman Index of Provincial Political Competition.** HHI captures the concentration of party seat shares in each provincial parliament, i.e., political competition. I calculate HHI for a province p in year t in two ways: first, discussed in the main part of the paper, by taking into account the ideological difference of each party r from the parliament's ideological score,

$$[\text{Ideologically Adjusted HHI}]_{pt} = \frac{\sum_r ((i_{rt} - PI)S_{rpt})^2}{\left(\sum_r S_{rpt}\right)^2},$$

[50] Note that even with the recent increases, the minimum wage in British Columbia is among the lowest in Canada and the governing Liberal party opposes further increases.

and second, by simply taking into account the number of seats each party has.

$$[\text{Simple HHI}]_{pt} = \frac{\sum_r (S_{rpt})^2}{\left(\sum_r S_{rpt}\right)^2}.$$

where S is the number of seats in the legislature. Both have the same interpretation, while simply inverting the direction in which party competition increases. When the Simple $HHI = 1$, one party holds all the seats and there is no party competition in the parliament. Using this measure of HHI in table 2 regressions, as opposed to the ideologically adjusted one, leads the coefficient on HHI to be positive, indicating that as the 'Plain HHI' increases to 1, political power is concentrated with one party making it easier to increase the minimum wage. Figure 8 illustrates these two measure of HHI. Notice that the value of 'Simple HHI' (dashed

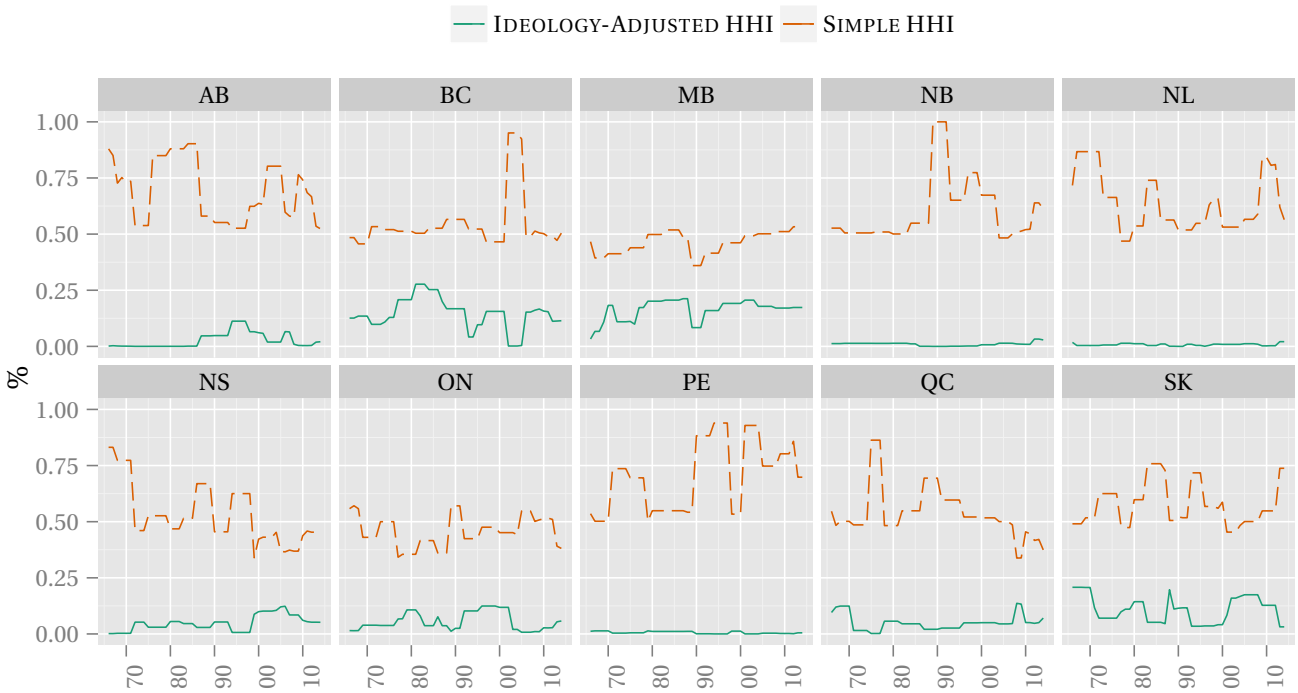

Figure 8. Two Herfindahl–Hirschman Indices of Provincial Political Competition, 1965-2013.

line) in New Brunswick during the period 1988-91 is equal to 1, as expected when one party holds 100% of the seats in the provincial legislature.

Furthermore, in regressions I also check for the *inverse of the HHI*, which measures the effective number of parties in the provincial parliament. The intuition here is that as the effective number of parties increases it is more challenging to increase the minimum wage, potentially requiring compromises with political opponents and concessions on other policies. Indeed, the coefficient on 'inverse HHI' in the regression has a negative sign, indicating that minimum wage increases with lower effective number of parties in the parliament.

APPENDIX E. LABOR DEMAND ELASTICITY

Following the theory, the absolute value of labor demand elasticity for each province is derived in eq. (2.2) as $\varepsilon = \frac{1}{1-\alpha}$, where α denotes labor share in total income, also calculated for each province. Although there is no widely accepted consensus, I estimate α following Gollin [2002], Morel [2006] recommendations. There are three ways of computing α, depending on how the small, self-employed unincorporated business income (UBI) is attributed to total labor income. Specifically,

$$\alpha_{Raw} = \frac{\text{Compensation of Employess}}{\text{GDP at Factor Cost}};$$

$$\alpha_{Adj1} = \frac{\text{Compensation of Employess} + \text{UBI}}{\text{GDP at Factor Cost}};$$

$$\alpha_{Adj2} = \frac{\text{Compensation of Employess}}{\text{GDP at Factor Cost} - \text{UBI}}$$

The "Raw" measure of labor share simply does not include the UBI and this underestimates the labor share

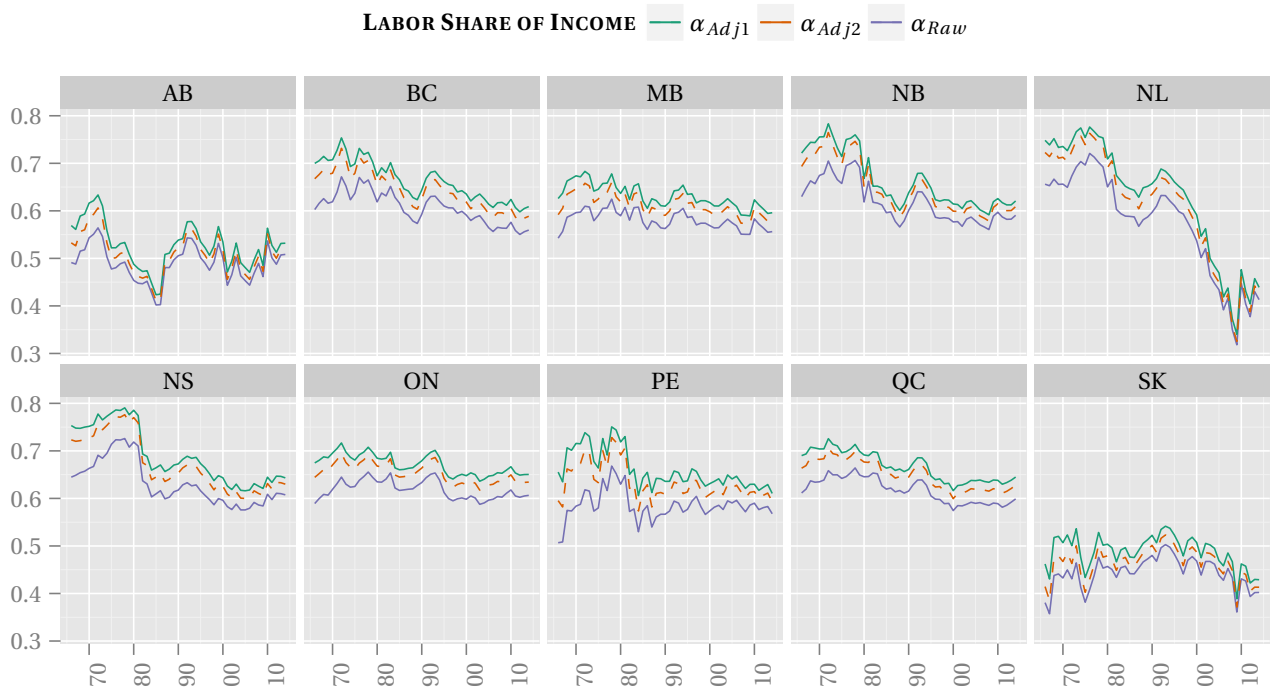

Figure 9. Labor Share of Income across Canadian provinces, 1965-2013.

measure, as show in Figure 9. Attributing entire UBI to labor income, as in "Adjustment 1", overestimates the labor share. A preferred adjustment is to somehow allocate UBI between these two extremes, where the gap is the measure of UBI. "Adjustment 2" subtracts the UBI from GDP, meaning the α_p is calculated for the incorporated part of the economy. According to Gollin [2002, p.468] this treats UBI "as comprising the same mix of labor and capital income as the rest of the economy." In Figure 9 we can see that this second adjustment measure lies between the other two extremes, denoted by a dashed line. The second adjustment

is the most preferred measure of α, used in this paper. The preferred measure of total income is GDP at factor cost (GDP at market prices - Indirect taxes less subsidies).

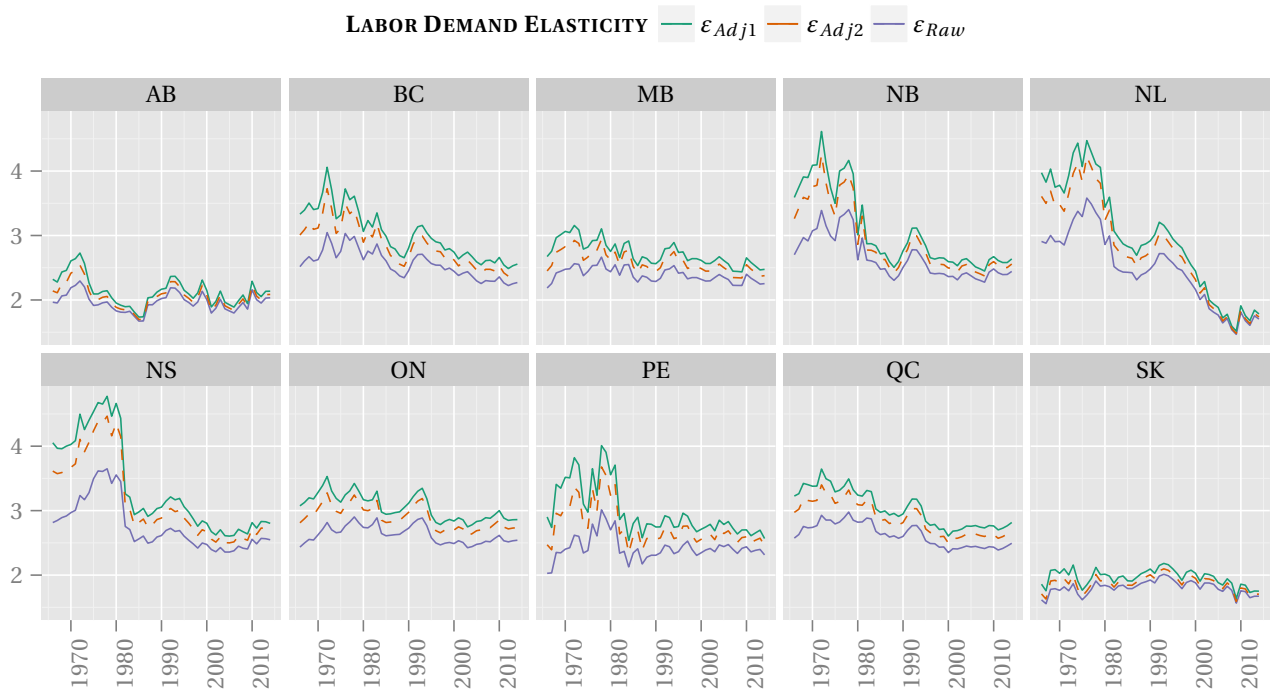

Figure 10. Labor Demand Elasticity across ten Canadian provinces for period 1965-2013.

DATA SOURCES.

- Compensation of Employees: CANSIM 384-5000 (1926-2013). Same values as 384-0037 compensation series (1981-2013).
- GDP at factor cost and indirect taxes less subsidies: CANSIM 384-0014 (1965-1980) and 384-0037 (1981-2013).
- Unincorporated Business Income: CANSIM 384-0014 (1965-1980) and 384-0040 (1981-2013).

After calculating α for each province, computing labor demand elasticity ε is straightforward. Figure 10 shows the three measure of ε corresponding to three adjustments. The preferred measure is again ε_{Adj2}.

APPENDIX F. PROVINCIAL UNION DENSITY ADJUSTED FOR THE SKILL LEVEL

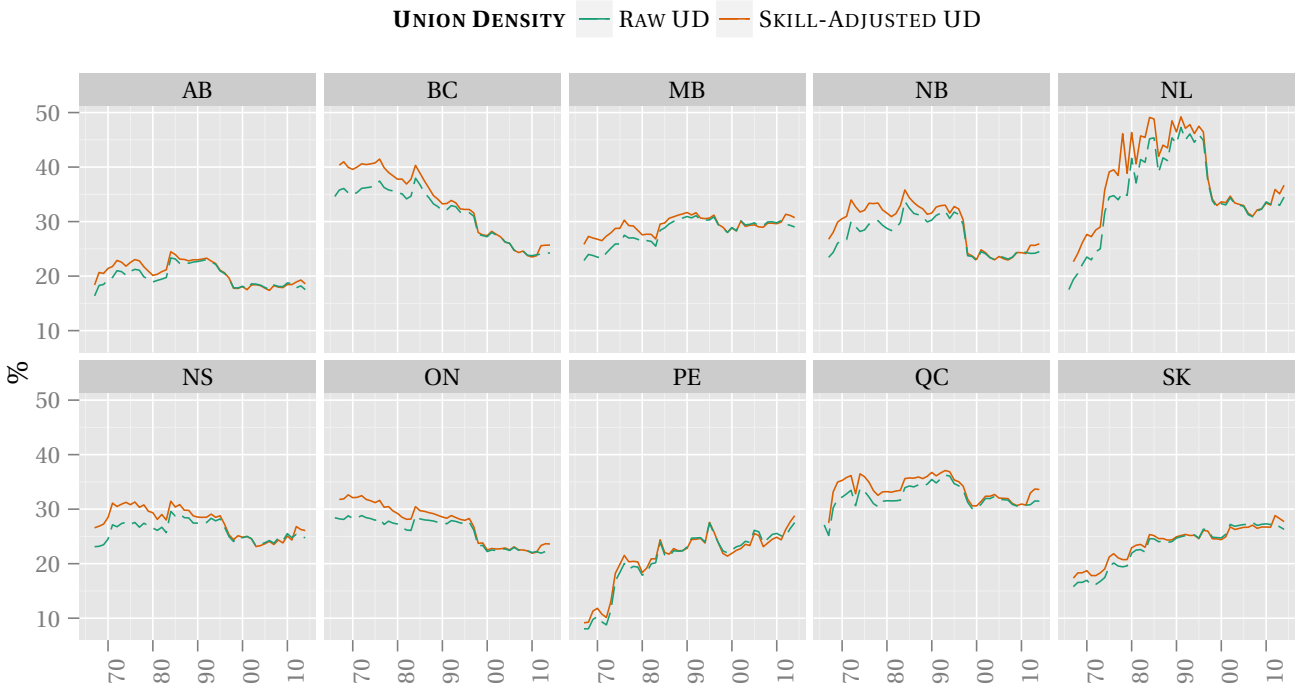

Figure 11. Union Density across Canadian provinces, 1965-2013.

Provincial union density is defined as the ratio of unionized workers to total employment. Provincial time-series data on unionized workers are obtained from the Corporations and Labour Unions Returns Act (CALURA) until 1995 and starting with 1997 from the Labor Force Survey (LFS). CALURa is an administrative data on union membership and combining it with the survey based LFS has certain drawbacks. Since CALURA only counts workers who are members of the union, when combining the two series I only use LFS's measure of employees who are union members, and exclude those workers who are also covered by a union contract despite not being members. See Legree et al. [2014] for more discussion on these two series.

Despite some limitations, these are the longest consistent measures of unionization in Canadian data. Further, the benefit is that membership series from both CALURA and LFS can consistently be separated by sex and province, over the entire period 1965-2013. The skill adjusted measure of union density is constructed by first weighing male and female unionized workers in each province by the respective ratios of average hourly earnings (AHE) to overall AHE, and then dividing the sum of the two measure by total provincial employment. In other words, I first compute a weighted sum of male (M) and female (F) unionized workers and then divide by total employment in the province. Specifically,

$$[\text{Skill Adjusted } UD]_{pt} = \frac{\frac{AHE_M}{AHE}\text{Unionized Workers}_{Mpt} + \frac{AHE_F}{AHE}\text{Unionized Workers}_{Fpt}}{\text{Total Employment}}$$

The weight for male union members is always > 1 while the one for women is < 1, although approaching 1 overt time. The average hourly earning are calculated from hours worked and labor compensation data used by the Canadian Productivity Accounts. Figure 11 illustrates two measure of union density, the Raw unadjusted and the Adjusted one from the above equation.

DATA SOURCES.

- Union Membership: CALURA CANSIM 279-0025 series for 1965-1995 and the LFS series CANSIM 282-0220 for 1997-2013. Printed CALURA reports were also used. Union data for 1996, when CALURA stopped, are obtained from Galarneau [2003].
- Total employment, persons: CANSIM 384-0035 and CANSIM 384-0002.
- Average Hourly Earnings, for the weight ratios: CANSIM 383-0024.

APPENDIX G. SOLOW RESIDUAL

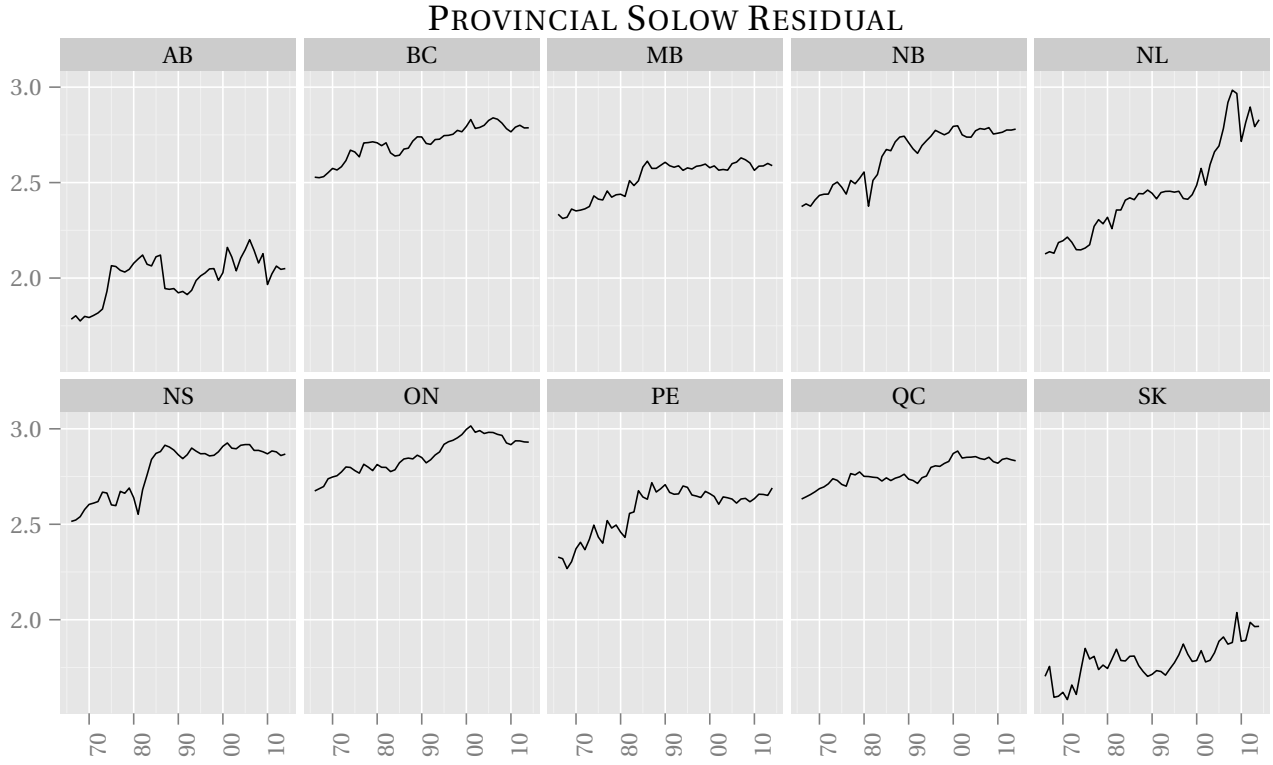

Figure 12. Logarithm of the Solow residual across Canadian provinces, 1965-2013.

Province specific Solow residual is used to measure the technological progress and the time series for each province is calculated as the residual of the Cobb-Douglas production function:

$$A_{pt} = \frac{Y_{pt}}{E_{pt}^{\bar{\alpha}_p} K_{pt}^{1-\bar{\alpha}_p}}$$

where Y_{pt} is real GDP in province p, in year t, while E and K are provincial employment and capital stock, respectively. $\bar{\alpha}_p$ is the average value of labor share in each province for 1961-2013. All dollar values are deflated by the provincial or federal CPI. For capital stock measures I used the geometric end-year net stock.

DATA SOURCES.

- Income based GDP: CANSIM 384-0014 (1961-1980) and CANSIM 384-0037 (1981-2013)
- Employment: CANSIM 281-0015 (1961-1982) CANSIM 281-0005 (1983-2000) CANSIM 281-0024 (2001-2013)
- Capital Stock: Fixed residential CANSIM 031-0008 (1961-2013) and fixed non-residential CANSIM 031-0005 (1961-2013)

APPENDIX H. CYCLICAL COMPONENT OF PROVINCIAL REAL GDP

Provincial business cycle is defined as fluctuations about trend of real GDP and a provincial recession is then simply a negative deviation from this trend. The provincial real GDP trend and cyclical component are calculated in two alternative ways, both of which give almost identical results. First, based on the well known Hodrick-Prescott detrending procedure, and second based on a nonparametric, kernel regression estimate of log provincial real GDP on its time trend. The nonparametric cyclical component of real GDP is then extracted as

$$\text{NPCC of RealGDP} = \log(\text{Real GDP}) - \text{NP Trend Real GDP}$$

where the NP Trend are the fitted values of the nonparametric provincial regression. Figure 13 superimposes both NP and HP calculated cyclical components. The nonparametric cyclical component is the preferred measure used in regressions to control for the effect of the business cycle.

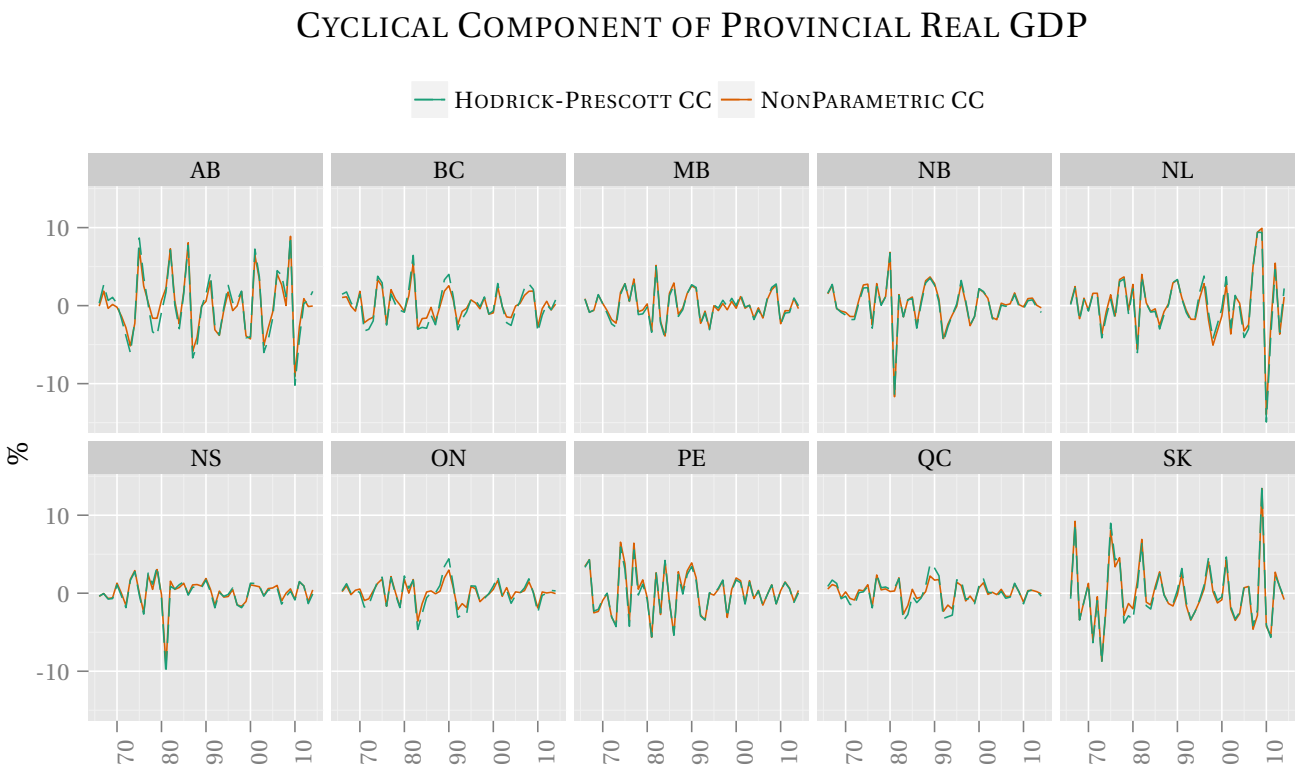

Figure 13. Percentage Deviations from Provincial Trend Real GDP, 1965-2013.

APPENDIX I. DATA SOURCES FOR CONTROL VARIABLES

- Unemployment Rate: CANSIM 384-0035 (1966-1975) and CANSIM 282-0002 (1976-2013)
- Teen and Working Age Population: CANSIM 051-0026 (1965-1971) and CANSIM 051-0001 (1971-2013)
- Teen and Youth Employment and Participation Rates: CANSIM 282-0002 (1976-2013)
- Average Hourly Earnings: Survey of Employment, Payrolls and Hours data on industrial composite of provincial average weekly earnings and hours. CANSIM 281-0021 and 281-0022 (1965-1982). CANSIM 281-0006 and 281-0007 (1983-2000). CANSIM 281-0027 and 281-0038 (2001-2013). Alternatively average weekly hours from the same source.
- Average Weekly Employment Insurance: CANSIM 276-0015 and CANSIM 276-0005 for (1965-2010) and CANSIM 276-0017 for (1997-2013)

- Election Dummy: Obtained from provincial parliaments' historical records available on their official websites.
- Provincial Small-Business Corporate Tax Rates: Cahill [2007] for the period 1965-2005 and updated to 2013 through Canadian Tax Foundation's *Finances of the Nation* reports.

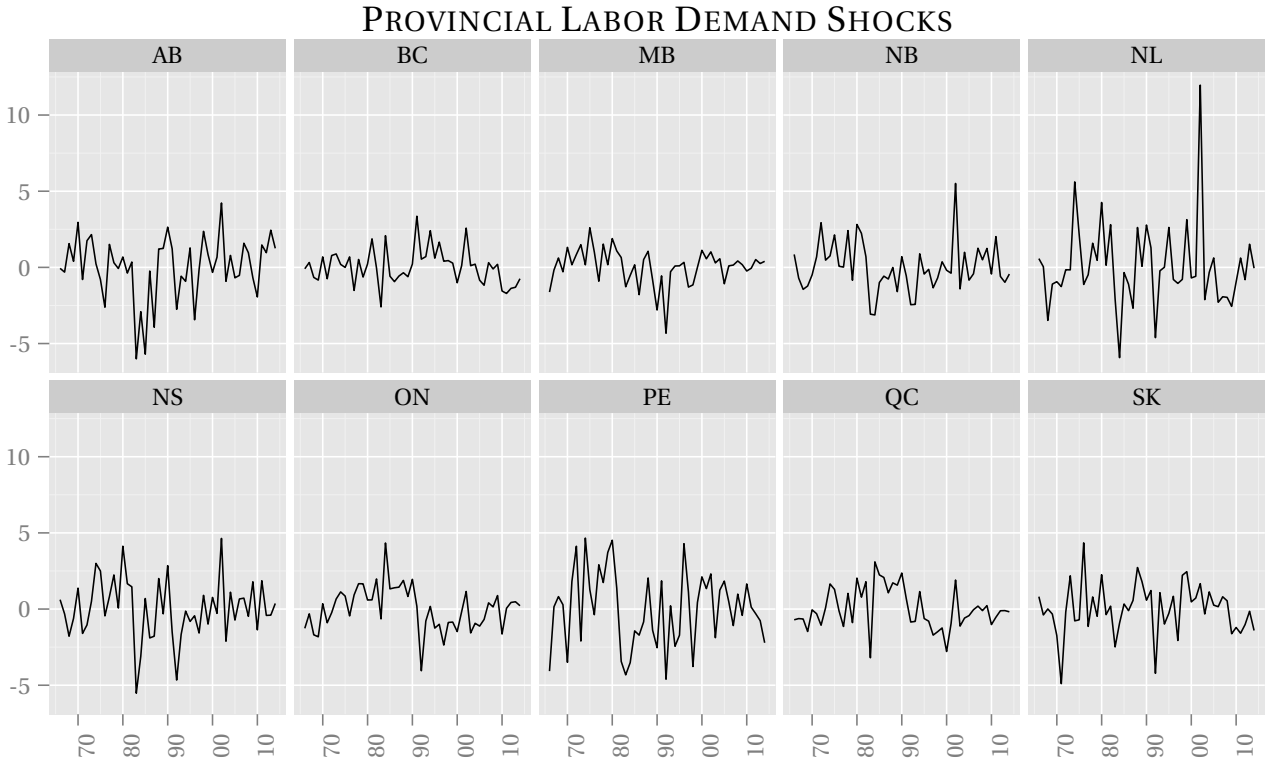

Figure 14. Labor demand shocks across Canadian provinces, 1965-2013.

Labor demand shocks are defined as the residuals from the following regression, run for each province separately:

$$\ln(E_{p,t}) = \alpha + \beta_1 \ln(E_{p,t-1}) + \beta_2 \ln(E_{p,t-2}) + \beta_3 \ln(E_{p,t-3}) + \beta_4 \ln(RGDP_{pt}) + \beta_5 \ln(RLC_{pt}) + \epsilon_{pt},$$

where E is provincial employment, $RGDP$ is real GDP and RLC is real employee labor cost. Residuals capture all sources of employment demand change other than change in real GDP, labor cost and past demand. As pointed out by Nickell et al. [2005], these residuals control for short-run employment shocks.

APPENDIX J. ROBUSTNESS CHECKS AND ADDITIONAL REGRESSION TABLES

Table 7. Estimates of Real Minimum Wages Determinants in Canadian provinces using Bootstraped Standard Errors with Clustering. The wild bootstrap was used in computation. These two columns are comparable to Table 2 columns (4) and (5).

	Dependent Variable: Log(Real Minimum Wage)	
	Prov+Year FE	Prov+Year FE
	(1)	(2)
Log(Union Density)	−.077	−.105
	(.063)	(.068)
Log(Technology)	.136	.219*
	(.097)	(.122)
Political Ideology	−.168**	−.178**
	(.078)	(.075)
Political Ideology×ε	.165**	.170*
	(.082)	(.091)
Log(ε)	−.005	.013
	(.084)	(.091)
Log(Real Wage)	.268**	.309
	(.127)	(.194)
Log(Real Weekly E.I.)	.215	.252
	(.186)	(.245)
Log(lag Unemployment Rate)	.003	−.086***
	(.019)	(.025)
Log(lag Teen Pop. Share)	−.023	
	(.054)	
Log(lag Teen Part. Rate)		.430***
		(.158)
Log(lag Teen Empl. Rate)		−.448***
		(.123)
Election Dummy	−.003	−.003*
	(.002)	(.002)
HHI	−.406*	−.288
	(.229)	(.274)
Constant	−.006	−.342
	(1.030)	(1.200)
Year dummies?	Yes	Yes
Province dummies?	Yes	Yes
Period	1965-2013	1976-2013
Observations	470	370
Adjusted R^2	.999	.999
F Statistic	8,626.000***	9,459.000***
Note:		*p<0.1; **p<0.05; ***p<0.01
		Bootstrapped Standard Errors with Clustering

The standard errors in these regressions, which are directly comparable to Table 2, are estimated by cluster bootstrapping (or block bootstrap) following Cameron et al. [2008]. The estimation is based on the wild cluster bootstrap, with province clusters, using the Rademacher distribution with 999 replications. This is a generalization of the wild bootstrap for models with heteroskedasticity. According to Henderson and Parmeter [2015] a wild bootstrap is consistent under both homoskedastic and heteroskedastic data.

Table 8. Robustness of Real Minimum Wage Determinants across Canadian provinces for Youth (15-24) Labor variables, Labor Demand Shocks and Provincial Business Cycle.

	Dependent Variable: Log(Real Minimum Wage)					
	Prov+Year FE	Prov+Year FE	Prov+Year FE	Prov+Year FE	Prov+Year FE	Prov+Year FE
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Union Density)	−.067* (.039)	−.076* (.039)	−.077** (.039)	−.066* (.038)	−.107*** (.039)	−.101** (.040)
Log(Technology)	.162** (.071)	.125* (.071)	.152** (.075)	.221*** (.076)	.203*** (.078)	.242*** (.079)
Political Ideology	−.167** (.068)	−.165** (.070)	−.167** (.070)	−.147* (.083)	−.168** (.083)	−.176** (.082)
Political Ideology×ε	.163** (.077)	.163** (.079)	.163** (.078)	.135 (.093)	.159* (.093)	.167* (.092)
Log(ε)	.036 (.062)	−.003 (.062)	−.001 (.061)	.048 (.066)	.020 (.065)	.019 (.065)
Log(Real Wage)	.220*** (.083)	.270*** (.090)	.268*** (.089)	.347*** (.087)	.318*** (.082)	.309*** (.082)
Log(Real Weekly E.I.)	.239*** (.092)	.209** (.092)	.211** (.091)	.196* (.113)	.246** (.112)	.246** (.112)
Log(lag Unempl. Rate)	−.001 (.017)	.002 (.016)	.003 (.016)	.004 (.030)	−.083*** (.026)	−.087*** (.026)
Log(lag Youth Pop. Share)	−.142* (.076)					
Log(lag Teen Pop. Share)		−.031 (.066)	−.020 (.066)			
Log(lag Youth Part. Rate)				−.833** (.339)		
Log(lag Youth Empl. Rate)				.501** (.254)		
Log(lag Teen Part. Rate)					.403** (.190)	.432** (.189)
Log(lag Teen Empl. Rate)					−.420*** (.157)	−.453*** (.157)
Election Dummy	−.003 (.007)	−.002 (.007)	−.002 (.007)	−.003 (.008)	−.003 (.008)	−.003 (.008)
HHI	−.413*** (.095)	−.411*** (.094)	−.408*** (.094)	−.263** (.103)	−.293*** (.106)	−.291*** (.107)
Labor Demand Shock		−.162 (.237)			−.202 (.215)	
Business Cycle			−.082 (.133)			−.102 (.152)
Year dummies?	Yes	Yes	Yes	Yes	Yes	Yes
Province dummies?	Yes	Yes	Yes	Yes	Yes	Yes
Period	1965-2013	1965-2013	1965-2013	1976-2013	1976-2013	1976-2013
Observations	470	470	470	370	370	370
Adjusted R^2	.999	.999	.999	.999	.999	.999
F Statistic	8,687.000***	8,490.000***	8,484.000***	9,458.000***	9,291.000***	9,281.000***

Note: *p<0.1; **p<0.05; ***p<0.01

Cluster Robust Standard Errors

Table 9. Robustness of Real Minimum Wage Determinants across Canadian provinces to inclusion of Average Regional minimum wages, small-business corporate income tax and nominal minimum wage increase in the previous year.

	Dependent Variable: Log(Real Minimum Wage)					
	Prov+Year FE	Prov+Year FE	Prov+Year FE	Prov+Year FE	Prov+Year FE	Prov+Year FE
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Union Density)	$-.077^{**}$ (.039)	$-.075^{*}$ (.039)	$-.089^{**}$ (.036)	$-.106^{***}$ (.038)	$-.090^{**}$ (.036)	$-.106^{***}$ (.038)
Log(Technology)	$.137^{*}$ (.070)	.095 (.069)	$.146^{**}$ (.070)	$.221^{***}$ (.075)	$.160^{**}$ (.073)	$.247^{***}$ (.077)
Political Ideology	$-.167^{**}$ (.070)	$-.163^{**}$ (.066)	$-.162^{**}$ (.068)	$-.176^{**}$ (.082)	$-.164^{**}$ (.076)	$-.183^{**}$ (.082)
Political Ideology$\times\varepsilon$	$.165^{**}$ (.079)	$.155^{**}$ (.074)	$.173^{**}$ (.075)	$.168^{*}$ (.091)	$.148^{*}$ (.086)	$.188^{**}$ (.092)
Log(ε)	$-.002$ (.063)	$-.031$ (.060)	.006 (.059)	.018 (.065)	$-.029$ (.063)	.033 (.064)
Log(Real Wage)	$.264^{***}$ (.088)	$.286^{***}$ (.089)	$.260^{***}$ (.086)	$.306^{***}$ (.081)	$.376^{***}$ (.083)	$.306^{***}$ (.079)
Log(Real Weekly E.I.)	$.213^{**}$ (.090)	$.199^{**}$ (.088)	$.222^{**}$ (.091)	$.255^{**}$ (.111)	$.214^{**}$ (.107)	$.271^{**}$ (.114)
Log(lag Unempl. Rate)	.003 (.016)	.0004 (.016)	.006 (.016)	$-.084^{***}$ (.027)	$-.076^{***}$ (.026)	$-.073^{***}$ (.025)
Log(lag Teen Pop. Share)	$-.021$ (.068)	$-.025$ (.066)	$-.011$ (.065)			
Log(lag Teen Part. Rate)				$.417^{**}$ (.189)	.276 (.188)	$.413^{**}$ (.187)
Log(lag Teen Empl. Rate)				$-.438^{***}$ (.157)	$-.347^{**}$ (.155)	$-.442^{***}$ (.155)
Election Dummy	$-.003$ (.007)	$-.002$ (.007)	$-.004$ (.007)	$-.003$ (.008)	$-.003$ (.008)	$-.004$ (.007)
HHI	$-.412^{***}$ (.093)	$-.438^{***}$ (.094)	$-.375^{***}$ (.092)	$-.295^{***}$ (.109)	$-.335^{***}$ (.105)	$-.259^{**}$ (.103)
Regional Average MW	.042 (.081)			.033 (.078)		
Small Business Tax		$.006^{***}$ (.001)			$.006^{***}$ (.001)	
MW Change Dummy			$.038^{***}$ (.009)			$.030^{***}$ (.008)
Year dummies?	Yes	Yes	Yes	Yes	Yes	Yes
Province dummies?	Yes	Yes	Yes	Yes	Yes	Yes
Period	1965-2013	1965-2013	1965-2013	1976-2013	1976-2013	1976-2013
Observations	470	470	470	370	370	370
Adjusted R^2	.999	.999	.999	.999	.999	.999
F Statistic	$8{,}486.000^{***}$	$8{,}782.000^{***}$	$9{,}034.000^{***}$	$9{,}274.000^{***}$	$9{,}700.000^{***}$	$9{,}763.000^{***}$

Note: *p<0.1; **p<0.05; ***p<0.01

Cluster Robust Standard Errors

Table 10. Determinants of Nominal Minimum Wages in Canadian provinces

	Dependent Variable: Log(Nominal Minimum Wage)			
	Prov+Year FE	Prov+Year FE	Prov+Year FE	Prov+Year FE
	(1)	(2)	(3)	(4)
Log(Union Density)	$-.080^{**}$	$-.068^{*}$	$-.096^{**}$	$-.065^{*}$
	(.041)	(.041)	(.038)	(.038)
Log(Technology)	$.182^{***}$	$.213^{***}$	$.241^{***}$	$.258^{***}$
	(.069)	(.069)	(.072)	(.074)
Political Ideology	$-.192^{***}$	$-.193^{***}$	$-.173^{**}$	$-.151^{*}$
	(.068)	(.067)	(.079)	(.082)
Political Ideology$\times\varepsilon$	$.186^{**}$	$.186^{**}$	$.163^{*}$	.134
	(.077)	(.076)	(.090)	(.092)
Log(ε)	.028	.076	.033	.087
	(.058)	(.059)	(.060)	(.061)
Log(Nominal Wage)	$.321^{***}$	$.261^{***}$	$.315^{***}$	$.375^{***}$
	(.087)	(.082)	(.079)	(.087)
Log(Nominal Weekly E.I.)	$.236^{**}$	$.261^{***}$	$.250^{**}$	$.223^{*}$
	(.099)	(.100)	(.117)	(.121)
Log(lag Unempl. Rate)	$-.005$	$-.010$	$-.100^{***}$	$-.007$
	(.016)	(.016)	(.026)	(.032)
Log(lag Teen Pop. Share)	$-.003$			
	(.067)			
Log(lag Youth Pop. Share)		$-.139^{*}$		
		(.077)		
Log(lag Teen Part. Rate)			$.464^{**}$	
			(.188)	
Log(lag Teen Empl. Rate)			$-.486^{***}$	
			(.156)	
Log(lag Youth Part. Rate)				$-.795^{**}$
				(.347)
Log(lag Youth Empl. Rate)				$.450^{*}$
				(.262)
Election Dummy	$-.003$	$-.003$	$-.004$	$-.003$
	(.007)	(.007)	(.008)	(.008)
HHI	$-.422^{***}$	$-.430^{***}$	$-.291^{***}$	$-.269^{***}$
	(.093)	(.093)	(.106)	(.103)
Year dummies?	Yes	Yes	Yes	Yes
Province dummies?	Yes	Yes	Yes	Yes
Period	1965-2013	1965-2013	1976-2013	1976-2013
Observations	470	470	370	370
Adjusted R^2	.998	.998	.999	.999
F Statistic	$4{,}491.000^{***}$	$4{,}522.000^{***}$	$6{,}206.000^{***}$	$6{,}170.000^{***}$

Note: *p<0.1; **p<0.05; ***p<0.01

Cluster Robust Standard Errors