

Why is Short-Time Compensation Use Rare in the U.S.?

by Gürkan Ay

B. Sc. in Industrial Engineering, June 20, 1996, Istanbul Technical University

M. Sc. in Finance, May 13, 2000, The University of Wyoming

M. A. in Economics, January 30, 2006, The George Washington University

M. Phil. in Economics, May 21, 2006, The George Washington University

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Donald O. Parsons
Professor of Economics

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Gürkan Ay

Dissertation Research Committee:

Donald O. Parsons, Professor of Economics, Dissertation Director

Brian L. Boulier, Professor of Economics, Committee Member

Anthony Marvin Yezer, Professor of Economics, Committee Member

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Dedication

I wish to dedicate this dissertation to my wife and children. Their unconditional support and innumerable sacrifices made it possible to complete one of the best doctoral programs an economist could hope for. I also would like to extend my appreciation to my parents and my in-laws for their unrelenting support.

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Abstract of Dissertation

Why is Short-Time Compensation Use Rare in the U.S.?

This dissertation explores the reasons for low utilization of short-time compensation (STC) in the U.S. I find that a great majority of workers on reduced time schedules due to slack demand are eligible for STC in states with a plan, but firms nonetheless do not participate in the program. This type of short-time work without the costs associated with a compensation scheme for the lost hours is apparently a major alternative to STC in the U.S.

STC's uniform treatment of workers regardless of seniority is another reason for low program use because seniority rules provide better job protection than STC for senior workers and union members. Similarly, all participating workers benefit from STC regardless of their skill level and productivity as STC programs require benefits to be provided to all affected workers in a business. Firms increase average productivity by dropping the less productive workers through layoffs. Under STC, they keep all workers, the highly productive and the less so.

One of the reasons for low STC use nationwide is that not all states have the program. A strong taste for greater government involvement in the economy appears to affect state STC adoption decisions. As expected, the probability of adoption increases during high unemployment rate years. The percent of the population that is female also increases the likelihood of STC. The share of minority population is found to be not a significant, suggesting STC is not perceived to be a powerful affirmative action tool as

originally thought. Interestingly, manufacturing employment does not affect a state's STC adoption probability even though the manufacturing sector is the major user of the program.

The similarity of utilization in Canada and the U.S. provides some evidence that utilization in the U.S. is not driven by experience rating of STC and UI charges in the U.S., nor by state-paid health plan and maintenance of fringe benefits in Canada.

Keywords: Short-time compensation, short-time work, work sharing, shared work, temporary layoff, unemployment insurance, Current Population Survey Outgoing Rotation Group

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CHAPTER 1: INTRODUCTION

Understanding the reasons for low STC use is important to evaluate policy recommendations on how and whether to expand STC program coverage in the U.S. The potential pool of employees for the STC program includes not only those who face layoffs but also those who are employed on a short-time work (STW) basis, but are currently uncovered. Of special interest is the extent to which STC is not utilized among short-time workers in states with STC plans.

STC is a common policy instrument, especially in Europe, designed to encourage work sharing instead of layoffs during temporary business downturns. Although STC-enabling legislation has been enacted by 19 states since 1978 as part of their UI programs, it is not widely used in the U.S. Even in states with an STC program, firms rarely use short-time compensation. Firm participation has been limited to less than 1 percent of employers in any given year (Walsh, London, McCanne, Needels, Nicholson, & Kerachsky, 1997). Nationwide, STC beneficiaries as a percentage of regular UI beneficiaries never exceeded 1.24 percent between 1982 and 2007. The average number of STC recipients during this period was little more than 45,000, reaching 100,000 only during and following the recession years. A small number of STC states utilized the program more than the others. During the 2001 recession, STC first payments as a percentage of regular UI first payments exceeded 5 percent in only five STC states.

STC is a countercyclical program. Reports on STC participation during the most recent recession of 2007-2009 indicate that STC participation is higher than ever. Both the

number of firms using an STC plan and the number of employees participating in these plans increased considerably. A few states that had an STC program for years but had no participants now have functioning STC programs. That said, U.S. programs have always been smaller than programs operating in Germany and Finland, where STC participants account for 8.2 and 14.9 percent of their regular UI programs in 2003 respectively (Wandner, 2008). Even the recent surge in the participation rates of the U.S. programs has not changed this discrepancy.

The purpose of this dissertation is to analyze the reasons for low utilization of short-time compensation (STC) in the United States. To understand these reasons, I first examine the rationale for establishing the STC program, including a detailed description of program features and trends in program participation in the U.S. I review program requirements that might affect participation by increasing the program's cost for employers such as maintenance of fringe benefits, surtaxes on participating firms, charging STC benefits only to the participating employer disregarding the base period charging rule, and higher unemployment insurance (UI) tax rates for negative balance employers. These requirements might cause STC costs to be higher than regular UI for employers.

Next I analyze state-level factors that affect a state's decision to adopt STC. This analysis is the first study focusing on political ideology of a state's constituency, demographic characteristics of state population, and economic factors such as unemployment rate, per capita income, and share of manufacturing employment. I examine the effects of these factors on the decision to adopt the program to determine whether factors affecting this decision are consistent with the program's rationale and intended use.

The theoretical literature on STC suggests that, contrary to the low rate of observed program participation, STC would be preferred to layoffs in response to demand shocks if experience rating is complete and taxes on unemployment benefits and wage income are similar. The theory also suggests that, to reduce layoffs, changes to the UI system should occur on the tax side such that regular UI and STC charges are more completely experience rated, and benefits and other income are taxed at the same rates. These changes would balance the layoff subsidy in distorting labor input reduction decisions towards employment reductions through the STC subsidy for work hour reductions. A higher layoff subsidy, as would be the case when STC is more effectively experience rated, or when payroll tax rates are higher for STC charges than UI charges, would still lead to employment reductions even if STC exists in the UI system.. In addition, most STC states require fringe benefits to be maintained fully during participation. Although these benefits have value for the workers, they represent increased costs per hour when hours are reduced and can be reduced only through layoffs. Through layoffs, firms drop least productive workers and increase average productivity of their workers while under STC they keep all workers. All participating workers benefit from STC regardless of their productivity. One of the main objectives of STC is to maintain skilled and productive workers during downturns. However, less productive workers experience an income gain while more productive workers experience an income loss under STC. In case of layoffs, on the other hand, it is more likely that less productive workers are laid off and more productive workers are kept and work normal hours.

The reasons for the low utilization of STC remain an understudied topic. This dissertation is a comprehensive collection of the most up-to-date program information to

shed light on features that may undermine the program take-up rates. I also examine the independent influence of political ideology of a state's constituency, demographic characteristics of state population, and economic factors on a state's probability of enacting an STC program. I review the theoretical literature to examine the conditions under which the existing models may predict layoffs instead of short hours and then examine whether the existing program features coincide with these conditions. I extend Levenson's (2001) work on prevalence of STW incidence by replicating his analysis of the incidence of STW from 1979 through 1993 and extending this analysis through 2009. I examine whether short-time workers are eligible for STC where available. Short-time workers eligible for STC but not participating in the program signal that short-time benefits compensated through a government-administered system of unemployment insurance are for some reason not worth the trouble.

This dissertation is organized as follows: Chapter 2 describes the program features with the purpose of explaining the costs and benefits to firms and employees in the U.S. Although STC is part of the UI system, and STC and UI benefits and charges are calculated similarly, relatively rare use of STC raises the question of whether the cost of STC is higher than that of UI. Chapter 3 focuses on the political economy of STC and examines economic, political, and demographic variables that may increase a state's probability of adopting STC. Chapter 4 describes the theoretical STC models. I provide a critical review of the STC literature and discuss the U.S. STC program features that differ from the model assumptions regarding the experience rating, UI tax rates, and the generosity of STC benefits to provide an explanation for low STC use. In Chapter 5, I examine whether reduced work hours as a response to economic downturns are as widespread as earlier

shown by Levenson (2001) using Current Population Survey (CPS) data. I also estimate whether workers on reduced hours are eligible for a pro-rata share of unemployment insurance compensation for their lost hours through the STC program where available. Chapter 6 extends the analysis to Canada, which has a similar work sharing scheme and low participation compared to the major programs in Europe. I present a review of the Canadian STC program, its features, and utilization trends in comparison to the U.S. Finally, Chapter 7 summarizes the findings and concludes my discussion.

CHAPTER 2: SHORT-TIME COMPENSATION IN THE U.S.

The purpose of this chapter is to provide a comprehensive review of the STC programs. The program's history and the rationale underlying the U.S. programs help set the stage for the remaining chapters of this dissertation. The features of state programs and the program take-up rates are also discussed to highlight the fact that the U.S. programs vary significantly in terms of financing and eligibility rules although they share some common features and overall program use is low.

Short-time compensation (STC) is an unemployment insurance (UI) payment to those workers whose hours are reduced to less than normal in response to a negative labor demand shock. STC programs are viewed as a tool to encourage reduction in labor inputs during economic downturns through hours reductions rather than layoffs. Public STC programs have been available to firms in Western European countries since the 1920s and in the U.S. and Canada since the late 1970s. In the U.S., employers decide whether to implement STC with the consent of employee representatives if workers are covered by a collective bargaining agreement. This chapter provides background on the historical evolution of public STC programs, current program features, and utilization in the U.S.

The standard UI program in the U.S. offers benefit payments to workers who are laid off, but not to those on reduced hours. Where available, and availability varies by state, STC compensates those workers whose hours are reduced below normal levels in response to a negative labor demand shock. STC does not compensate workers for reduction in overtime hours. The main objective of the program is to reduce temporary layoffs during an economic downturn by spreading the available work across employees in a business unit

and providing UI benefits prorated for the lost hours. For example, a firm may decide to lay off 20 percent of its workforce as a response to a business downturn. The remaining employees work full-time and continue to earn their regular wage income. The laid off employees collect weekly UI benefits that are calculated based on their wages in previous quarters (weekly benefit amount). Alternatively, through an STC plan, the firm can retain all its workforce, spread the available work across its entire workforce by reducing all its workers' hours by 20 percent, either by reducing the workweek from five days to four days or by cutting the daily work hours from 8 to 6. Workers whose hours are reduced then become eligible to collect 20 percent of the regular UI benefits that they would be eligible for if they were to be laid off. A worker earning \$500 a week in a normal work week would earn \$400 hourly wage income and 20 percent of the weekly benefit amount if he/she were to be laid off. Although his/her wage income drops by 20 percent, his/her overall earnings would drop less than 20 percent under an STC plan. Although all states provide partial UI benefits for very short work hours, this worker would not be eligible to collect any UI benefits without the STC program because his/her weekly earnings would exceed the weekly benefit amount.

STC utilization allows employers to retain workers during temporary demand shocks, potentially reducing hiring and training costs during recovery and to return to normal hours quickly as business improves. Participating workers continue to earn a relatively stable income and may maintain their fringe benefits. On the other hand, there are potential costs associated with STC usage. From the employer's perspective, fringe benefit costs are higher under STC than with layoffs because most of the STC states require employers to maintain employee benefits. Additionally, some STC states impose higher

payroll taxes on STC firms than on those that use regular UI either by imposing surtaxes on STC firms or by prohibiting negative balance firms from program participation.

The remainder of this chapter is organized as follows. The next section provides background information how STC programs have become a part of the United States' UI system. Then, I describe the structure of and the rationale for STC programs. The fourth section describes the features of the STC programs in the U.S. and the last section provides information on program utilization.

2.1 Program Background

Work sharing as an alternative to layoffs has been used in the U.S. especially during the Great Depression, but compensation for reduced hours due to work sharing was not a part of the original unemployment insurance legislation. “Early in the depression... , there was ... an organized campaign to share work widely. The result was an extraordinary amount of work-sharing” (Millis & Montgomery, 1938, p. 118, fn. 2). A 1932 survey of 6,500 firms across all industries revealed that less than 28 percent of the firms were operating five days or more. In these firms, only 44 percent of employees were working full-time and the remaining 56 percent experienced, on average, a 41 percent reduction in their normal full-time work hours (Chandler, 1970, pp. 34-35).

In the 1970s, economic uncertainty and increased unemployment in the wake of second oil crisis caused business coalitions and organized labor to promote work sharing plans (Balducchi & Wandner, 2007). The first governmental action emphasizing work sharing was the guidelines issued in 1975 by the New York City Commission on Human Relations. These guidelines required employers to consider work sharing as an alternative to layoffs but without any UI subsidy for the lost hours. Although STC has been promoted

abroad as a labor adjustment tool to avert layoffs and sustain purchasing power during economic downturns, the major concern that led to STC initiative in the U.S. was the disparate impact of layoffs on recently hired women and minorities (MaCoy & Morand, 1984; Blumrosen, 1984).¹ The state of New York considered an STC bill in 1975 but the bill did not pass. In 1978, when California became the first state to implement an STC without any federal regulation, affirmative action concerns and the role of civil rights groups were already declining (MaCoy & Morand, 1984).

The United States' UI system is administered at the state level, and states must modify their unemployment insurance legislation in order to implement STC programs. To encourage other states to adopt STC, the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 provided model legislative language and program guidelines based largely on California's program (MaCoy & Morand, 1984). The AFL-CIO initially opposed STC but reversed its position and supported federal legislation once union safeguards were incorporated in the bill (Ittner, 1984).

On the business side, the Committee for Economic Development and a private firm, Motorola, promoted and supported federal STC legislation (MaCoy & Morand, 1984). Eight states enacted the program between passage of the federal STC legislation in 1982 and its expiration in 1985. After 1985, states continue to operate and adopt STC with no federal guidance or objection. The economic downturn of the early 1990s revived congressional interest in the program and in 1992 STC became a permanent part of federal UI laws; changes to the Social Security Act and the Federal Unemployment Tax Act permanently authorized STC (Balducci & Wandner, 2007). According to the

¹ Despite the expectation that STC would reduce the disparate impact of layoffs on minorities and women, STC was not found to provide major affirmative action advantages on these groups (Kerachsky et al., 1986; Walsh et al., 1997).

Unemployment Compensation Amendments of 1992 (House Bill H.R. 5260, 1992), the STC benefit amount is a pro rata portion of the unemployment compensation that would be payable if the worker were totally unemployed. Unlike regular UI, eligible employees are not required to meet the availability for work or work search requirements while collecting STC benefits, but they are required to be available for their normal workweek. Section 303(a)(5) of the Social Security Act allows states to pay for STC from their account within the Unemployment Trust Fund along with the regular UI benefits (Wandner, 2008). This fund is financed almost entirely by the taxes imposed on employers and is partly based on their prior layoff experience (and STC experience where the program is adopted).

Overall, 19 states have enacted an STC program (Wandner, 2008). Currently, there are 18 states with STC programs in effect as part of their UI legislation (UWC-Strategic Services on Unemployment & Workers' Compensation [UWC], 2010) with most structured on California's program (MaCoy & Morand, 1984).

States' experiences with STC have been varied. California and Arizona differ from other STC states with respect to how they started their STC programs, Illinois and Louisiana in how they ended their programs. A single company, Motorola, was a big supporter of several STC programs (Arizona, Illinois, and Florida) as well as the 1982 Federal STC legislation because it was implementing a policy to reduce hours instead of using layoffs during low demand periods.

In 1978, California state officials approved a proposal that imposed a cap on property taxes. The cap was predicted to reduce the state's tax income and hence cause a mass layoff of public workers. To avert this mass layoff, California's STC bill was rushed through the state's legislative process—it took only two weeks to introduce and pass the

bill. However, the mass layoff of public workers did not happen as feared but later firms in the private sector became the major users. Motorola was the main force behind Arizona's STC program. The firm perceived STC as a tool to maintain its skilled labor force during the economic downturns, and remains the major user of the program in Arizona (MaCoy & Morand, 1984; St. Louis, 1984).

Illinois adopted an STC program in 1983, but required the participant firms to prepay the short-time benefits before implementing the STC plan, effectively making the state's STC program fully experience-rated. Illinois' program was not part of the regular unemployment insurance trust fund (Nemirow, 1984). No firm participated in the program and it was dropped in 1988. Louisiana adopted STC in its unemployment insurance legislation but no longer operates the program. The program was enacted in 1986 but employers were reportedly discouraged from participating by state officials. No employers have participated since 1988 (Walsh, London, McCanne, Needels, Nicholson, & Kerachsky, 1997). In 2006, North Dakota enacted a one-year demonstration project for a single firm, but the program was not implemented for wider use (Balducchi & Wandner, 2007). That leaves 17 states with operational STC programs.

2.2 Rationale for STC Programs

Women and minorities were disproportionately more prone to layoffs in case of economic downturns because of last-in/first-out layoff system and their relatively shorter job tenures. Work sharing was suggested as a way to reduce the disparate impact of layoffs on recently hired women and minorities to avoid the risk of discrimination complaints during the 1973-1975 recession (Blumrosen, 1984). However, by the time the first STC program in the U.S. adopted by California, the work sharing idea grew out of its

affirmative action role and became a program with a specific goal of reducing temporary layoffs for all workers. With this objective in mind, I next discuss the motivation for short-time compensation. STC is a special UI program and the rationale for STC programs comes from two sources: (1) Since STC is a UI program, the rationale for instituting UI programs mainly applies to STC; and (2) STC benefits that outweigh its costs constitute the motivation to implement the program.

2.2.1 Rationale for STC Since It is a UI Program

The main purpose of the UI program in the U.S. is to provide insurance to workers² who are unemployed through no fault of their own. The UI system is financed almost entirely by the taxes imposed on payrolls, with the tax rate partly based on the employer's layoff history³.

As the recent recession that started in December 2007 showed (Tuna, 2009), firms may employ several workforce reduction strategies during economic contractions, including layoffs, furloughs, shorter work hours, and temporary and permanent shutdowns, depending on the severity of the situation as well as firm's expectation of the recovery potential. Obviously earnings losses per worker due to reduction in work hours, furloughs, or temporary shutdowns are smaller than those for workers on layoff. Nonetheless, the income losses from part-time work are real, and STC programs are intended to alleviate the economic hardship to affected workers and help firms maintain the skilled employees during a temporary downturn. However, as the share of temporary

² The UI program covers 97 percent of all wage and salary workers in the U.S. The exceptions are workers on small farms and a small number of service categories (UWC-Strategic Services on Unemployment & Workers' Compensation, 2007).

³ Alaska and New Jersey are the only states that impose UI taxes on both employers and employees. Pennsylvania and West Virginia require employee contributions only under certain conditions (UWC-Strategic Services on Unemployment & Workers' Compensation, 2007). None of these four states has STC.

layoffs in overall unemployment decreases—especially pronounced during the recessions of the early 1990s and 2001 (McConnell & Tracy, 2005)—the demand for STC, as a program to reduce such layoffs, is also expected to decline.

The UI program helps businesses and individuals by maintaining purchasing power during periods of low economic activity. This helps workers smooth their consumption; hence, helping firms to avoid further demand declines⁴. Anderson and Meyer (1993) emphasize that the effect of UI on welfare will be different if business cycles are caused by technology shocks than if they are caused by a decline in aggregate demand. In the case of technology shocks, UI delays the economy's adjustment process and reduces welfare by decreasing efficiency. This reasoning also applies to STC since it may potentially subsidize the delay of necessary adjustments. In case of aggregate demand decline, however, UI may increase welfare by increasing demand (Anderson & Meyer, 1993) as does STC through its consumption smoothing function.

UI increases the job search activity by providing income support while unemployed (Anderson & Meyer, 1993). Employees are not subject to job search requirements while collecting short-time compensation benefits (House Bill H.R. 5260, 1992) but they are not prevented from searching other employment opportunities, either. In fact, with the reduced work hours, employees will have more time to devote to their job search activities.

Both UI and STC are government programs but only UI is compulsory. Besides, the very large risks associated with UI prevent private insurers from offering UI since the risks

⁴ The UI system in the U.S. is almost entirely financed by the taxes imposed on employers and is partly based on their layoff experience in previous years. Layoffs occurring in the current year affect employers UI tax the following year. The consumption smoothing aspect of UI benefits loses its effectiveness if the economic downturns last more than a year or two because as their UI funds are depleted, states move to a higher UI tax schedule by which the UI tax rates rise for all firms, putting more financial stress on firms.

are too large to diversify for private insurers⁵ (Anderson & Meyer, 1993; Parsons, 2000). A worker may save to self-insure against layoffs or hours reduction but the required savings may be substantial and not optimal if the worker never becomes employed (Parsons, 2000). In addition, adverse selection may prevent private insurers from offering UI because individuals who are likely to leave their jobs or firms that are likely to have layoffs are more likely to purchase UI (Anderson & Meyer, 1993). Government-mandated UI programs (Parsons, 2000) and allowing only job losers (not quitters) to be eligible for UI (Anderson & Meyer, 2000) may eliminate adverse selection. The moral hazard problem, however, may not be eliminated: When receiving UI compensation, people will have less incentive to find work (Parsons, 2000).

It is possible, but may not be optimal, for a firm to implement its own private STC plan. Firms reduce their labor input during business downturns and those are the periods when they are under more financial constraints than normal expansionary periods. Furthermore, the firm will not be relieved of its obligation to fulfill regular UI funding requirements even it maintains a private STC plan unless workers accept lower wages. Therefore, privately financing an STC program will become prohibitively costly for a single firm. Rather, the firm is more likely to seek out alternative ways to spread the risk across time and share it with other firms through a government-operated program. A firm's concerns about having a private STC plan are evident in Motorola's efforts to convince Arizona state officials to adopt a state-administered STC program. Through a simulation study, Motorola was able to demonstrate that company-provided compensation for the

⁵ Self-insurance and private insurance may not work for STC but may work in case of Workers' Compensation probably because job-related accidents are not market related and do not affect multiple firms, sectors, or entire economy at once, allowing "pooling" of risk. In addition, precautions to reduce the incidence rate are likely to be less costly than strategies to reduce the probability of workforce reduction.

reduced hours may become too expensive for a single firm to handle in an economic downturn. Motorola showed that a firm may choose an STC program administered by the state government over a private program administered on its own through self-financing. As an insurance program, a state-operated STC program spreads risk not only through time but also across firms, unless the plan is 100 percent experience rated. St. Louis (1984) provides a detailed account of how Motorola persuaded the Arizona Department of Economic Security (DES) and the state legislators that a state operated STC program was needed. When Motorola first approached the DES with a work sharing plan to stabilize its workforce, the department thought that Motorola did not need the state's involvement to implement the plan. The major problem with compensating privately for hours reductions in the absence of state support is the financing. The DES initially indicated that since work sharing was going to replace layoffs, Motorola's UI tax liabilities (which are experience-rated) would decline, allowing the corporation to pay short-time compensation benefits without resorting to state UI funds. However, in the absence of state-provided STC, Motorola would have to maintain two reserve accounts:⁶ The first one was statutorily required reserve account for layoffs and the second one was a private account for compensating the hours reduction to self-insure, because state UI law did not allow the corporation to use the former for STC benefit payments before the STC legislation. Lastly, Motorola showed that a single firm had to maintain a larger reserve balance when acting alone than would several firms pooling their resources in order to share the risk of depleting the STC funds.

⁶ Arizona is a reserve-ratio state. In the reserve ratio system, the UI tax rate reflects an employer's cumulative experience. All benefits charged against the employer are subtracted from all UI taxes paid into the UI Trust Fund by the employer. The balance is divided by the employer's average payroll for the past three years.

The Motorola example shows that in a business downturn facing financial distress, it is difficult, if not impossible, for a firm to finance its own UI/STC scheme. A government-administered program helps spread the risk over time and across firms. However, if the program charges are 100 percent experience rated, risk sharing across firms disappears.

2.2.2 Rationale for STC: Program Benefits and Costs from Employer's Perspective

Employers facing a reduction-in-force decision must in all states with the program submit an STC plan with its workers' consent obtained through an employee representative or union to the state's employment agency for approval. If the affected workers are not unionized or do not have a collective bargaining agreement, usually the only requirement for the employer is to inform the affected workers about the STC plan in advance. Only in Connecticut are employers required to gather the affected workers' input on a proposed STC plan and include them in their application for state's approval (Connecticut Department of Labor Shared Work Program, 2010). For STC to be a successful program, overall, its benefits should outweigh its costs to all stakeholders involved—employer, employee, and state government. Not surprisingly, in states in which STC has been exploited, surveyed stakeholders perceive the program favorably (Schiff, 1985; Kerachsky et al., 1986; Walsh et al., 1997).

Employer experiences with STC have been positive. According to the findings of the latest program evaluation required by Congress (Walsh et al., 1997) “overall, employers more frequently cited the potential advantages associated with STC than potential disadvantages” (p. 5-10). Perhaps more telling, these firms have used the program repeatedly. STC utilization allows employers to retain workers during temporary demand

shocks, potentially reducing hiring and training costs during recovery. According to the survey results of the Walsh et al. (1997) evaluation report, the most important advantage for employers gained by using STC instead of layoffs is the retention of valued employees. Other, not mutually exclusive, advantages include preserving a large portion of the workforce, reducing hiring and rehiring costs, maintaining employee morale, smoother business operations, faster adjustment of employment levels during recovery, and maintaining employee benefits.

This last, employee benefits, is an additional cost to employers, one that would not have been paid if layoffs were made. Benefits make up a substantial portion of total employer compensation costs. The Bureau of Labor Statistics (BLS) reports that benefits are 30.4 percent of the civilian employer costs per hour worked for employee compensation (United States Department of Labor Bureau of Labor Statistics, 2010, June). On average, the total cost of employee compensation is \$29.52 per hour worked. Civilian employers pay \$2.63 of this amount for the insurance benefits (health, life, and disability insurance), which constitutes the second largest share (8.8 percent) of total compensation after wages and salaries (69.5 percent). Legally required benefits are \$2.30 (on average, 7.8 percent of total compensation) and they cover Social Security, Medicare, unemployment insurance, and workers' compensation. Other optional benefits are paid leave (6.9 percent of total compensation), retirement and savings (4.4 percent), supplemental pay including overtime, shift differentials, and nonproduction bonuses (2.4 percent).

Participating firms listed higher UI tax rates and possible decline in productivity especially due to unwillingness of senior workers as disadvantages of the program. Not all layoffs increase a firm's UI tax liabilities since a portion of the laid off workers do not

collect UI benefits⁷. Besides, STC participants tend to have higher wages than the average at participating firm, hence, higher benefits because they have longer tenures. The one-week waiting period required by most states to claim regular UI benefits is usually waived when collecting STC benefits potentially causing higher UI tax rates for STC employers due higher benefit charges.

To illustrate how STC may cause higher UI taxes, consider a simple scenario in which three identical firms with 100 workers each has been in business for three years with no change in its workforce. In the fourth year, a demand shock hits the firms and each firm decides that a 20 percent reduction in total work hours for six months during the second half of the year will help weather the downturn. However, each implements a different strategy to cut the work hours. While Firm 1 lays off 20 workers, Firm 2 implements an STC plan to keep its workforce intact and reduces its workweek from 5 days to 4 days for its entire workforce. Firm 3 also goes from a 5-day workweek to 4-day workweek but it does that by reducing hours without compensating for the lost hours through an STC plan. Further assume that all workers in each of these firms are identical and earn \$10 per hour and work 40-hour weeks (2,080 hours) in a year before the downturn. Workers across these firms may vary in their valuation of leisure and income as well as outside job opportunities available to them.

Let's also assume that these firms operate in a reserve-ratio state such that benefits charged against the employer are subtracted from the UI contributions made into the UI

⁷ Following are among the reasons for less than 100 percent benefit collection. Recently hired workers who do not have enough earnings may not be eligible for UI benefits. Provisions to disqualify UI claimants vary across states (UWC, 2010, p. 3) and low rates of awards to claimants are found to reduce the benefit collection rates (Vroman, 2001). In addition, laid-off workers who can quickly find jobs may prefer not to apply for the benefits for their short duration of unemployment to avoid reducing their future eligibility..

Trust Fund by the employer to determine the employer's UI tax rates. For demonstration purposes, I use California's UI tax rate schedules⁸ (State of California Employment Development Department, 2010), which calculates the UI charges based on the base wage of \$7,000. Firms' UI tax rates and contributions in this example are determined in the reserve-ratio experience rating system; however, they could be different in a benefit-ratio system, in which UI taxes are based simply on the ratio of an employer's benefit charges over a period to the employer's payroll over the same period.

A comparison of UI contributions across a nine-year period for the three firms implementing three different labor reduction strategies is shown in Table 1. For the first four years, the firms are required to pay the new-employer rate of 3.4 percent of their base payroll. At the end of each year, a firm's tax schedule is determined based on the ratio (percent to determine its tax schedule next year) of its reserve account balance (\$71,400) to its gross payroll (\$2,080,000). This ratio is 3.4 percent at the end of the fourth year for these hypothetical firms, placing them on the most favorable tax schedule ("AA") for a firm. The reserve ratio is then calculated as the ratio of the reserve account balance to the base payroll (which is equal to \$700,000 for 100 workers). Schedule AA prescribes the experience-rated tax rate of 1.4 percent to determine the following year's contributions.

Assuming in year 4 that each of the 20 workers laid off by Firm 1 collects the hypothetical maximum of \$160 in UI benefits for 26 weeks, total benefits charges to Firm 1 amount to \$83,200. Through an STC plan in place, all workers of Firm 2 earn their hourly wages for the 4-day week and collect 20 percent of the regular UI benefits (\$32 per week

⁸ California's UI tax rate schedule and experience rating calculations are available online at www.edd.ca.gov/pdf_pub_ctr/de231z.pdf.

for each worker). The total STC charges to Firm 2's account is also equal to \$83,200. At the end of year 4, both Firm 1 and Firm 2 end up with \$12,000 in their reserve balances.

The effect of layoffs and short-time in the fourth year are not reflected in the tax rate until the fifth year. Firm 1's "percent to determine its tax schedule" is slightly higher (0.4 percent) in year 5 than that of Firm 2 (0.6 percent) because Firm 1 has a smaller workforce, hence a smaller gross payroll. Given the numbers in this example, both firms are placed on the least favorable schedule ("F") at the end of year 5. If the workforce reduction rates were higher than 20 percent, Firm 1 would have ended up in a more favorable tax schedule than Firm 2 because it would have a smaller gross payroll given the same reserve account balances for both firms.

Carrying out similar calculations, I observe that since the STC-firm's (Firm 2) average base payroll exceeds that of the layoff-firm (Firm 1) at the end of year 8, causing the STC-firm to have a lower reserve-ratio and higher UI tax rate. This difference could have occurred earlier or later for higher or lower workforce reduction rates respectively. Across all years in this scenario, Firm 1 pays \$184,100 in total into its UI fund account as a result of its layoff strategy while Firm 2 pays a little more, \$185,500, as a result of its STC plan. Finally, I observe that Firm 3, reducing work hours without an STC plan, pays the lowest UI taxes since no charges have been made into its UI account.

Table 1

A Comparison of UI Tax Rates for Three Hypothetical Firms

Firm 1: Lays off 20% of its Workforce												
Year	Gross Payroll	Base Payroll	Average Base Payroll (Avg of prv 3 years)	UI Tax Rate	Contributions to UI Fund	UI Benefit Charges to Firm's UI Fund Account	Reserve Account Balance	Percent to Determine Next Year's UI Tax Rate Schedule	Tax Schedule	Reserve Ratio	Experience Rated UI Tax Rate for the Next Year	
1	\$2,080,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$23,800					
2	\$2,080,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$47,600					
3	\$2,080,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$71,400					
4	\$2,704,000	\$630,000	\$700,000	3.40%	\$23,800	\$83,200	\$12,000	3.4%	AA	0.102	1.40%	
5	\$2,080,000	\$700,000	\$676,667	1.40%	\$9,800	\$0	\$21,800	0.4%	F	0.017	4.90%	
6	\$2,080,000	\$700,000	\$676,667	4.90%	\$34,300	\$0	\$56,100	1.0%	C	0.032	3.60%	
7	\$2,080,000	\$700,000	\$676,667	3.60%	\$25,200	\$0	\$81,300	2.7%	AA	0.083	1.80%	
8	\$2,080,000	\$700,000	\$700,000	1.80%	\$12,600	\$0	\$93,900	3.9%	AA	0.120	1.00%	
9	\$2,080,000	\$700,000	\$700,000	1.00%	\$7,000	\$0	\$100,900	4.5%	AA	0.134	0.80%	
Total UI Tax Bill:					\$184,100							
Firm 2: Reduces Hours by 20% for its Workforce under STC												
Year	Gross Payroll	Base Payroll	Average Base Payroll (Avg of prv 3 years)	UI Tax Rate	Contributions to UI Fund	STC Benefit Charges to Firm's UI Fund Account	Reserve Account Balance	Percent to Determine Next Year's UI Tax Rate Schedule	Tax Schedule	Reserve Ratio	Experience Rated UI Tax Rate for the Next Year	
1	\$2,080,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$23,800					
2	\$2,080,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$47,600					
3	\$2,080,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$71,400					
4	\$1,872,000	\$700,000	\$700,000	3.40%	\$23,800	\$83,200	\$12,000	3.4%	AA	0.102	1.40%	
5	\$2,080,000	\$700,000	\$700,000	1.40%	\$9,800	\$0	\$21,800	0.6%	F	0.017	4.90%	
6	\$2,080,000	\$700,000	\$700,000	4.90%	\$34,300	\$0	\$56,100	1.0%	C	0.031	3.60%	
7	\$2,080,000	\$700,000	\$700,000	3.60%	\$25,200	\$0	\$81,300	2.7%	AA	0.080	1.80%	
8	\$2,080,000	\$700,000	\$700,000	1.80%	\$12,600	\$0	\$93,900	3.9%	AA	0.116	1.20%	
9	\$2,080,000	\$700,000	\$700,000	1.20%	\$8,400	\$0	\$102,300	4.5%	AA	0.134	0.80%	
Total UI Tax Bill:					\$185,500							
Firm 3: Reduces Hours by 20% without STC												
Year	Gross Payroll	Base Payroll	Average Base Payroll (Avg of prv 3 years)	UI Tax Rate	Contributions to UI Fund	UI Benefit Charges to Firm's UI Fund Account	Reserve Account Balance	Percent to Determine Next Year's UI Tax Rate Schedule	Tax Schedule	Reserve Ratio	Experience Rated UI Tax Rate for the Next Year	
1	\$2,080,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$23,800					
2	\$2,080,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$47,600					
3	\$2,080,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$71,400					
4	\$1,872,000	\$700,000	\$700,000	3.40%	\$23,800	\$0	\$95,200	3.4%	AA	0.102	1.40%	
5	\$2,080,000	\$700,000	\$700,000	1.40%	\$9,800	\$0	\$105,000	5.1%	AA	0.136	0.80%	
6	\$2,080,000	\$700,000	\$700,000	0.80%	\$5,600	\$0	\$110,600	5.0%	AA	0.150	0.06%	
7	\$2,080,000	\$700,000	\$700,000	0.06%	\$420	\$0	\$111,020	5.3%	AA	0.158	0.06%	
8	\$2,080,000	\$700,000	\$700,000	0.06%	\$420	\$0	\$111,020	5.3%	AA	0.158	0.06%	
9	\$2,080,000	\$700,000	\$700,000	0.06%	\$420	\$0	\$111,020	5.3%	AA	0.158	0.06%	
Total UI Tax Bill:					\$111,860							

2.2.3 Rationale for STC: Program Benefits and Costs from Employee’s Perspective

For employees, STC provides job security and a cushion if the labor adjustment transition ends up with permanent layoffs (Balducchi & Wandner, 2007). It helps employees maintain job-specific skills and has other employment benefits⁹ (Kerachsky et al., 1985; Rosow & Zager, 1981). STC subsidizes the earnings of those who would have been laid off in the absence of the program. In contrast, it reduces the earnings of those who would have been kept even in the absence of the program. Therefore, the program is not equally advantageous for all participating employees.

Although all states provide partial unemployment insurance benefits for underemployed, partial benefits are available only to individuals whose earnings are very low, usually less than the weekly UI benefit amount (UWC, 2010), which is determined based on previous earnings during a base period. In principle, the weekly UI benefit amounts are directly related to individual’s usual wages and should replace about 50 percent of wages (UWC, 2010) up to a maximum. The average weekly benefit amount across all states in 2009 was \$311 (United States Department of Labor Office of Workforce Security Division of Fiscal and Actuarial Services, 2009, December, p. 8) and weekly earnings of employees in the private sector averaged at about \$753¹⁰, resulting in a wage replacement rate of less than 50 percent. Therefore, only individuals with large work hour reductions whose earnings remain below the weekly benefit amount can collect partial unemployment benefits unless they participate in an STC plan.

⁹ Majority of STC states require employers to maintain employment benefits: 8 of them require full benefits, while two states allow for pro-rated benefits (Walsh et al., 1997).

¹⁰ According to “Employment, Hours, and Earnings from the Current Employment Statistics Survey (National), 2009”, on average, an individual employed in the private sector worked 33.9 hour (series id CEU0500000002) earning \$22.21 per hour (series id CEU0500000003), and approximately \$753 per week.

To illustrate how the weekly earnings of an individual change with hours worked when STC and partial UI benefits are available for lost hours, I construct a simple example in which an individual is assumed to earn \$10 for each hour worked, earns an overtime premium for hours worked more than 40 in a week, participates in an STC plan allowing STC benefits for the hour reduction levels between 10 percent and 40 percent of the regular hours (STC benefits are not allowed for reducing overtime hours), and collects partial unemployment benefits for low work hours. For simplicity, I further assume that the weekly UI benefit amount is \$160 for this individual. For the partial unemployment benefit calculations, I assume that the first \$25 (or 25 percent, whichever is greater) of weekly earnings are disregarded from the wage earnings and, then, the benefit amount is adjusted dollar for dollar for the remaining earnings.

Figure 1 shows the weekly income of this individual as the sum of her wage earnings, STC benefits, and partial UI benefits depending on the number of hours worked per week.¹¹ For instance, if the individual works only 16 hours in a week, experiencing a 60 percent cut in normal hours, her total income of \$200 is calculated as the sum of \$160 in wages and \$40¹² in partial UI benefits. Since the hours reduction is outside the range allowed by the STC plan, she is not eligible for STC benefits. If she worked full-time this week, she could have earned \$400. With the partial UI benefits, her income amounts to 50 percent of her regular earnings while her hours are reduced to 40 percent of its normal

¹¹ It is important to note that partial UI is different in nature from STC. Partial UI benefits are paid to individuals with weekly earnings below the weekly benefit amount. This includes those who are unemployed but work on a temporary or part-time job (not necessarily on their regular job) with very short hours while continuing to look for a full-time job.

¹² Her partial UI benefits in this case are calculated as follows. The earning disregard for \$160 of hourly wage earnings is \$40 (25 percent of \$160, which is greater than \$25). The disregard amount is deducted from the wage earnings to find his/her adjusted earnings ($\$160 - \$40 = \$120$). Finally, the weekly benefit amount of \$160 is adjusted down by the amount of the adjusted earnings (\$120). The partial UI benefit amount then becomes \$40 ($\$160 - \40).

levels. As Figure 1 shows, the partial UI benefit amount declines as the number of hours worked increases. Depending on the hourly wages, the work hours, and the partial UI formula, workers cannot collect partial UI benefits unless STC is present in the UI system. Most STC programs are designed to increase earnings of individuals whose hours are reduced but not low enough to collect partial UI benefits.

On the other hand, if the individual experiences a 40-percent reduction and works 24 hours a week, she will not be eligible to collect partial UI since her earnings exceed the weekly benefit amount. Where an STC plan is available, she will earn \$304, the sum of \$240 in wage earnings and \$64 in STC benefits (which is 40 percent of the \$160-weekly benefit amount). With the STC benefits, her income amounts to 76 percent of her regular earnings while her hours are reduced to 60 percent of normal levels.

If she experiences a smaller reduction of 10 percent and works 36 hours a week, she will earn \$376, the sum of \$360 in wage earnings and \$16 in STC benefits (which is 10 percent of the \$160-weekly benefit amount). With the STC benefits, her earnings amounts to 94 percent of her regular earnings while her hours are reduced to 90 percent of its normal levels. As this example shows, STC provides income subsidy for short work hours for which partial UI benefits are not available. For small levels reductions, overall income loss becomes smaller with the help of STC benefits.

A 25-percent reduction in labor input through STC or layoffs in this example will result in the same amount of expected compensation for the individual (\$340 per week). She will earn \$300 in wage earnings and \$40 in STC benefits. If the 25 percent reduction in labor is accomplished by laying off 25 percent of the workers, her probability of being laid off will be 0.25 and probability of being employed will be 0.25, yielding an expected

compensation of \$340 ($0.75 \times 400 + 0.25 \times 160$). Thus, her expected compensation is the same but she has greater certainty under STC. However, working short-time may interfere with job search and being on UI while laid off allows full time search. In this case, the individual's welfare depends on the tradeoff between value of time available for job search and risk aversion.

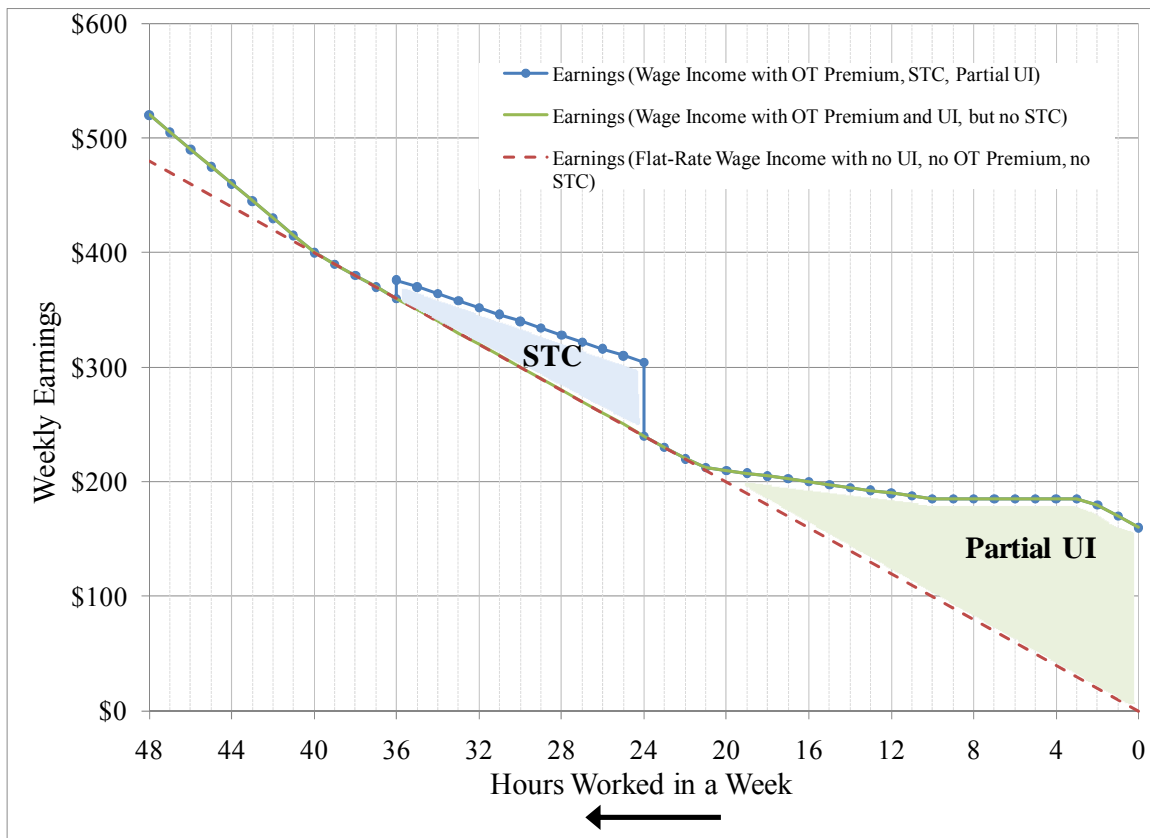


Figure 1. Work Hours and Weekly Earnings with STC and Partial UI Benefits.

Assumes the hourly wage is \$10/hour, STC benefits are earned for reduction levels of 10 to 40 percent, weekly benefit amount is \$160, earning disregard for partial UI benefits is \$25 or 25 percent of wage earnings (whichever is higher), the weekly benefit amount after the earnings disregard is adjusted dollar for dollar for the hourly wages, an overtime premium of 1.5 times the regular hourly rate is earned for hours over 40 per week.

STC is promoted as a program that provides benefits to society as well. By averting layoffs, STC reduces expenditures that increase with unemployment (Kerachsky, Nicholson, Cavin, & Hershey, 1985), for example, public assistance for the unemployed; and by protecting employment, the program may help maintain affirmative action gains (MaCoy & Morand, 1984; Rosow & Zager, 1981). Not all hypothesized benefits are found to be realized. Although one of the major arguments for STC compared to layoffs was that it would help protected groups (minorities, women, younger workers) to keep their jobs by avoiding last-in-first-out (Schiff, 1985), two evaluation reports (Kerachsky et al., 1985; Walsh et al., 1997) do not find any significant affirmative action gains.

Unions initially did not welcome STC during the early stages of its development. Program proponents encouraged unions to support STC because it would help preserve employment, which in turn, help unions preserve membership, reduce the polarization between senior and junior members, and provide bargaining flexibility (Rosow & Zager, 1981). Although unions changed their positions and later supported the state programs and the federal legislation, their focus remained on “active government programs to stimulate employment” (Zalusky, 1985, p. 443).

An important feature of STC programs in the U.S. is that STC benefits are deducted from UI benefits if the workers are subsequently laid off. The STC benefits are deducted from total UI entitlement on a dollar-for-dollar basis during a benefit year. This feature might discourage workers from participation as future layoffs are certainly possible (Vroman & Brusentsev, 2009). However, integrating STC and UI entitlement amounts in this way provides an incentive for STC participants to find employment more quickly if laid off or accept lower wages or other employment alternatives such as part-time work.

2.3 Program Features Vary Across States

STC programs in the United States share a common framework but they differ in program duration and eligibility requirements. These rules are listed by state in Table 2 through Table 4. Firms must prepare a plan describing the planned work reductions and a list of affected workers, and then submit this to the state unemployment insurance agency. The approval stage takes one to two days and almost all plans are approved. The STC claims must be filed during the program period, usually every two weeks. All STC programs enacted in the U.S. require employee consent or union consent when employees affected by the program are union members (Walsh et al, 1997).

2.3.1 STC Program Requirements and Rules for Employers

STC plans could last from 13 weeks to one year but 26-week programs are the most common. The minimum hours reduction required for STC eligibility is either 10 percent or 20 percent as shown in Table 2. Most states allow up to 40 to 60 percent reductions in hours. California, however, does not have a set limit, effectively providing UI benefits for layoffs and all with reduced hours.

An STC plan does not have to cover all employees in a firm and can be implemented for a set of workers in a business unit, which can be a plant, department, shift, or other unit within a firm. Four states (Oregon, Texas, Vermont, and Washington) do not impose any restrictions on the number of workers that STC covers, but others require either at least two participants or 10 percent of the affected unit. Maryland plans must show that at least two full-time positions are saved.

Although it is not a requirement in the federal STC guidelines, 11 states require fringe benefits to be maintained during the plan period. Of these, three states—Minnesota,

Rhode Island, and Washington—allow employers to prorate employee benefits based on the hours reduction stated in their plans.

Table 2

STC Program Features by State: Requirements and Rules for Employers

State ^a	Program Start Year ^{d,e}	Employer Plan Requirements		Employer Participation Rules	
		Plan Duration Before New Approval is Required	Minimum Number of Workers Affected ^e	Reduction in Hours Allowed	Required to Maintain Employee Benefits ^c
Arizona	1982	1 year	2	10% to 40%	
Arkansas	1985	12 months	2	10% to 40%	Yes
California	1978	6 months	10 % of affected unit	10% or more	
Connecticut	1992	6 months	4 ^h	20% to 40%	Yes. Fringe benefits cannot be reduced ^h
Florida	1984	12 months	10 % of affected Unit and at least 2 workers ⁱ	10% to 40%	
Illinois ^b	1983				
Iowa	1992	26 weeks ^f	10 % of affected unit ^j	20% to 50%	Yes. Fringe benefits cannot be reduced ⁱ
Kansas	1988	12 months	10 % of affected Unit and at least 2 workers	20% to 40%	Yes
Louisiana ^c	1986	12 months	10 % of affected Unit and at least 3 workers ^k	20% to 40%	Yes
Maryland	1984	13 weeks ^g	Must be saving jobs of 2 full-time equivalent positions ^g	10% to 50%, > 50% with special approval	
Massachusetts	1988	26 weeks	2	10% to 60%	Yes
Minnesota	1994	12 months	5	20% to 50%	Yes ^l

Table 2 (continued)

State ^a	Program Start Year ^{d,e}	Employer Plan Requirements		Employer Participation Rules	
		Plan Duration Before New Approval is Required	Minimum Number of Workers Affected ^e	Reduction in Hours Allowed	Required to Maintain Employee Benefits ^e
Missouri	1987	12 months	10 % of affected Unit and at least 3 workers	20% to 40%	
New York	1986	1 year	5	20% to 60%	Yes
Oregon	1982	52 weeks	No minimum	20% to 40%	
Rhode Island	1991	12 months	2	10% to 50%	Yes ^l
Texas	1985	12 months	No minimum	10% to 40%	
Vermont	1986	6 months or plan date if earlier	No minimum	20% to 50%	Yes
Washington	1983	12 months or plan date if earlier	No minimum	10% to 50%	Yes ^l

Note. This table is mostly based on the information from the Short-Time Compensation table in UWC (2010), which was adapted with permission of the author. Other sources are indicated separately. Union consent is required by all programs (Walsh et al., 1997).

^aNorth Dakota enacted a demonstration project that was available to one firm in 2006 but was allowed to expire (Balducchi & Wandner, 2007). ^bIllinois' program was not part of the regular unemployment insurance trust fund (Nemirow, 1984) and allowed to expire in 1988 (Walsh et al., 1997). ^cLouisiana adopted STC in its UI legislation but no longer operates the program. No employers have participated since 1988 (Walsh et al., 1997). ^dFederal Legislation on STC attached to an omnibus tax bill signed into law on September 3, 1982 (MaCoy & Morand, 1984, p12). ^eWalsh et al. (1997). ^fThe employer plan is valid for 26 weeks (UWC, 2010) over a two-year period (Voluntary Shared Work Program, Iowa Code, Chapter 96, Section 40, 1999)). ^gThe plan was valid for 13 weeks but could be renewed up to four times in one year (Maryland Department of Labor, Licensing and Regulation, 2010) ^hConnecticut Department of Labor Shared Work Program (2010). ⁱState of Florida Agency for Workforce Innovation (2010b). ^jVoluntary Shared Work Program, Iowa Code, Chapter 96, Section 40 (1999). ^kCriteria for Shared-Work Plan Approval (Louisiana Code, RS 23:1750.1, 2006). ^lEmployers were allowed to pro-rate benefits based on percent time employee works (Walsh et al., 1997).

2.3.2 STC Employee Participation Rules and Duration of Benefit Receipt

The STC programs also have provisions that control the eligibility of employees for participation. These provisions are listed in Table 3. Two of these provisions are related to seasonal and part-time workers. Seasonal workers experience hours reduction because of the seasonal nature of their jobs, not because of temporary demand shocks. The usual work hours for part-time employees are less than normal. Subsidizing seasonal and part-time workers for their less than normal work hours is usually not regarded as a way to avert temporary layoffs, among the seventeen states with an active STC program, 11 states prohibit part-time workers from participating while 13 states prohibit seasonal workers. Minimum tenure with the participating employer is usually not necessary to participate in the program, but Oregon and Minnesota allow employees with at least 6 months of prior work with the firm, whereas this requirement is three months in Maryland, 12 weeks in Kansas, and one week in California and Florida.

As shown in Table 2, maximum duration of benefit receipt under STC programs is usually 26 weeks. In Connecticut, this can be extended up to 52 weeks. Iowa, Minnesota, Oregon, Rhode Island, Texas, and Washington provide benefits up to 52 weeks and New York limits the duration to 20 weeks. California does not have a limit on duration but the total benefits cannot exceed 26 times the UI weekly benefit amount.

Table 3

STC Program Features by State: Employee Participation Rules and Duration of Benefit Receipt

State	Part-Time Workers Excluded	Seasonal Workers Excluded	Minimum Tenure Required with Employer ^k	Maximum Duration of Benefit Receipt ^l
Arizona			None	26 weeks ^m
Arkansas		Yes ^f	None	26 weeks
California			1 week	No limit but total paid cannot be >26xWBA
Connecticut	Yes ^a	Yes ^a	None	26 weeks (can be extended to 52 weeks)
Florida	Yes ^b	Yes ^b	1 week ^b	26 weeks ^b
Iowa	Yes (temporary PT is excluded) ^c	Yes ^c	None	52 weeks ^m
Kansas	Yes	Yes ^g	12 weeks	26 weeks
Louisiana	Temporary PT excluded ^d	Yes	1 week	26 weeks
Maryland	Yes	No ^h	3 months	26 weeks
Massachusetts		Yes	None	26
Minnesota	Yes	Yes ⁱ	1 year ⁱ	52 weeks
Missouri		Yes	None	26 weeks
New York			None	20 weeks
Oregon			6 months	52 weeks
Rhode Island	Yes ^c	Yes	None	52 weeks
Texas	Yes	Yes	None	52 weeks
Vermont	Yes	Yes	None	26 weeks
Washington	Yes	Yes ^j	None	52 weeks ^m

Note. Most of the information on this table is gathered from Walsh et al. (1997). Other sources are indicated separately.

^aConnecticut Department of Labor Shared Work Program (2010). ^bState of Florida Agency for Workforce Innovation (2010a). ^cVoluntary Shared Work Program (Iowa Code, Chapter 96, Section 40, 1999). ^dCriteria for Shared-Work Plan Approval (Louisiana Code, RS 23:1750., 2006). ^eMust have regularly worked over 30 hours per week (Rhode Island Department of Labor and Training, 2010). ^fSeasonal workers were not excluded by law, but they were excluded in practice (Walsh et al, 1997). ^gKansas Department of Labor (2010b).

^hSeasonal workers are not explicitly excluded but the program is ""not intended to be a means for employers to address problems such as seasonal or cyclical shutdowns, inventory control, model changeovers, or equipment maintenance (Maryland Department of Labor, Licensing and Regulation, 2010, p 3). ⁱSeasonal workers were not excluded by law, but they were excluded in practice (Walsh et al, 1997). ^jSeasonal workers were excluded by law, but this rule was not usually enforced (Walsh et al., 1997). ^kMinnesota Department of Employment and Economics Development (2010). ^lMaximum duration of benefit receipt column is adapted from UWC (2010) with permission of the author. Other sources are indicated separately. ^mUnited States Department of Labor Employment and Training Administration (2010).

2.3.3 STC Benefit Amounts and Program Financing

STC benefits are based on regular UI benefit amounts prorated by the hours reduction and are charged to the STC employer's UI fund account similar to regular UI benefit charges. Table 4 lists the type of experience rating system adapted to calculate UI tax rates, STC benefit amounts, and the special financing rules for each of the 19 states with STC legislation.

States have adopted two major experience rating systems¹³. The type of experience rating system and STC financing rules for STC states are listed in Table 4. In the reserve ratio system, the UI tax rate reflects an employer's cumulative experience. All benefits charged against the employer are subtracted from all UI taxes paid into the UI Trust Fund by the employer. The balance is divided by the employer's average payroll for the past three years¹⁴. Nine of the 19 states with STC legislation calculate the experience-rated UI tax rates using the reserve ratio system. The remaining 10 states operate under the benefit ratio system, in which UI taxes are based simply on the ratio of an employer's benefit charges over a period to the employer's payroll over the same period¹⁵. Under both systems, STC benefit amount is the prorated amount of regular UI weekly benefit amount (WBA) based on a plan's hours reduction rate.

¹³ The most common experience-rating system, adopted by 33 states (including Puerto Rico and Virgin Islands), is the reserve-ratio system. Benefit ratio system does not take the UI taxes an employer paid into account and only the last few years' benefit charges are used. The other systems are benefit ratio (17 states), benefit wage ratio (two states), and payroll decline (one state) (UWC-Strategic Services on Unemployment & Workers' Compensation, 2007).

¹⁴ Arkansas uses the average payroll from the last 3 or 5 years whichever is smaller, or only the last year. Massachusetts uses the payroll only from the last year. New York uses the average of last 5 years.

¹⁵ Usually 3 to 5 years. Connecticut, Illinois, Maryland, Missouri, Oregon, Texas, and Vermont use a 3-year; Minnesota uses a 4-year; and Kansas and New York use a 5-year period.

Early in 1980's when several states adopted the program, they added surtaxes to STC employers' UI taxes with the concern that STC, if it becomes a program as widespread as the regular UI, could deplete the state UI funds (MaCoy & Morand, 1984). Arizona is the only remaining state that still imposes surtaxes on STC employers by adding 1 percent to the tax rate of STC employer's whose negative reserve ratio is 5 percent or more but less than 15 percent, and adds 2 percent if the negative reserve ratio is 15 percent or more (UWC, 2010).

Florida and Missouri raise the maximum tax rate for STC employers. Florida raises the maximum tax rate from 5.4 percent to 6.4 percent for the STC employers (State of Florida, Agency for Workforce Innovation, 2010) whereas Missouri raises the ceiling from 9.75 percent to 13.6 percent. Unless an STC employer in these two states hits the tax ceiling, it will not be burdened by any additional taxes.

The majority of STC states do not impose special financing requirements on participating employers, but employers with negative reserve ratios or high benefit ratios are either excluded or required to pay higher tax rates. Kansas, for example, does not require any special financing provisions for the STC benefits but prohibits employers who have not established an experience rating, employers with negative UI account balance, governmental and reimbursing employers from program participation. To participate in the program employers must have established an experience rating and cannot be delinquent on unemployment tax reports or payments (Kansas Department of Labor, 2010a). Similarly, Massachusetts requires reimbursement of all STC benefits if the participating employer has a negative UI account balance and Oregon requires reimbursement of STC benefits if the

employer's benefit ratio is greater than allowed (UWC, 2010). Exclusion of delinquent or negative balance employers from participation, in effect, may leave out a large portion of the traditionally cyclical employers and traditionally cyclical sectors, which are more likely to use STC than more stable employers and sectors.

Both STC benefits and regular UI benefits of an individual are usually charged to all his/her employers during his/her base period if the individual worked for multiple employers during this period. However, in three states (Iowa, Maryland and Rhode Island), while this base period charging rule is applied to the regular UI benefits, the STC benefits of participating workers are charged only to the employer that implemented the STC plan. This requirement makes the experience-rating of STC higher for STC employers than that of regular UI because, through the base period charging rule, employers are able to transfer the burden of their layoffs to other employers while this is not possible for the STC employers who are charged for all their STC benefits.

Table 4

STC Program Features by State: Benefit Amounts and Financing

State	Type of Experience Rating	Computation of WBA	Financing by Participating Employers
Arizona	Reserve Ratio	WBA multiplied by % hours reduction	1% added if negative reserve ratio is at least 5% but less than 15%; 2% added if negative reserve ratio is 15% or more
Arkansas	Reserve Ratio	WBA multiplied by % reduction of individual's usual hours	No special financing
California	Reserve Ratio	% of reduction in individual's hours and wages, rounded to nearest 5%, multiplied by individual's WBA.	No special financing
Connecticut	Benefit Ratio	WBA multiplied by nearest full % reduction of individual's hours	No special financing
Florida	Benefit Ratio	WBA multiplied by % hours reduction	Participating employer's maximum rate will be 1% above current max. applicable to other employers ^b
Iowa	Benefit Ratio	WBA multiplied by % reduction of individual's usual hours	All STC benefits charged to worksharing employer unless employee is in training
Kansas	Reserve Ratio	WBA multiplied by % of reduction of individual's usual hours	Not applicable to negative balance and delinquent governmental and reimbursing employers
Louisiana	Reserve Ratio	WBA multiplied by % of reduction of individual's usual hours	No Special Financing
Maryland	Benefit Ratio	WBA multiplied by the % reduction in worker's normal weekly hours + dependents allowance	Unlike regular UI benefit, all STC benefits charged to worksharing employer regardless of base period charging rule ^c
Massachusetts	Reserve Ratio	WBA multiplied by the % reduction in worker's normal weekly hours + dependents allowance multiplied by the same % reduction.	Negative balance employers reimburse 100% benefit charges, all others charged as regular benefits
Minnesota	Benefit Ratio	WBA multiplied by nearest full % reduction of individual's regular weekly hours	No special financing
Missouri	Reserve Ratio	WBA multiplied by % of reduction of individual's usual hours	Participating employer's base tax rate can be as high as 9%
New York	Reserve Ratio	WBA multiplied by % reduction of individual's usual wages	No Special Financing. Benefit charges are dollar amounts not effective days
Oregon	Benefit Ratio	WBA multiplied by % of reduction of individual's usual hours	If employer's benefit ratio is greater than its tax rate, the employer is required to reimburse the excess at the end of each quarter ^d
Rhode Island	Reserve Ratio	WBA multiplied by % of reduction of individual's usual hours	All STC benefits charged to worksharing employer regardless of base period charging rule
Texas	Benefit Ratio	WBA multiplied by % of reduction of individual's usual hours	No special financing
Vermont	Benefit Ratio	WBA multiplied by % of reduction of individual's usual hours	No special financing
Washington ^a	Benefit Ratio	WBA multiplied by % of reduction of individual's usual hours	Employer with benefit ratios greater than 5.4% are excluded from participation ^d

Note. Most of the information on this table is gathered from Walsh et al. (1997). Other sources are indicated separately.

^aWashington did not have an experience rated UI system until 1984 (Washington State Legislature, 2010). ^bIn Florida, the maximum tax rate is 1 percent higher for STC employers than for non-STC employers but STC participants maximum tax rate does not automatically is increased to 6.4 percent. Other factors are also taken into account (State of Florida Agency for Workforce Innovation, 2010). ^cMaryland Department of Labor, Licensing and Regulation (2010). ^dUnited States Department of Labor Employment and Training Administration (2010).

2.3.4 Generosity of STC Benefits

The rule of thumb for calculating the weekly benefit amount (WBA) is that it should cover approximately 50 percent of normal weekly earnings (UWC-Strategic Services on Unemployment & Workers' Compensation [UWC], 2007), but the rule differs across states. Since STC benefits are computed based on the weekly benefit amounts that vary from state to state, generosity of each STC program varies. Table 5 presents the ranking of the STC states based on their weekly benefit amounts as a percentage of high quarter wages (and then maximum WBA amount if there is a tie). Benefit amounts are listed in UWC (2007) and STC utilization in Wandner (2008). STC utilization is measured as the ratio of STC beneficiaries (first payments) to regular UI beneficiaries (in percent).

States calculate the WBA using weekly, quarterly, or annual wage formulas. States also determine minimum and maximum WBAs. The weekly wage formula computes the WBA as a percentage of the claimant's average weekly wage. The quarterly formula computes the WBA of a claimant as 1/26 of his/her wages in the calendar quarter with the highest wages (high quarter) during the base period. Claimants who worked all 13 weeks in their high quarter are expected to receive 50 percent wage replacement. Annual wage formula is computed as the annual wages divided by the number of weeks worked. Some states provide dependent allowances in addition to regular WBAs. A state's maximum WBA is usually calculated as a fixed percentage of the average weekly wage in that state UWC (2007). The numbers in Table 5 exclude dependent allowances.

Table 5

Ranking of Weekly Benefit Amounts in STC States

Rank	State	Weekly Benefit Amount ^a			No of STC First Payments as a % of regular UI ^c
		As a % of HQ ^b	Min	Max	
1	Rhode Island	4.62%	\$68	\$492	4.5%
2	Vermont	4.44%	\$59	\$394	2.9%
3	Iowa	4.35%	\$50	\$334	n/a ^d
4	Kansas	4.25%	\$69	\$386	3.2%
5	Maryland	4.17%	\$25	\$340	n/a ^e
6	Texas	4.00%	\$60	\$240	1.8%
7	Missouri	4.00%	\$56	\$280	4.9%
8	Arizona	4.00%	\$56	\$364	1.9%
9	New York	3.85%	\$71	\$395	1.3%
10	Massachusetts	3.85%	\$40	\$450	1.3%
11	Washington	3.85%	\$15	\$483	1.0%
12	Connecticut	3.85%	\$32	\$275	n/a ^e
13	California	3.85%	\$31	\$571	1.8%
14	Arkansas	3.85%	\$38	\$351	0.2%
15	Minnesota	3.85%	\$40	\$405	1.2%
16	Florida	3.85%	\$116	\$496	0.1%
17	Oregon	3.25%	\$104	\$445	0.9%

^a As of 2007 and adapted from UWC (2007) with permission of the author. ^bHQ indicates “high quarter”. Some states calculate WBA as a percentage of the wages in a calendar quarter in which wages are highest during the base period. This quarter is called high quarter (HW). For states that use weekly or annual wages, the quarterly equivalent is calculated and shown in this table. ^cAs of 2007 from Wandner (2008). ^dNo longer reports on the program. ^eReports STC activity but not the first payments. ^fRanked by WBA as a percentage of the high quarter (HQ) wages.

Since the STC benefits amounts are calculated based on the WBAs, states with high WBA amounts are also expected to have high STC benefits, hence, high STC use. To test the relationship between the WBA amount and the STC use in a state, I calculate¹⁶ the Spearman’s rank correlation coefficient (Spearman’s *rho*) between the WBA as a percentage of high-quarter wages and the number of first STC payments as a percentage of

¹⁶ Spearman’s non-parametric test for correlation between two ordinal variables is performed using Stata’s “spearman” command.

regular UI claims columns. The test statistic is 0.8369 and statistically significant with p-value of 0.0002. This result suggests that high WBA amounts are correlated with high STC use in 2007.

2.4 Program Utilization

Even firms in states with an STC program do not use short-time compensation frequently. Nationwide, STC beneficiaries as a percentage of regular UI beneficiaries never exceeded 1.24 percent between 1982 and 2007. The average number of STC recipients during this period was little more than 45,000, reaching 100,000 during and following the recession years. A small number of STC states utilized the program more than others. For example, as shown in Table 6, STC first payments as a percentage of regular UI first payments reached 6.2 percent in Rhode Island, 6.1 percent in Missouri, and 6.0 percent in Kansas in 2001. The reasons for U.S. employers' low utilization of STC remain unclear.

The U.S. programs have been always smaller than the major programs operating in Germany and Finland, where STC participants account for 8.2 and 14.9 percent of regular UI program in 2003, respectively (Wandner, 2008). As the latest federal study of STC programs in the U.S. (Walsh et al., 1997) reported the program participation was low in 1992. The number of firms with STC plans in California, the largest user of STC programs, was 5,143 in 1992. In New York, the second largest user of STC programs, this number was just 737. STC outlays were \$2.4 million in Arizona in 1992, representing only 1.4 percent of all benefits. California's spending for the same year was \$18.6 million, or 0.8 percent of all STC and UI benefits. Participation in the STC program has been limited to less than 1 percent of employers, generally not more than 100 firms, in any given year.

Table 6

Number of First Payments: STC as a Percentage of Regular UI

State	Program Adopted	1997	2001	2005	2007
U.S. Total STC First Payments		33,577	111,202	40,238	49,920
STC Beneficiaries as a % of Regular UI Beneficiaries		0.4	1.1	0.5	0.7
Arizona	1982	1.7	4.9	0.4	1.9
Arkansas	1985	n/a ^a	n/a ^a	n/a ^a	0.2
California	1978	1.6	3.2	1.5	1.8
Connecticut	1991	0	n/a ^b	n/a ^b	n/a ^b
Florida	1983	0.5	1	0.1	0.1
Iowa	1991	0	0	0	n/a ^b
Kansas	1988	3.8	6	2.1	3.2
Maryland	1984	n/a ^b	n/a ^b	n/a ^b	n/a ^b
Massachusetts	1988	0.2	1.1	0.4	1.3
Minnesota	1994	0.1	3.4	0.7	1.2
Missouri	1987	2.5	6.1	3.8	4.9
New York	1985	0.8	2.2	1.5	1.3
Oregon	1982	0.1	1.5	1.3	0.9
Rhode Island	1991	1	6.2	3.9	4.5
Texas	1985	0.2	1.1	1.1	1.8
Vermont	1985	0.9	5.5	5	2.9
Washington	1983	1	2	0.5	1

Note. Reproduced from Table 3 in Wandner (2008, p23).

^aArkansas still has an STC program, but no longer reports on the program. ^bUsually does not report the first STC payments.

STC is a countercyclical program and the reports on STC participation during the most recent recession of 2007-2009 indicate that STC participation is higher than ever but still below the major programs in Europe. The number of firms using an STC plan in New York increased about four times from 483 in 2008 to 1,858 in the first 9 months of 2009. Minnesota has a smaller program than New York and received on average 30 to 50

applications a year from firms that wanted to use STC. At the end of the third quarter of 2009, 420 firms were using the program in Minnesota (Knight, 2009). A few states had STC programs but had no participants for years. For the first time since 2003, Iowa's program paid STC benefits in 2009 (Vroman, 2009) and 70 firms, mostly manufacturing companies, used STC in 2009 (Henderson, 2009).

Rhode Island also experienced a sharp increase in its STC participation in 2009. The number of STC employees increased from 3,781 in March, 2009 to 17,856 in June, 2009 (Reed, 2009). Connecticut, Washington, and Massachusetts are among those with increasing number of STC employees. The number for Connecticut is up from 250 in 2008 to 5,000 in the first half of 2009; from 6,039 to 39,119 for Washington; and from 621 to 10,127 for Massachusetts (Greenhouse, 2009).

CHAPTER 3: POLITICAL ECONOMY OF SHORT-TIME COMPENSATION IN THE U.S.

The United States unemployment insurance (UI) system is administered at the state level, and states must modify their UI legislation in order to implement Short-Time Compensation (STC) programs. The process of changing a piece of legislation is influenced by several factors and incorporating STC into the UI legislation is no exception. A variety of factors, mainly political, demographic, and economic, were considered by state legislators in their STC decisions. Government's intervention in firms' and workers' employment and work hours decision through STC is influenced by economic security concerns and political tendencies in a state. This paper is the first study to estimate a model of STC adoption by states and focuses on political ideology of a state's constituency, demographic characteristics of state population, and economic factors such as unemployment rate, per capita income, and share of manufacturing employment. The independent influence of these factors on a state's probability of enacting an STC program is estimated using the probit regression analysis technique. As an alternative model, a survival analysis is performed using the same factors used in the probit model to investigate whether they affect the timing of a state's adoption of the program.

Work sharing as an alternative to layoffs has been used in the U.S., especially during the Great Depression, but compensation for the reduced hours due to work sharing was not a part of the unemployment insurance system until 1978. STC has been promoted abroad as a labor adjustment tool to avert layoffs and sustain purchasing power during economic downturns, but the major concern that led to STC initiative in the U.S. was the

disparate impact of layoffs on recently hired women and minorities (MaCoy & Morand, 1984).

The number of women in the U.S. labor has been steadily increasing for the last century. Prior to STC discussions in the 1970s, female labor participation rate increased from 24.3 percent in 1930 to 41.6 percent in 1970 (Killingsworth & Heckman, 1986). After the Civil Rights Act of 1964, while labor participation rate increased for minority females (Killingsworth & Heckman, 1986), it decreased for minority males (Pencavel, 1986) following the trends in female and male participation rates respectively¹⁷. Women and minorities were disproportionately more prone to layoffs in case of economic downturns because of last-in/first-out layoff system and their relatively shorter job tenures. STC idea emerged as an affirmative action tool at the National Urban Coalition's "Affirmative Action in a Recessionary Period" seminar in March 1975 (MaCoy & Morand, 1984).

In addition to the affirmative action discussions in the 1970s, federal authority for employment and training services began to shift to state governments. In the mean time, economic uncertainty and increased unemployment in the wake of the second oil crisis caused business coalitions and organized labor to promote work sharing plans (Balducchi & Wandner, 2007). The first governmental action emphasizing work sharing was the guidelines issued in 1975 by the New York City Commission on Human Relations. These guidelines required employers to consider work sharing as an alternative to layoffs. Later in the same year, the state of New York considered an STC bill, but the bill did not pass.

In 1978, when California became the first state to implement an STC without any federal regulation, affirmative action concerns and the role of civil rights groups had been

¹⁷ Killingsworth and Heckman (1986) and Pencavel (1986) report estimates of civilian labor force participation rates for 1955-1982 period.

declining. California state officials, in 1978, approved a proposal that imposed a cap on property taxes. The cap was predicted to reduce the state's tax income and hence cause a mass layoff of public workers. California's STC bill was rushed through the state's legislative process—it took only two weeks to introduce and pass the bill. However, the mass layoff of public workers as feared did not happen. Firms in the private sector became the major user of the STC program in California (MaCoy & Morand, 1984; St. Louis, 1984).

Civil rights groups, women's organizations, religious representatives, and labor unions lobbied and testified for Rep. Patricia Schroeder's (D-CO) 1982 federal STC bill, which provided model legislative language and program guidelines mainly based on California's program to encourage other states to adopt STC and enacted as part of the Tax Equity and Fiscal Responsibility Act (TEFRA) of 1982 (MaCoy & Morand, 1984).

Organized labor initially opposed STC but reversed its position. AFL-CIO withheld its support for the STC bill sponsored by Rep. Schroeder until 1981 when the bill incorporated safeguards to ensure that (i) STC costs to UI trust fund be controlled, (ii) fringe benefits were maintained while on STC, (iii) union consent was required for each employer plan, and (iv) employers prove that hours reduction was necessary (Ittner, 1984). It is common in all STC programs in North America and Europe that an employer must obtain workers', worker representatives', or union's consent before implementing an STC plan¹⁸. Most states perceived that organized labor had a small impact on program adoption (Walsh, London, McCanne, Needels, Nicholson, & Kerachsky, 1997). As a measure of unions' influence on STC enactment, union density is included as one of the explanatory

¹⁸ This requirement was eliminated from federal UI laws in the U.S. in 1992 but all U.S. programs, currently operational in 17 states, still require union consent.

variables in my analysis. Adopting STC is a political decision made at the state level.

Political variables are included to examine the relationship between the adoption decision and political tendencies prevalent in a state (such as political ideology and whether a state has enacted Right-to-Work (RTW) laws). In this chapter, I introduce a formal model to disentangle the relative importance of these factors.

On the business side, the Committee for Economic Development and a private firm, Motorola, promoted and supported federal STC legislation. Motorola was also a big supporter of several STC programs (Arizona, Illinois, and Florida) and the major user of the program in Arizona (MaCoy & Morand 1984; St. Louis, 1984). Eight states enacted the program between when the federal STC legislation passed in 1982 and when it expired in 1985. After 1985, states continue to operate and adopt STC with no federal guidance or objection. The economic downturn in the early 1990s revived congressional interest in the program and in 1992 STC became a permanent part of federal UI laws as changes to Social Security Act and the Federal Unemployment Tax Act permanently authorized STC (Balducci & Wandner, 2007). Section 303(a)(5) of the Social Security Act, defines STC as UI program and allows states to pay for STC from their account within the Unemployment Trust Fund along with the regular UI benefits (Wandner, 2008).

Although affirmative action concerns led to the STC legislation, by the time STC was made a permanent part of federal UI law in 1992, support from the civil rights groups, women's organizations and other groups had apparently dissipated. Two STC evaluation reports¹⁹ required by Congress (Kerachsky, Nicholson, Cavin, & Hershey, 1986; Walsh et

¹⁹ The Unemployment Compensation Amendments of 1992 directed the Department of Labor to report to Congress on the implementation of STC programs. Up to today, Congress has requested the evaluation of the program only twice. The first one was prepared by Kerachsky, Nicholson, Cavin, and Hershey in 1986. The second one was prepared by Walsh, London, McCanne, Needels, Nicholson, and Kerachsky in 1997.

al., 1997) found no significant affirmative action advantages for newly hired minority and female workers. In this study, I test whether demographic characteristics of a state's population (female ratio, old-to-young ratio, and non-white ratio) have a significant effect on the existence of the STC program.

Recessions and high unemployment periods are times when policy makers are more focused on work sharing schemes to reduce unemployment (Balducci & Wandner 2007). Following two recessions in a three-year period between 1980 and 1982 (the first recession lasted from January to July in 1980 and the second lasted from July 1981 to November 1982), the first federal STC legislation and Arizona and Oregon programs adopted in 1982. Kansas enacted its program in 1988 to help many small businesses that were threatened by an economic downturn in that year. However, a survey of state officials revealed that most of the STC states did not consider economic crisis or recession as a key factor in the adoption of the program (Walsh et al., 1997). I examine state unemployment rates to test whether they play a role in states' STC decision.

The manufacturing sector has been the major user of STC programs both in the U.S. and abroad. Officials of the states that have not enacted STC indicated that lack of manufacturing and industrial employers in their states was a primary reason for not adopting the program because they thought that STC usually benefited such employers (Walsh et al., 1997). To test this finding, the share of manufacturing employment in a state's total wage and salary employment is examined. Real per capita personal income is added to examine the effect of the level of economic development of a state on the passage of STC legislation.

The rest of the chapter is organized as follows. The next section discusses a number of political, demographic, and economic variables that may affect states' STC decisions; and explains the data sources and variables used in the analysis. A probit regression model estimating the probability of a state's program adoption is described in Section 3.2. Then, I present a survival model as an alternative to the probit model in Section 3.3. The last section concludes.

3.1 Description of the Data and Analysis Variables

A database, containing one record per state, is constructed to estimate the probit model described in detail in the next section. The dependent variable in this model is whether a state has STC legislation, while the explanatory variables describe each state's political, demographic, and economic characteristics that would affect the probability of passage of this legislation. Next, I discuss the dependent variables in detail.

3.1.1 Response (Dependent) Variable

Starting with California in 1978, 19 states have adopted STC. Illinois adopted an STC program in 1983, but dropped the program in 1988 since no firm took part in the program due to program's prepayment requirement of STC benefits. Louisiana adopted STC in its unemployment insurance legislation but no longer operates the program. The state officials enacted the program in 1986 but employers are reportedly discouraged from participating. No employers have participated since 1988 (UWC, 2007; Walsh et al., 1997). In this study, I examine three scenarios to investigate the effect of these discontinued programs on my analysis results: First, Illinois and Louisiana are considered STC states. Second, they are placed in a separate category from STC and non-STC states. Third, they are treated as non-STC states as if they have never passed the STC legislation. In 2006,

North Dakota implemented a one-year demonstration project for a single firm, but the program was not implemented for wider use (Wandner, 2008). North Dakota is treated as a non-STC state since it has never enacted the program. That leaves 17 states with STC programs in effect.

The response variable in my model is whether a state modified its UI legislation to allow for short-time compensation. I develop three different versions of the dependent variable to capture the different behavior of Illinois and Louisiana. The first one (STC1) is a binary variable and assumes that both Illinois and Louisiana are STC states along with the other 17 STC states taking the value of 1 and the 34 non-STC states taking the value of zero. The second version (STC2) places these two states in a separate category so that STC2 takes the value of zero for the non-STC states, one for Illinois and Louisiana, and two for the STC states. Finally, Illinois and Louisiana are treated as non-STC states by STC3 variable. Table 1 shows the values of these three STC variables for each state.

Table 1

Response Variable: STC

State	STC Year	STC1	STC2	STC3	State	STC Year	STC1	STC2	STC3
Alabama		0	0	0	Missouri	1987	1	2	1
Alaska		0	0	0	Montana		0	0	0
Arizona	1982	1	2	1	Nebraska		0	0	0
Arkansas	1985	1	2	1	Nevada		0	0	0
California	1978	1	2	1	New Hampshire		0	0	0
Colorado		0	0	0	New Jersey		0	0	0
Connecticut	1992	1	2	1	New Mexico		0	0	0
Delaware		0	0	0	New York	1986	1	2	1
District of Columbia		0	0	0	North Carolina		0	0	0
Florida	1984	1	2	1	North Dakota		0	0	0
Georgia		0	0	0	Ohio		0	0	0
Hawaii		0	0	0	Oklahoma		0	0	0
Idaho		0	0	0	Oregon	1982	1	2	1
Illinois	1983	1	1	0	Pennsylvania		0	0	0
Indiana		0	0	0	Rhode Island	1991	1	2	1
Iowa	1992	1	2	1	South Carolina		0	0	0
Kansas	1988	1	2	1	South Dakota		0	0	0
Kentucky		0	0	0	Tennessee		0	0	0
Louisiana	1986	1	1	0	Texas	1985	1	2	1
Maine		0	0	0	Utah		0	0	0
Maryland	1984	1	2	1	Vermont	1986	1	2	1
Massachusetts	1988	1	2	1	Virginia		0	0	0
Michigan		0	0	0	Washington	1983	1	2	1
Minnesota	1994	1	2	1	West Virginia		0	0	0
Mississippi		0	0	0	Wisconsin		0	0	0
					Wyoming		0	0	0

Note. Based on UWC (2007) and Walsh et al. (1997).

3.1.2 Explanatory Variables

The explanatory variables in this analysis can be loosely categorized into three groups, political, demographic, and economic. Except for the political ideology index, these variables are time-dependent. The political ideology index²⁰ is estimated by Medoff (1997) and reflects the states' political ideology as of 1993. Time-dependent variables are built as of 1982, the year when the first federal legislation providing program guidelines was adopted. By 1982, all states were aware of STC. It took some states (e.g. Connecticut,

²⁰ Medoff (1997) estimates this index to determine the prevalent political view of the constituents in each state and is general in nature such that it is not specifically designed to be used in the models I estimate in this chapter.

Minnesota, and Iowa) longer to adopt while the others (e.g. Arizona, Oregon, and Washington) were quick to adopt the program. 32 states have never enacted STC to date. Descriptive statistics for the explanatory variables are shown in Table 3 and Table 4 at the end of this section.

3.1.2.1 Political variables. Adopting STC is a political decision made at the state level. Therefore, political variables are included in my analysis to examine how political tendencies prevalent in a state such as political ideology and whether a state has enacted Right-to-Work (RTW) laws change the probability of program adoption.

State political ideology (SPI). Ideological preferences of a state's voting population are reflected in the decisions made by state legislators such as the enactment of STC. A state's ideology is the aggregation of these preferences on political, social, economic, and foreign issues. Medoff (1997) constructs four different state political ideology (SPI) measures, each being located relative to other states on a conservative-liberal continuum.

The Americans for Democratic Action (ADA), a liberal interest group, provides a legislator's ideology rating of each member of the House of Representatives. This rating ranges between 0 (extremely conservative) and 100 (extremely liberal) and is highly correlated (.96) with the conservative group Americans for Constitutional Action rating. The District of Columbia has only a non-voting delegate in the United States House of Representatives and therefore does not have an ADA score. Medoff's first measure (SPI1) assumes that representatives have perfect information about voter preferences and their vote exactly reflects these preferences. SPI1 is calculated as the average of each representative's 1993 ADA score, weighted by the proportion of a state's voting population residing in the representative's district. All four of Medoff's (1997) SPI measures are

explained in Appendix A. SPI1 is the simplest measure among the four, and it is less likely to be correlated with the model's other independent variables. On the other hand, SPI4, accounting for constituency economic interest, legislator shirking, and political party loyalty, is more likely to cause the multicollinearity problem.

The STC states lie across both sides of the political ideology spectrum, but an average STC state is more likely to be a liberal one with its political ideology index SPI1 of 57.20. The political ideology variable is included to test whether liberal states are more likely to approve pro-labor laws than the conservative states.

Right-to-work laws (RTW). The National Labor Relations Act (1935) was amended by the 1947 Taft-Hartley act to allow states to pass right-to-work (RTW) laws so that employees can decide whether to join and financially support a union. While employers supported, unions resisted the passage of RTW legislation (Moore, 1998). A simple t-test in my data supports this finding by showing that the average union density in RTW states is lower compared to non-RTW states and this relationship is statistically significant²¹ as expected.

Adoption of RTW laws makes a state's labor force more attractive to new businesses compared to a state with no such laws according to Palomba and Palomba (1971), who showed that those states low on a relative ranking of economic development by states were more likely to pass RTW legislation. Holmes (1998) showed that state policies may influence firms' location choices and manufacturing employment in states with RTW laws is usually higher than the neighboring states without such laws.

²¹ A two-tailed t-test is performed using union densities and list of RTW states as of 1982. The average union density is 14.32 percent in RTW states and 22.89 percent in non-RTW states, with a difference of 8.57percent. The t-value is estimated as 5.30 with 49 degrees of freedom and with a p-value of 0.

Table 2

States with Right-to-Work Laws

State	Year Enacted	State	Year Enacted
Florida	1944	Alabama	1953
Arizona	1946	South Carolina	1954
Nebraska	1946	Utah	1955
South Dakota	1946	Kansas	1958
Arkansas	1947	Mississippi	1960
Georgia	1947	Wyoming	1963
Iowa	1947	Louisiana	1976
North Carolina	1947	Idaho	1985
Tennessee	1947	Texas	1993
Virginia	1947	Guam	2000
North Dakota	1948	Oklahoma	2001
Nevada	1952		

Note. Guam is not part of the analysis. Idaho, Texas, and Oklahoma are considered non-RTW states since they adopted RTW later than the analysis year, 1982. Based on The National Right to Work Legal Defense Foundation (2008).

Twenty-three states adopted the law, mostly in the late 1940s and 1950s (Moore, 1998) and as late as Oklahoma's enactment in 2001. The list of states with RTW laws is shown in Table 2. There is no significant correlation between STC and RTW states.²² However, RTW is negatively correlated with SPI1 and this relationship is statistically significant at 1 percent level.²³ That is, liberal states, as measured by SPI1, are less likely to have passed RTW laws. RTW variable is included in this probit model to test whether a state's perception of RTW laws (as an indicator of pro-business environment) and STC are related controlling for the state's political, economic, and demographic characteristics.

3.1.2.2 Demographic variables. STC is designed to deter layoffs and temporarily preserve the jobs of those who would have been laid off. Since layoffs are usually based on

²² Simple correlation coefficient between RTW and STC3 variables is -0.1259 with p-value 0.3837.

²³ Simple correlation coefficient between RTW and SPI1 variables is -0.5598 with p-value <0.0001.

seniority and job tenure, newly hired workers are more likely to be laid off. Minorities, women, and younger workers usually have shorter job tenure than their counterparts. Therefore, STC may play an “affirmative action” role (Rosow & Zager, 1981; Kerachsky et al., 1986; Johnson, 1987) and may be perceived as a job security tool by minorities, women, and younger workers. From the “affirmative action” point of view, a higher ratio of any of these three demographic variables in a state is expected to translate into a higher probability of adopting STC in this model, because it is assumed that minorities, women, and young workers affect their legislators’ decisions by their votes. On the other hand, STC, once implemented, does not disproportionately benefit ethnic and racial minorities, the young, or women (Kerachsky et al., 1986; Walsh et al., 1997). Demographic characteristics of a state’s population (female ratio, old-to-young ratio, non-white ratio) are tested to see if they have a significant effect on the existence of the STC program.

The Population Distribution Branch and Population Estimates Branch of the U.S. Bureau of the Census publish population estimates online (U.S. Census Bureau, 1970-1979; U.S. Census Bureau, 1981-1989; U.S. Census Bureau, 1990-2000). Population series used to construct female, old-to-young, and non-white ratios are taken from the estimated resident population for each state as of July 1 of a year. Female ratio shows the fraction of females among people ages between 20 and 64 residing in a state as reported by the Census. Old-to-young ratio is the ratio of old population (ages between 45 and 64) to young population (ages between 20 and 44) from the same data source. Non-white ratio for ages 20 to 64 is computed as one minus the ratio of whites for 1979,²⁴ and one minus

²⁴ 1980 race information is not available on the Census web site. Thus, 1980 non-white ratios are imputed as the averages of 1979 and 1981.

the ratio of non-Hispanic whites for years after 1979, because Hispanic categorization was introduced to the Census population survey in 1980.

3.1.2.3 Economic variables. Walsh et al. (1997) conducted a survey of state officials, in which respondents were asked questions regarding the factors contributing to the decision to adopt STC legislation. Perceived economic need for STC is found to have played a significant role in six²⁵ of the STC states' adoption of the program. To test this finding, the unemployment rate, share of manufacturing employment, union density, and real per capita income are included as explanatory variables. Below, I specify each of these variables.

Unemployment rate. The unemployment rate in Arizona jumped from 6.2 percent in 1981 to 10 percent in 1982. At the same time, Oregon experienced a smaller but significant increase, from 9.8 percent to 11.6 percent. STC legislation was adopted by both Arizona and Oregon in 1982 due to the concerns about widespread layoffs and the well being of state employers. In 1988, Kansas did not experience a sudden increase in unemployment rate, but STC legislation was enacted to save many small businesses whose survival was threatened amid an economic slowdown (Walsh et al., 1997).

State unemployment rates are extracted from The Bureau of Labor Statistics (BLS), Local Area Unemployment Statistics web site (U.S. Department of Labor Bureau of Labor Statistics, 2008). The BLS defines the unemployment rate as the ratio of unemployed to the civilian labor force. Higher unemployment rate is expected to be positively related to the probability of the passage of STC legislation.

²⁵ These STC states are Arizona, California, Kansas, Oregon, Rhode Island, and Washington.

Share of manufacturing employment. To test whether the size of manufacturing industry matters in a state's decision to pass STC legislation, a variable showing the percent employed in industry as a share of total wage and salary employment is included. Percentages are taken from "Total Full-Time and Part-Time Employment by Industry Table" (SA25) provided by the Bureau of Economic Analysis (BEA) (Bureau of Economic Analysis, 2009).

Walsh et al. (1997) finds that across five STC states (CA, FL, KS, NY, and WA) at least 40 percent of the firms participated in an STC program between 1991 and 1993 were in manufacturing industry. Given the large take-up rates of these programs by manufacturing firms, it is expected that a higher share of employment in manufacturing would increase the probability of the passage of STC legislation.

Union density. Union density is the percentage of nonagricultural wage and salary workers who are union members; and it is estimated for each state from the Current Population Survey (CPS) by Hirsch, Macpherson, and Vroman (2001) and Hirsch and Macpherson (2003).²⁶

Unions rejected the idea of work sharing during the Great Depression years but welcomed California's STC program four decades later (Lammers, 1984). Currently, all STC programs enacted in the United States require union consent when employees affected by the program are union members (UWC, 2007). This variable is included to test whether union density had a significant effect on the adoption probability of the STC legislations.

Real per capita personal income. Real per capita personal income is included to investigate the effect of the level of economic development on the passage of STC

²⁶ Hirsch & Macpherson (2003) make "The Union Density and Union Coverage Database" available online at <http://www.unionstats.com>.

legislation. The Bureau of Economic Analysis (BEA) computes per capita personal income as total personal income divided by total midyear population. Per capita income is extracted from the BEA's Summary file (SA1-3)²⁷ and then adjusted by the BEA's GDP implicit price deflator index with 2000 as the base year.

Table 3

Description of Independent Variables

Variable	Description
SPI1	State Political Ideology Index as calculated by Medoff (1997)
rtw	1 if a state has right-to-work laws, 0 otherwise (The National Right to Work Legal Defense Foundation)
union	Percentage of nonagricultural wage and salary workers who are union members as computed by Hirsch, Macpherson, and Vroman (2001) from the Census data
nw	1 minus the ratio of non-Hispanic whites (ages 20 to 64) to total population (ages 20 to 64) as computed from the Census data
fem	Fraction of females (ages 20 to 64) residing in a state as computed from the Census data
old	Ratio of old (ages 45 and 64) to young (ages between 20 and 44) as computed from the Census data
rpcpi	Real per capita personal income from the BEA in '000s.
mfg20	Percent employed in manufacturing industry as a share of total wage and salary employment from the BEA
unemp	Unemployment rate from the BLS

²⁷ Per capita income is available online for each state at <http://www.bea.gov/regional/spi/default.cfm?satable=summary>.

Table 4

Descriptive Statistics for Independent Variables

Variable	Statistic	Overall	STC1=0	STC1=1	STC2=0	STC2=1	STC2=2	STC3=0	STC3=1
	N	50	31	19	31	2	17	33	17
SPI1	Min	11.67	11.67	32.75	11.67	35.00	32.75	11.67	32.75
	Mean	49.51	45.59	55.89	45.59	44.78	57.20	45.54	57.20
	Median	46.42	43.89	55.62	43.89	44.78	58.13	43.89	58.13
	Max	100.00	100.00	83.33	100.00	54.55	83.33	100.00	83.33
	StdDev	17.59	16.96	17.14	16.96	13.82	17.36	16.60	17.36
rtw	Min	0	0	0	0	0	0	0	0
	Mean	0.38	0.42	0.32	0.42	0.50	0.29	0.42	0.29
	Median	0	0	0	0	0.5	0	0	0
	Max	1	1	1	1	1	1	1	1
	StdDev	0.49	0.50	0.48	0.50	0.71	0.47	0.50	0.47
union	Min	7.00	7.00	9.20	7.00	14.00	9.20	7.00	9.20
	Mean	19.71	19.68	19.75	19.68	19.50	19.78	19.67	19.78
	Median	20.30	18.10	21.90	18.10	19.50	21.90	18.10	21.90
	Max	32.10	32.10	31.10	32.10	25.00	31.10	32.10	31.10
	StdDev	7.01	7.35	6.61	7.35	7.78	6.74	7.25	6.74
nw	Min	1.44	1.44	1.44	1.44	21.11	1.44	1.44	1.44
	Mean	15.80	15.77	15.84	15.77	25.33	14.73	16.35	14.73
	Median	12.71	13.77	11.65	13.77	25.33	11.62	14.92	11.62
	Max	64.79	64.79	33.03	64.79	29.54	33.03	64.79	33.03
	StdDev	12.21	13.35	10.43	13.35	5.96	10.37	13.17	10.37
fem	Min	46.31	46.31	49.72	46.31	51.11	49.72	46.31	49.72
	Mean	50.70	50.53	50.98	50.53	51.27	50.95	50.57	50.95
	Median	50.81	50.77	51.11	50.77	51.27	50.73	50.84	50.73
	Max	52.22	52.06	52.22	52.06	51.42	52.22	52.06	52.22
	StdDev	1.08	1.24	0.70	1.24	0.22	0.74	1.21	0.74
old	Min	29.55	29.55	44.23	29.55	46.06	44.23	29.55	44.23
	Mean	48.80	48.12	49.91	48.12	48.34	50.09	48.13	50.09
	Median	49.37	49.34	49.90	49.34	48.34	49.90	49.34	49.90
	Max	60.01	59.65	60.01	59.65	50.62	60.01	59.65	60.01
	StdDev	5.41	5.82	4.58	5.82	3.22	4.76	5.67	4.76
rpcpi	Min	13.133	13.133	14.252	13.133	16.835	14.252	13.133	14.252
	Mean	18.359	17.915	19.083	17.915	18.717	19.127	17.963	19.127
	Median	18.366	17.594	19.110	17.594	18.717	19.110	17.594	19.110
	Max	29.554	29.554	23.733	29.554	20.599	23.733	29.554	23.733
	StdDev	2.886	3.178	2.224	3.178	2.662	2.259	3.119	2.259
mfg20	Min	4.19	4.19	11.34	4.19	11.76	11.34	4.19	11.34
	Mean	18.39	17.93	19.15	17.93	16.89	19.42	17.86	19.42
	Median	19.08	19.79	19.08	19.79	16.89	19.08	19.79	19.08
	Max	30.55	30.55	28.49	30.55	22.03	28.49	30.55	28.49
	StdDev	7.37	8.52	5.10	8.52	7.26	5.02	8.35	5.02
unemp	Min	5.50	5.50	6.50	5.50	10.20	6.50	5.50	6.50
	Mean	9.15	9.28	8.94	9.28	10.75	8.72	9.37	8.72
	Median	8.85	9.00	8.50	9.00	10.75	8.40	9.00	8.40
	Max	15.60	15.60	11.80	15.60	11.30	11.80	15.60	11.80
	StdDev	2.29	2.64	1.60	2.64	0.78	1.54	2.59	1.54

Note. All variables are as of 1982, except SPI1 (which is as of 1993).

3.2 Model Estimation

In this dissertation, the probit model is used to estimate the probability of a state enacting the STC program into its UI legislation given a set of state characteristics. When the response y_i is binary, taking the values 1 for an STC state and 0 for a non-STC state, the probit equation is

$$P_i = \Pr(y_i = 1) = F(x_i' \beta), \quad (1)$$

where

β is a vector of parameter estimates,

x_i is a vector of explanatory variables showing the state characteristics, including an intercept term,

P_i is the probability that y_i takes the value 1,

F is the normal cumulative distribution function of standard normal random variable.

In cases where there is only one observation on each decision maker, maximum likelihood methods may be used (Judge et al., 1988, p. 791) due to the independence of the occurrence of each observation. STC enactment decision is such a case in which a state passing the legislation is observed only once. Given a sample of T independent observations, where each observation is on a different state, the likelihood function is

$$L = \prod_{i=1}^T f(y_i) = \prod_{i=1}^T P_i^{y_i} (1 - P_i)^{(1-y_i)} = \prod_{i=1}^T F(x_i' \beta)^{y_i} [1 - F(x_i' \beta)]^{(1-y_i)}, \quad (2)$$

where f is the standard normal distribution function.

The log-likelihood function and the first order condition are

$$\ln L = \sum_{i=1}^T y_i \ln F(x_i' \beta) + \sum_{i=1}^T (1 - y_i) [1 - F(x_i' \beta)], \quad (3)$$

$$\frac{\partial \ln L}{\partial \beta} = \sum_{i=1}^T y_i \frac{f}{F} x_i - \sum_{i=1}^T (1 - y_i) \frac{f}{1 - F} x_i, \quad (4)$$

where $y_i = 1$ if STC is adopted, zero otherwise. This maximization problem cannot be solved directly because the first order derivatives (Equation 4) are highly nonlinear functions of β . Therefore, the log-likelihood function is typically maximized using numerical methods (Judge et al., 1988, p. 792).

In the probit regression, unlike in simple linear regression, the estimated coefficients in β do not indicate the change in the probability of a state enacting STC, given a one-unit increase in an explanatory variable. Rather, the coefficients reflect the effect of a change in an explanatory variable on the inverse of the standard normal cumulative distribution function, F^{-1} , which is a Z-score. For example, the estimated coefficient for the unemployment variable is the difference between the expected Z scores for STC states and non-STC states. Therefore, it is more straightforward and customary to interpret the partial derivatives of probability with respect to an explanatory variable to figure out the marginal effects of a state characteristic on the probability of enacting STC. The partial derivative of probability with respect to an explanatory variable for the probit model can be written as follows:

$$\frac{\partial P_i}{\partial x_{ij}} = f(x_i' \beta) \cdot \beta. \quad (5)$$

Since this partial derivative is a function of all elements of x_i 's, the marginal effects of explanatory variables can only be computed by assigning certain values to x_i 's, such as

the mean values, which is the standard practice. Both the coefficient estimates and the marginal effects are reported for the selected model in Table 5 through Table 8.

To test the factors that affect a state’s decision to adopt the STC legislation, the probit model in Equation 1, combining the variables discussed in the previous section, is estimated.²⁸ The procedure calculates maximum likelihood estimates and drops any observations having missing values for any of the independent variables or the response variables. Therefore, District of Columbia is excluded from the probit estimation because the SPI score is not available for the district.

Both Illinois and Louisiana enacted the program but neither program has ever been implemented. To empirically test whether the characteristics of these two states are in line with STC or non-STC states or different from either group, I estimate three sets of probit models with different versions of STC as the response variable. When the response variable STC is binary as in STC1 and STC3, the probabilities are computed using an ordinary probit model. STC2, on the other hand, is a multinomial response variable and estimated in an ordered probit model.²⁹

Each of the three response variables (STC1, STC2 and STC3) are estimated using the same set of variables such that:

$$\Pr(STC) = F(SPII, \textit{right-to-work laws}, \textit{union density}, \textit{female ratio}, \textit{old to young ratio}, \textit{non-white ratio}, \textit{real per capita personal income}, \textit{share of manufacturing employment}, \textit{unemployment rate}) \quad (6)$$

where F is the cumulative distribution function of a standard normal random variable.

²⁸ The estimation is carried out by using the “probit” procedure of Stata/SE Version 9.0, 2005.

²⁹ STC1 and STC3 variables are binary variables, and estimated by Stata's "probit" command. STC2 is multinomial and estimated as an ordered probit model by Stata's "oprobit" command.

The goodness of fit statistics and parameter estimates for these models are shown in Table 5. “Log Likelihood-Model” (LL) on this table is the value of log likelihood function evaluated at the maximum likelihood estimates of the full model as shown in Equation 3. Log Likelihood-Constant Only (LL0) shows the value of log likelihood function evaluated at the maximum likelihood estimates of the constant-only model, which excludes all the explanatory variables except the intercept term. To test the significance of the model, the likelihood ratio Chi-Square test statistic (Chi2), which is defined as $-2*(LL0 - LL)$, is reported as the goodness of fit statistic. Although there is no R-square statistic for a probit model as in linear regression models, a pseudo R-Square (Pseudo R2) can be computed by $1-(LL / LL0)$. This measure varies between value 0 when the estimated coefficients are zero and value 1 when the model is a perfect predictor such that $\hat{P} = F(x_i' \tilde{\beta}) = y_i$ (Judge et al., 1988, p. 794; StataCorp., 2005, p. 144). Since the probability associated with the *Chi2* is less than 10 percent, the null hypothesis that all coefficients of the explanatory variables are zero is rejected for all three models.

Coefficient estimates in probit models allow interpreting the direction of the effects but the marginal effects are easier to interpret the magnitudes of these effects. Tables 6, 7, and 8 show the marginal effects evaluated at the mean values of each variable on the probability of program adoption. Political ideology index (SPI1), union density, and real per capita personal income are significant at least at 10 percent level in all three models.

A positive SPI1 coefficient estimate from the probit model indicates that liberal states are more likely to adopt STC. In the STC1 model, a one-percentage point increase in SPI1, i.e. a one-percent shift towards being more liberal in a 0-1 political ideology continuum, increases the probit index by 0.055 standard deviations *ceteris paribus* as

shown in Table 5. This translates into a 0.02 increase in the probability of adopting STC as shown in the Marginal Effects table (Table 6).

Higher union density reduces the probability of program adoption. A one-percent increase in union density decreases the probability of adoption by 0.049 in the STC1 model as shown in Table 5. Union density has a similar effect on the probability in STC2 and STC3 models. This is probably because unions fought hard for the seniority rule and reluctant to concede that right to STC, under which work sharing affects all employees in a work unit regardless of their seniority.

An increase in real per capita personal income in a state yields a statistically significant increase in the probability of program adoption. Real per capita personal income in 1982 in the STC states is \$19,083 on average, which is higher than the non-STC average of \$17,915. A \$1,000 increase in per-capita income causes a 0.178 increase in the probability of adopting STC.

Female ratio is a significant factor in STC1 and STC2 models with the largest coefficient estimate among all the other explanatory variables. Females constitute 50.7 percent of the population between ages 20 and 64 in 1982. While this ratio is slightly higher in STC states (50.98 percent), it is lower in non-STC states (50.53 percent). Although the difference in female ratio between the STC and non-STC states does not seem to be large enough to cause such a significant impact on states' STC decision, it is important to note that female ratio does not vary much overall and any small and consistent difference between STC and non-STC states will have a sizeable impact. A one-percent increase in female ratio causes a 0.448 increase in the probability of adopting STC. Although empirical studies of STC programs (Kerachsky et al. 1986, Walsh et al., 1997)

showed no significant affirmative action gains from implementing the program, the perception of it when STC was promoted and introduced was that STC would provide better job protection to women (as well as minorities and younger workers) who usually had shorter job tenures than their counterparts. Combining this perception with the steady increase in the female labor force participation rate, one of the major aspects of the labor market for the last half century, can help explain the significance of the female coefficient. The trend in the labor force participation rate of minorities and youth has been less pronounced than that of women, and their (old-to-young ratio and non-white ratio) effects on the probability in this model are not significant.

Female ratio is not significant in STC3, probably because female ratios for Illinois (0.5111) and Louisiana (0.5142) are closer to the average female ratio of STC states (0.5095) although they are classified as non-STC states whose average female ratio is 0.5057.

Right-to-Work laws and unemployment rate estimates are positive in three models but they are never significant. Excluding right-to-work law variable from these probit models has almost no effect. In addition, if the three states that adopted right-to-work laws after 1982 (Idaho, Oklahoma, and Texas; shown in Table 2) are assumed to be right-to-work states, the probit model's predictions do not change. The same variables are statistically significant and the changes in coefficient estimates are minimal. A change in unemployment rate is not expected to have an immediate impact on a state's STC adoption decision. Therefore, these probit models are also estimated using the change in unemployment rate between 1981 and 1982 as well as using the change in unemployment rate between 1980 and 1981. In either case, however, unemployment rate is not significant,

the same variables continue to be statistically significant, and the change in coefficient estimates is minimal compared to using 1982's unemployment rate.

Although share of manufacturing employment has the unexpected sign and reduces the probability of STC adoption, it is never significant. Given that STC is viewed as a policy to help mostly the manufacturing industry and the negative and significant coefficient estimate for union density in the model, the unions' influential presence in the industry is a probable cause for the negative estimate.

STC2 represents a ranking among states that have not adopted the program, states that adopted the program but then discontinued, and states that adopted and kept the program; but the differences among these adjacent categories cannot be treated as the same. The STC2 model estimates probabilities for a response with these three categories using ordinal probit estimation technique. A single set of marginal effects cannot be produced in this case. For each outcome of the response variable, marginal effects are generated separately as shown in Table 7. The upper panel shows that the marginal effect of a variable would induce a change in the probability of being a non-STC state instead of being a state that has discontinued the program or being a state that has adopted and kept the program. The middle panel shows that the marginal effect of a variable would induce a change in the probability of being a state that has discontinued the program instead of being a non-STC state or being a state that has adopted and kept the program. None of the estimates are statistically significant in this panel, implying that none of the variables help explain the probability of adopting and then discontinuing the program or Illinois and Louisiana need not to be categorized as a separate group.

The analysis year in these models is 1982, the year when the first federal legislation providing program guidelines was adopted. By 1982, all states were aware of STC and could have adopted then but states who adopted the program did so in different years. California is the only state that adopted the program before 1982 and all the other states and the federal legislation used its program as a guideline. To test the uniqueness of California, California was dropped from the probit models. The results do not change in any major way. The changes in coefficient estimates were minute and the significance of the variables did not change except for union density in STC3 model.

In addition to the set of explanatory variables discussed above, the rate of short-time work without UI compensation for the reduced hours (STW) is also considered an independent variable affecting states' adoption decision because if STW is high, an STC program would mostly benefit those who are already on STW and be less effective in achieving its main objective of reducing layoffs. However, I find that STW is not statistically significantly different between STC and non-STC states, therefore, not expected to have an effect in the adoption probability in this model. A detailed discussion of STW is provided in Chapter 5.

The probit model estimated in this section uses time-dependent covariates as of 1982. Since most states adopted the program after 1982, it is important to incorporate the effect of changes in covariates over time on the adoption probability. Hence, a hazard model with time-varying covariates is estimated in the next section.

Table 5

Probit Model Coefficient Estimates

Response Variable	STC1	STC2	STC3
Model Statistics			
Observations	50	50	50
Pseudo R2	0.331	0.279	0.306
Chi2	21.976	22.094	19.598
Log Likelihood-Model	-22.215	-28.550	-22.253
Log Likelihood-Constant Only	-33.203	-39.597	-32.052
Degrees of Freedom	9	9	9
Prob>Chi2	0.009	0.009	0.021
Coefficient Estimates			
SPI1	0.055*** (0.004)	0.056*** (0.003)	0.054*** (0.005)
Right-to-Work Laws	0.624 (0.351)	0.555 (0.401)	0.447 (0.511)
Union Density	-0.134* (0.050)	-0.134** (0.040)	-0.129** (0.049)
Non-White Ratio	-0.043 (0.171)	-0.043 (0.151)	-0.041 (0.169)
Female Ratio	1.229** (0.028)	1.051** (0.041)	0.808 (0.129)
Old-to-Young Ratio	-0.043 (0.576)	-0.025 (0.734)	-0.003 (0.969)
Real Per Capita Personal Income ('000s)	0.488*** (0.004)	0.462*** (0.004)	0.418** (0.011)
Share of Manufacturing Employment	-0.078 (0.136)	-0.062 (0.200)	-0.042 (0.406)
Unemployment Rate	0.189 (0.25)	0.152 (0.331)	0.107 (0.498)
Constant	-69.496** (0.010)		-48.902* (0.054)
cut1:Constant		60.832** (0.014)	
cut2:Constant		60.991** (0.014)	

Note. P-values are shown in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 6

Probit Model Marginal Effects: STC1 as the Response Variable

$y = \text{Pr}(\text{stc1}) = 0.33672545$	dy/dx	SE	z	P> z	95% CI	Mean
SPI1	0.020	0.007	2.87	0.004 ***	[0.006,0.034]	49.505
Right-to-Work Laws ^a	0.231	0.246	0.94	0.347	[-0.25,0.713]	0.380
Union Density	-0.049	0.024	-2.00	0.045 **	[-0.097,-0.001]	19.706
Non-White Ratio	-0.016	0.011	-1.39	0.164	[-0.038,0.006]	15.797
Female Ratio	0.448	0.204	2.20	0.028 **	[0.049,0.848]	50.700
Old-to-Young Ratio	-0.016	0.028	-0.56	0.576	[-0.071,0.039]	48.800
Real Per Capita Personal Income	0.178	0.061	2.93	0.003 ***	[0.059,0.297]	18.359
Share of Manufacturing Employment	-0.028	0.019	-1.47	0.141	[-0.066,0.009]	18.392
Unemployment Rate	0.069	0.059	1.16	0.245	[-0.047,0.185]	9.150

Note. CI = confidence interval

^a dy/dx is for discrete change of dummy variable from 0 to 1

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 7

Probit Model Marginal Effects: STC2 as the Response Variable

$y = \Pr(\text{stc2}=0) = 0.66624025$	dy/dx	SE	z	P> z	95% CI	Mean
SPII	-0.020	0.007	-2.97	0.003 ***	[-0.034,-0.007]	49.505
Right-to-Work Laws ^a	-0.205	0.243	-0.84	0.399	[-0.681,0.271]	0.380
Union Density	0.049	0.023	2.10	0.036 **	[0.003,0.094]	19.706
Non-White Ratio	0.016	0.011	1.46	0.145	[-0.005,0.037]	15.797
Female Ratio	-0.382	0.186	-2.06	0.04 **	[-0.746,-0.018]	50.700
Old-to-Young Ratio	0.009	0.027	0.34	0.734	[-0.044,0.062]	48.800
Real Per Capita Personal Income	-0.168	0.058	-2.91	0.004 ***	[-0.281,-0.055]	18.359
Share of Manufacturing Employment	0.023	0.018	1.27	0.203	[-0.012,0.057]	18.392
Unemployment Rate	-0.055	0.056	-0.98	0.327	[-0.166,0.055]	9.150

$y = \Pr(\text{stc2}=1) = 0.05572666$	dy/dx	SE	z	P> z	95% CI	Mean
SPII	0.002	0.001	1.14	0.255	[-0.001,0.004]	49.505
Right-to-Work Laws ^a	0.014	0.018	0.77	0.441	[-0.021,0.048]	0.380
Union Density	-0.004	0.004	-1.04	0.298	[-0.011,0.003]	19.706
Non-White Ratio	-0.001	0.001	-0.92	0.356	[-0.004,0.001]	15.797
Female Ratio	0.030	0.028	1.06	0.291	[-0.025,0.085]	50.700
Old-to-Young Ratio	-0.001	0.002	-0.33	0.743	[-0.005,0.004]	48.800
Real Per Capita Personal Income	0.013	0.012	1.12	0.262	[-0.01,0.036]	18.359
Share of Manufacturing Employment	-0.002	0.002	-0.9	0.369	[-0.006,0.002]	18.392
Unemployment Rate	0.004	0.006	0.75	0.453	[-0.007,0.016]	9.150

$y = \Pr(\text{stc2}=2) = 0.27803309$	dy/dx	SE	z	P> z	95% CI	Mean
SPII	0.019	0.006	2.94	0.003 ***	[0.006,0.031]	49.505
Right-to-Work Laws ^a	0.191	0.229	0.83	0.404	[-0.258,0.641]	0.380
Union Density	-0.045	0.021	-2.10	0.036 **	[-0.087,-0.003]	19.706
Non-White Ratio	-0.015	0.010	-1.46	0.145	[-0.034,0.005]	15.797
Female Ratio	0.352	0.172	2.05	0.04 **	[0.015,0.69]	50.700
Old-to-Young Ratio	-0.008	0.025	-0.34	0.734	[-0.057,0.04]	48.800
Real Per Capita Personal Income	0.155	0.053	2.91	0.004 ***	[0.051,0.26]	18.359
Share of Manufacturing Employment	-0.021	0.016	-1.27	0.205	[-0.053,0.011]	18.392
Unemployment Rate	0.051	0.052	0.98	0.326	[-0.051,0.153]	9.150

Note. CI = confidence interval

^a dy/dx is for discrete change of dummy variable from 0 to 1

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

Table 8

Probit Model Marginal Effects: STC3 as the Response Variable

$y = \text{Pr}(\text{stc3}) = 0.28465605$	dy/dx	SE	z	P> z	95% CI	Mean
SPII	0.018	0.006	2.83	0.005 ***	[0.006,0.031]	49.505
Right-to-Work Laws ^a	0.155	0.238	0.65	0.515	[-0.312,0.623]	0.380
Union Density	-0.044	0.022	-2.02	0.043 **	[-0.086,-0.001]	19.706
Non-White Ratio	-0.014	0.010	-1.39	0.164	[-0.034,0.006]	15.797
Female Ratio	0.274	0.181	1.51	0.131	[-0.082,0.63]	50.700
Old-to-Young Ratio	-0.001	0.027	-0.04	0.969	[-0.053,0.051]	48.800
Real Per Capita Personal Income	0.142	0.054	2.6	0.009 ***	[0.035,0.248]	18.359
Share of Manufacturing Employment	-0.014	0.017	-0.82	0.41	[-0.048,0.019]	18.392
Unemployment Rate	0.036	0.053	0.68	0.496	[-0.068,0.141]	9.150

Note. CI = confidence interval

^a dy/dx is for discrete change of dummy variable from 0 to 1

* significant at 10 percent; ** significant at 5 percent; *** significant at 1 percent.

3.3 An Alternative: Analysis of Time to Program Adoption

A survival model is estimated in this section to test the factors that affect the time passed until a state adopted the program.

3.3.1 Hazard Model with Time-Varying Covariates

Survival models analyze the time to the occurrence of an event, in this case, a state's adoption of STC. The hazard function, or the hazard rate, specifies the instantaneous rate of adoption at time t and indicates the way the risk of adoption varies with time.

Assuming that a state's time until adoption (T) of STC is discrete, the hazard rate for such a discrete-time process is:

$$h(t) = \text{Pr}(T = t | T \geq t) \tag{7}$$

That is, the hazard rate is the probability of adopting STC during period t . Next, assume that each state faces some function of the hazard that every other state faces (baseline

hazard), modified by its own characteristics. A common way to parameterize such a function is

$$h(t | \mathbf{X}) = h_0(t) \exp(\beta' \mathbf{X}), \quad (8)$$

with $h_0(t)$ baseline hazard function, \mathbf{X} a $p \times 1$ vector of covariates, and β a $p \times 1$ vector of regression coefficients. The baseline hazard corresponds to the case where $\mathbf{X} = \mathbf{0}$. The models are called the Cox proportional hazard models in which covariates have a multiplicative effect on the hazard function (Lawless, 2003, p. 341) and the baseline hazard function is not required to be specified (Jones & Branton, 2005). Given the time-invariant covariates, this model implies that the ratio of hazards of two states is constant over time, hence the term proportional.

The Cox proportional hazard models can be modified to incorporate time-varying covariates, which is necessary in my analysis because all variables vary over time across states, except the political ideology index. The Cox regression with both time-invariant and time-varying covariates assumes the relationship

$$h(t) = h_0(t) \exp[(\beta_1 x_1 + \dots + \beta_k x_k) + (\varphi_1 z_1 + \dots + \varphi_m z_m)], \quad (9)$$

where $h_0(t)$ denotes the baseline hazard function, x_1, \dots, x_k are the time-invariant covariates z_1, \dots, z_m are the time-varying covariates, and β_j and φ_i are regression coefficients. In this case, the baseline survival function is the percentage of states that would have not adopted the program based on time alone when all covariates are equal to zero. However, the ratio of hazards of two states is no longer assumed to be constant over time with the time-varying covariates.

3.3.2 Description of Data and Variables

The same set of political, demographic, and economic variables used in the probit model described are used in the Cox model, Equation 9, to determine the relationship between these factors and the time to a state's adoption of STC. As discussed in the introduction of this chapter, states started to discuss STC in 1975 as an affirmative action tool and to emphasize work sharing as an alternative to layoffs. Thus, I take 1975 as the first year in which states face a positive probability of adoption. An analysis database with each state's political, economic, and demographic variables between 1975 and 1999 is built. 1999 is the latest year for which the demographic variables are available. Therefore, it is the last year in the analysis database. During this 24-year period, 19 states adopted the program starting with California in 1978 and ending with Minnesota in 1994 but, as evidenced by North Dakota's pilot project implementation in 2006, states have been subject to risk of adoption even after 1994.

The event or the censor variable indicates whether a state adopted the STC program. Similar to the probit model, I estimate three sets of models with different versions of STC. Recall that the difference among these versions is the way Illinois and Louisiana are treated. First, STC1 is a binary sequence where 0 denotes non-adoption in a given year and 1 indicates adoption. The data for the states that adopted the program have one observation per year between 1975 and the year of adoption. After the adoption year, these states drop out of the risk pool. That is, a state can adopt STC only once. Once adopted, a state no longer faces a risk of adoption again. States that have never adopted the program between 1975 and 1999 have one observation for each year and they continue to face the

risk of adoption every year. Illinois and Louisiana adopted STC in 1983 and 1986, respectively. Both programs became obsolete in 1988. They are treated the same way as the other states that adopted and kept their programs. Second, under STC2, these two states never leave the risk pool but the years between the program adoption and 1988 are flagged as adoption years. Years from 1988 to 1999 are flagged as non-adoption years. Finally, STC3 considers these two states as if they never adopted the program and treats them the same way the states that have never adopted program. That is, they continue to face the risk of adoption throughout the analysis period.

The only time-invariant covariate is the state political ideology index. All other covariates are time-varying and have values for all the years between 1975 and 1999 for the non-STC states and for the years between 1975 and the adoption year for the STC states.

3.3.3 Estimation of the Hazard Function with Time-Varying Covariates

A hazard function is the estimate of the ratio of the hazard rate given a one unit increase in the covariate to the hazard rate without such an increase. The hazard function estimated here depends on both time-invariant and time-varying covariates.

The goodness of fit statistics and hazard ratio estimates for these models are shown in Table 9. The goodness of fit statistic for these models is the likelihood ratio Chi-Square test statistic. This statistics is significant in all three models, implying that the covariates in these models have more explanatory power than a time-only model.³⁰

³⁰ To test for the unobserved heterogeneity in the hazard model with time-varying covariates, a shared-frailty model is also estimated. In shared-frailty models, the frailties represent unobservable differences across states and are assumed to be gamma distributed. The results suggest that the unobserved heterogeneity problem cannot be ruled out. In the shared-frailty model, the model's explanatory power declines and the female coefficient becomes completely insignificant.

Table 9

Hazard Model with Time-Invariant and Time-Varying Covariates: Hazard Ratio Estimates

Event Variable	STC1	STC2	STC3
Model Statistics			
Observations	955	984	955
No of Event Occurences	19	26	17
Chi2	40.89	62.32	31.56
Log Likelihood	-95.74	-129.26	-87.83
Degrees of Freedom	9	9	9
Prob>Chi2	0.0000	0.0000	0.0002
Hazard Ratios			
SPI1	1.055*** (0.006)	1.048*** (0.010)	1.056*** (0.007)
Right-to-Work Laws	1.838 (0.507)	1.193 (0.836)	1.876 (0.516)
Union Density	1.021 (0.749)	1.038 (0.523)	1.027 (0.694)
Non-White Ratio	0.964* (0.092)	0.976 (0.212)	0.959* (0.075)
Female Ratio	3.518*** (0.007)	3.402*** (0.002)	3.175** (0.022)
Old-to-Young Ratio	0.779*** (0.000)	0.766*** (0.000)	0.793*** (0.000)
Real Per Capita Personal Income ('000s)	1.094 (0.278)	1.073 (0.348)	1.081 (0.375)
Share of Manufacturing Employment	0.917 (0.131)	0.936 (0.170)	0.928 (0.241)
Unemployment Rate	1.507*** (0.001)	1.567*** (0.000)	1.393** (0.015)

Note. P-values are shown in parentheses.

* significant at 10%; ** significant at 5%; *** significant at 1%

The parameter estimates in this table are expressed in terms of hazard ratios. Hazard ratios below 1.0 indicate that higher levels of covariates reduce the likelihood of program adoption. The estimated hazard rate for SPI1 is greater than 1 in all three models, implying that more liberal states (as they have higher SPI1 scores) have a higher chance of adopting STC than less liberal states. The effect of SPI1 is small but significant at 1 percent level in all three models.

As expected, a higher unemployment rate significantly increases the probability of adoption. Recessions and high unemployment periods are times when policy makers are more focused on work sharing schemes such as STC policies to reduce unemployment (Balducci & Wandner, 2007). I find that having right-to-work laws or higher union density also increases the chance of adoption but this effect is not significant in any of the models. Given that the right-to-work laws were adopted long before STC and they may be no longer relevant to STC policy discussions and that union's support for the program has been trivial, not finding significant results is not surprising. Furthermore, real per capita personal income has no significant effect on the hazard rate.

Female ratio, as in the probit model, has a large and significant effect on the probability of adoption. This is probably because the female labor force participation rate has been rising and female ratios of STC and non-STC states are very close but it is always higher in the STC states. Thus, a slightest increase in female-ratio results in a very large increase in the probability. That is, states with higher female working and voting age population are more likely to adopt the program.

An estimated hazard ratio less than 1 indicates that the hazard rate decreases in value as the covariate increases. Consequently, a higher non-white ratio implies a lower probability of adoption in all models, contrary to the expectation that STC could be used as an affirmative action tool. The estimates are significant in STC1 and STC3 models only at 10 percent level and not significant in STC2 model. These barely statistically significant results are consistent with the fact that the affirmative action concerns have diminished since the initial STC discussions in late 1970s.

The hazard ratio estimate for old-to-young ratio is significant and less than 1, indicating that states with older population are less likely to adopt the program. An indirect effect of seniority rule seems to be at play here. Workers with longer tenure are usually older and as the population gets older, the seniority rule as opposed to STC may provide better job protection for such workers.

Share of manufacturing employment and union density are found to have opposite but not significant impact on the probability, implying that they do not have any effect on a state's adoption decision.

3.4 Conclusion

Using probit and hazard model with time-varying covariates, I analyze the factors affecting a state's decision to enact STC into its unemployment insurance legislation. Although the probit estimates reflect the state characteristics in a single year (1982, the year in which the federal STC bill was passed), the hazard model uses 24 years of information (from the onset of STC discussions in 1975 to 1999), the results of two analyses are consistent.

Strong taste for greater government involvement in the economy affects states' STC adoption decision. Political ideology and level of unionism are indicators of a state's tendency towards progressive labor laws. Liberal political ideology is found to be a significant factor in both models. Opposition to STC by organized labor in the early years of STC is embodied by the negative and significant estimate of union density variable in the probit model. The reversal of unions' position on STC and decreasing level of unionism are reflected by an insignificant but positive coefficient estimate in the Cox model, which incorporates the trends in a 24-year period and the transition of union's position through time. Right-to-work laws seem to be unrelated to states' STC decisions at all since right-to-work law indicator is not significant in either model³¹.

Recessions and high unemployment periods are times when policy makers are more focused on work sharing schemes to reduce unemployment. Not surprisingly, high unemployment rate increases the adoption probability and is found to be significant in the Cox model but not in the probit model.

Higher working and voting age, and higher female population significantly increase the probability of adoption in both models. Apparently, the share of the female population is significant in both probit and survival models probably because the increasing female participation in the labor force makes women a major voting block that state legislators take into account.

The share of the minority population is not significant in the probit model and is barely significant in the survival model, suggesting that STC is not perceived to be a

³¹ Excluding right-to-work law variable from either model has almost no effect. The same variables are statistically significant when this variable is excluded and the change in coefficient estimates is minimal.

powerful affirmative action tool. The significant female coefficient in both models is probably because female ratios of STC and non-STC states are very close but it is always higher in the STC states. Therefore, even a slightest increase in female-ratio results in a very large increase in the probability.

Interestingly, both models find that the share of manufacturing employment does not play a role in a state's STC adoption decision even though the manufacturing sector is the major user of the program.

CHAPTER 4: SHORT-TIME COMPENSATION IN THEORY: LITERATURE REVIEW

The theoretical literature suggests that, *ceteris paribus*, demand for STC should be strong, but it is not. This prediction is inconsistent with the observed utilization rate of STC in the U.S. Even 30 years after adoption of such programs, few firms find them attractive. In this chapter, I review the STC literature and discuss the U.S. STC program features that differ from the model assumptions in this literature regarding experience rating, UI tax rates, and the generosity of STC benefits. The objective is to isolate those assumptions that lead to that apparently erroneous conclusion and investigate whether these assumptions are violated in practice.

A common argument in the literature is that changes in the tax system that finances unemployment insurance (UI) might be needed to make work sharing preferred to layoffs. Two major changes associated with the tax system are: (a) increasing the experience rating of the UI benefit charges and (b) increasing the taxable base wage (Feldstein, 1976; Burdett and Wright, 1989b; Fitzroy & Hart, 1985; Hamermesh, 1978; Hamermesh, 1990; Jehle & Lieberman, 1992). If unemployment benefits are paid only to workers who are laid off and taxes only partially cover the firm's benefit payout, then the firm is effectively subsidized to reduce labor inputs through layoffs rather than hours. If STC is introduced into the system with similar imperfect experience rating of taxes, that tax advantage of layoffs vanishes. More generally, it is important to know whether STC is more or less effectively experience rated than layoffs.

Another aspect of the UI tax system in the U.S. is that the taxable wage base is low compared to actual earnings, essentially making the UI tax a fixed cost of employment. If the firm lays workers off and rehires new workers within the same year, it pays twice the tax it would if it kept them employed and reduced their hours. Hence, the firm can reduce its UI tax costs by maintaining a steady workforce. This chapter is organized as follows: The next section describes the model developed by Burdett and Wright (1989b). In section 4.2, I discuss Van Audenrode's model (1994) that analyzes the impact of more generous STC benefits on work sharing and layoff decisions. Next, I discuss the fixed costs of employment and distinguish between the effect of UI taxable wage base and fringe benefits on work sharing and layoff decisions in Section 4.3. I finish the chapter with a discussion of STC's impact on.

4.1 Experience Rating and STC in Burdett and Wright Model

The most prominent theoretical study of the properties of STC is Burdett and Wright (1989b). Their study compares an STC system (European) with a non-STC system (American) within a standard labor contracting framework with UI based on Feldstein's model (1976). They report that higher experience rating of UI can eliminate layoffs regardless of whether STC exists in the UI system. Their model and the logic of this conclusion are discussed in this section.

The U.S. is unique in financing its UI system through taxes based on the benefit experience of the firm's own workers³². Even in the U.S., experience rating is incomplete, meaning taxes rise less than dollar for dollar with benefit payouts. The incomplete experience rating in the U.S. emerges primarily from the upper and lower limits on UI tax

³² Recently, some OECD countries introduced experience rating of the UI benefits for older workers to reduce the layoffs at old age although this may reduce firms' willingness to hire older workers (Organisation for Economic Co-operation and Development, 2007b, p. 179).

rates. Firms that heavily use layoffs often receive benefits in excess of taxes paid (the required full-funding rate exceeds the maximum rate), while firms with stable labor forces often pay taxes in excess of benefits paid (the full-funding rate is below the minimum tax rate). An extra layoff does not increase the unemployment tax bill for either of these firm types. UI tax payments of those firms below the minimum tax rate are essentially transfers to firms above the maximum tax rate.

In the model developed by Burdett and Wright (1989b), a representative firm is assumed to maximize profits while a large number of identical workers maximize their utilities across leisure and work hours (earnings) and collect UI and STC when available. The firm produces output using labor input and pays wages to its workers and taxes to the government as required. The total number of attached workers is fixed and normalized to one, and workers are risk averse so that they always prefer work sharing to random layoffs without UI benefits.

The representative firm's production function $f = f(l, x)$ is subject to random productivity shocks, x , with $F(x_0) = \text{prob}(x \leq x_0)$, l represents labor input (capital is ignored). The production function is twice continuously differentiable, strictly increasing in both terms with $f_l \rightarrow \infty$ as $l \rightarrow 0$, $f_{ll} < 0$, and $f_{l2} > 0$ so that an interior solution to the firm's profit maximization problem exists. That is, higher values of x indicate higher marginal as well as total product, and therefore, unambiguously indicate better economic times. Labor input is an increasing function of the number of employed workers (n) and hours per worker (h) such that $l = l(n, h)$, $l_1 > 0$, $l_2 > 0$, $l = 0$ if either $n = 0$ or $h = 0$.

In order to separate policy effects of production technology on employment, Burdett and Wright (1989b) assume that production technology is not biased against work

sharing; that is, given the same amount of manhours, the amount of effective labor input generated is higher for the less hours-intensive combination. This assumption is sufficient but not necessary to predict full employment in the absence of UI and STC.

Regardless of this assumption, workers prefer work sharing to random layoffs since the model assumes workers are risk averse (as opposed to Feldstein's (1976) risk neutral workers) and the technology favors work sharing rather than layoffs. Since workers are identical, layoffs are random (for instance, there is no seniority rule). The total number of attached workers is fixed and normalized to 1. Workers have strictly increasing and strictly concave utilities, $U = u(y, 1-h)$, that are defined over income (y) and leisure ($1-h$). The strict concavity of the utility function with income and leisure requires that the matrix of second derivatives, the Hessian matrix, is negative definite.³³

Let μ be marginal rate of substitution, such that:

$$\mu = \mu(y, 1-h) \equiv u_2(y, 1-h) / u_1(y, 1-h) \text{ and } \mu \rightarrow 0 \text{ as } y \rightarrow 0 \text{ and } \mu \rightarrow \infty \text{ as } h \rightarrow 1. \quad (1)$$

Since the total number of workers attached to the firm is normalized to 1, the probability of being employed is $n(x)$ and the probability of being unemployed is $[1-n(x)]$ in state x . Let y_e and y_u represent the representative worker's income when employed and on layoff, respectively. His/her expected utility in state x , then, becomes

$$U(x) = n(x) \cdot u[y_e(x), 1-h(x)] + [1-n(x)] \cdot u[y_u(x), 1]. \quad (2)$$

Employment income (y_e) in state x is defined over contract wage, $w(x)$, hours worked, $h(x)$, and rate of income taxes on employment earnings, t_y , under the American UI system. In addition to employment income, the European system incorporates pro rata

³³ The Hessian matrix is negative definite if $U_{yy} < 0$ and $U_{1-h, 1-h} < 0$, and $U_{yy} \cdot U_{1-h, 1-h} - U_{y, 1-h}^2 > 0$.

benefits, g , for reduced hours when a worker is employed. These benefits are taxed at a rate, t_g , lower than the rate of income taxes on employment earnings, t_y .³⁴

$$\text{American: } y_e(x) = w(x) \cdot h(x) \cdot (1 - t_y), \quad (3)$$

$$\text{European: } y_e(x) = w(x) \cdot h(x) \cdot (1 - t_y) + g \cdot [1 - h(x)] \cdot (1 - t_g). \quad (4)$$

In case of layoffs, $h(x) = 0$, the representative firm makes direct payments, $b(x)$ to laid-off worker, and the worker collects after tax UI benefits, $g \cdot (1 - t_g)$, under both American and European systems:

$$\text{American and European: } y_u(x) = b(x) \cdot (1 - t_y) + g \cdot (1 - t_g). \quad (5)$$

Equation 5 provides a general model for tax rates on regular income and UI benefits as developed by Burdett and Wright (1989b). In the U.S. and Canada, and at least some other European countries, the tax rate on benefits is same as on other income.³⁵

Firms will choose, in the absence of government intervention through UI or employment protection laws, to meet negative demand shocks through reduced hours given that firm size (number of attached workers) is fixed, workers are risk averse and technology is not biased against work sharing. Without assuming that technology is not biased against work sharing, layoffs can occur along with work sharing. Miyazaki and Neary (1985) argue

³⁴ If UI benefits are not taxed at all (as it was the case in the U.S. before 1979), the rate at which the benefits replace wages may vary across individuals and may result in very large replacement rates for some (Nicholson & Needels, 2006) because of the variation in taxation of other compensation. Taxation of UI benefits effectively reduces these benefits but eliminates the distortion in firms' layoff decisions (Feldstein, 1978). Taxing UI benefits at a rate lower than other compensation may increase the net benefits for beneficiaries without increasing the level of benefits.

³⁵ Among the OECD countries, the U.S., Canada, Iceland, the Netherlands, Norway, Poland, and Sweden, impose regular income tax on UI benefits. Denmark, Finland, France, Hungary, Italy, Luxemburg, Spain, and Switzerland impose lower tax rates. Long-term benefit recipients do not pay taxes on UI benefits in Belgium, Ireland, and the U.K. In Czech Republic, Greece, Portugal, Slovak Republic, and Turkey, no taxes are levied on UI benefits. In Austria and Germany benefits are calculated as a proportion of after-tax income, hence not taxable (Organisation for Economic Co-operation and Development, 2007a, p. 58).

that layoffs may occur with a Cobb-Douglas production function $l(n, h) = n^\alpha \cdot h^\beta$ if α is very small compared to β and the state of the economy, x , is bad enough.³⁶

UI for layoffs would cause firms to use layoffs during demand downturns when unemployment benefits are not fully experience rated. Incomplete experience rating provides a subsidy to layoffs by shifting part of the cost of UI to the public. This subsidy has to be sufficiently large so that workers would accept increased risk of being laid off as part of the equilibrium contract.

Under the UI system without STC (American) in Burdett and Wright (1989b), there is no compensation for hours reduction. Therefore, government UI benefits received by a given worker is $G = g$ if $h = 0$, and $G = 0$ if $h > 0$. Under the UI system with STC (European), government UI benefits received by a given worker can be written as:

$$G = g[(H - h) / H] \text{ if } h < H \text{ and } G = 0 \text{ if } h \geq H, \quad (6)$$

where H is normal hours and set to equal to 1. Wright and Hotchkiss (1988) note in a similar model that G is normalized so that the worker receives the same benefits under either the American or European system when $h = 0$.

Then, the employer pays the taxes (t) to finance the government UI benefits such that $t = eG^T + T$. Here, G^T represents total benefits paid to the average worker who started the period attached to the firm and T is the lump sum tax. The experience rating factor e varies between 0 and 1. It is more complicated in the U.S. than is shown here but effectively $e < 1$.

The representative firm's objective is to maximize its expected utility. In this model the firm can be risk neutral or risk averse. That is, its utility over profits $v(\pi)$ is strictly

³⁶ State of the economy is indicated by the price of the firm's output in Miyazaki and Neary (1985).

increasing ($v' > 0$) and weakly concave ($v'' \leq 0$), where $\pi(x)$ is profit net of the firm's UI tax bill:

$$\pi(x) = f[l(x), x] - n(x)h(x)w(x) - [1 - n(x)]b(x) - t(x). \quad (7)$$

Under the American system, the firm's UI tax bill is the sum of experience rated unemployment benefits and a lump sum tax.

$$t(x) = eg[1 - n(x)] + T. \quad (8)$$

European UI systems provide benefits to the unemployed and short-time compensation to those on reduced hours. Firing restrictions, such as advance notice and severance payments (direct payments from firms to the unemployed), are common but vary across countries. These UI systems are financed through non-experience rated taxes and contributions paid by employers and/or employees and specifically designated to make UI benefit payments. In case of deficits, revenues from general taxation are used (Organisation for Economic Co-operation and Development, 2007, p. 163). Non-experience rated taxes imply that $e = 0$. However, in its general form, the UI tax bill for a European firm can be written to incorporate STC benefits as follows.

$$t(x) = eg[1 - n(x)] + egn(x)[1 - h(x)] + T = eg[1 - n(x)h(x)] + T. \quad (9)$$

Burdett and Wright (1989b) solve the following optimization problem to give us the equilibrium contract. The representative firm maximizes its expected utility across all states given that the worker's expected utility across all states exceeds the reservation utility, \underline{U} .

$$\max EV = \int V(x)dF(x) \quad (10)$$

$$\text{subject to } EU = \int U(x)d(F(x)) \geq \underline{U}, n(x) \leq 1 \text{ for each } x,$$

where $V(x)$ is the employer's utility in state x , and EV depicts the expected value of the employer's utility across all states. In the absence of government intervention through UI or

employment protection laws, firms will choose to meet negative demand shocks through reduced hours because workers are risk averse and technology is not biased toward layoffs. However, when technology is biased towards layoffs, layoffs can occur even though workers prefer work sharing.

Under both the American and European UI systems, if the experience rating is complete and taxes on unemployment benefits and wage income are treated equally ($t_y = t_g$), the layoff subsidy disappears and firms will employ all the attached workers as in the absence of UI in Burdett and Wright (1989b). In addition, if the taxes on unemployment benefits and wage income are eliminated, then the optimal contract suggests efficient hours (marginal product of labor equals the marginal rate of substitution).

Burdett and Wright (1989b) conclude that random layoffs dominate work sharing if UI benefits (g) are sufficiently large to compensate for a potential reduction in output, which occurs when technology is not biased toward layoffs. Then, the firm can get the public sector to subsidize its operations if and only if layoffs are part of its contract in the American UI system. Of course, if the technology is biased toward layoffs, it is easier to get unemployment in the optimal contract.

As long as the assumption that production technology is not biased against work sharing is imposed and $u(\cdot)$ is concave, existence of STC along with regular UI always results in employment, though possibly reduced hours, of all attached workers. In addition, if this system is completely experience rated, the efficient hours will prevail as well. Otherwise, there will be underemployment. This can be observed in the following equation that Burdett and Wright (1989b) derive from the first order conditions of the optimization problem in Equation 10: $f_1(l,x)l_2(n,h) = \mu n + (1-e)gn$. Assuming a standard labor input

function, $l = nh$ guarantees full employment, $n = 1$ under the European system, in which $f_l(h, x) = \mu + (1-e)g$. This shows that the marginal product exceeds marginal rate of substitution (underemployment).

In summary, under certain policy parameters, an incompletely experience rated UI system with no STC causes firms to employ layoffs excessively during demand downturns when the unemployment benefits are not fully experience rated. If experience rating is complete and taxes on unemployment benefits and wage income are treated equally, the layoff subsidy disappears and firms will employ all the attached workers as in the absence of UI if the technology is not biased against work sharing. When STC is introduced into the system, however, the optimal contract leads to reduced hours and full employment, at least when firms are not worse off with work sharing. Incomplete experience rating in this case will lead to inefficient hours while complete experience rating will lead to efficient hours. It is important to note that the assumption that technology is not biased against work sharing is crucial for the Burdett and Wright (1989b) model to predict full employment when STC is present in the UI system.

These predictions of the Burdett and Wright (1989b) model also depend importantly on the assumption that firm size is fixed. An increase in experience rating reduces unemployment by increasing the marginal cost of laying off a worker. When the firm size is determined endogenously, however, higher levels of experience rating will reduce not only layoffs but also the number of workers that are hired in the first place, and in contrast to the fixed firm size model, raise hours per worker—making hours reductions less likely (Burdett and Wright 1989a). Hamermesh (1978) made the same prediction earlier and suggested that the firm is likely to be smaller when “faced with an incentive to

pay for short-time work...use [its smaller workforce] intensively at seasonal peaks by paying overtime, and rely on STC during slack times to induce the reduced workforce to remain with the firm” (p. 253).

It is important to note that, in all theoretical models of STC, the experience rating of layoffs and STC are assumed to be equal. However, this assumption is violated by some U.S. programs. Three states (Iowa, Maryland and Rhode Island) charge regular UI benefits paid to all of the base period employers while charging STC benefits only to the work sharing employer.³⁷ This requirement makes the experience-rating of STC higher than that of regular UI because, through the base period charging rule, employers are able to transfer the burden of their layoffs to other employers while this is not possible for the STC employers who are charged for all their STC benefits. In addition, three other states impose higher tax rates on STC charges via surtaxes (Arizona) or higher maximum tax rates (Florida and Missouri) (see Footnote 37). STC and regular UI benefit charges are treated equally in the remaining states with an STC program.

Walsh, London, McCanne, Needels, Nicholson, and Kerachsky (1997) in an extensive evaluation of the U.S. STC programs also provide evidence that firms participating in STC are subject to higher UI tax rates on average than are comparable non-participants because of higher total benefit charges (sum of STC and regular UI benefit charges). Hence, the STC benefit charges appear to be more effectively experience rated than regular UI benefit charges in some states, making the program more expensive for a firm.

³⁷ The details of the program financing rules are provided in Chapter 2.

To illustrate how the employment and hours predictions of the Burdett and Wright model (1989b) would change if the experience rating of layoffs differs from that of STC, I slightly modify their model and rewrite the equation for the firm's taxes $t(x)$ (Equation 9 above) as follows:

$$t(x) = eg[1 - n(x)] + e_{STC} gn(x) [1 - h(x)] + T, \quad (11)$$

where e is the experience rating factor for regular UI benefits for layoffs and different from the experience rating factor for the short-time compensation benefits, e_{STC} . Further, I assume that there exists a constant ρ such that $e_{STC} = (1 + \rho)e$ and $\rho > 0$ to indicate higher experience rating of STC benefits. Of course, it is conceivable to have $\rho \leq 0$ if there is a subsidy for STC. Recall from Equation 9 that $[1 - n(x)]$ is the number of unemployed (or probability of being unemployed since $n(x)$ is normalized to 1), $[1 - h(x)]$ is the percent reduction of hours, and T is the lump sum tax.

Given the new tax equation, the firm's utility in state x becomes

$$V(x) = v[\pi(x)]$$

$$\text{where } \pi(x) = f[l(x), x] - n(x) h(x) w(x) - [1 - n(x)] b(x) - t(x)$$

$$\text{and } t(x) = e g [1 - n(x)] + (1 + \rho) e g n(x) [1 - h(x)] + T. \quad (12)$$

Compared to the original Burdett and Wright model (1989b), allowing higher experience rating for STC increases the firm's tax liabilities by an amount equal to the additional cost of STC benefits borne by the firm due to this high experience rating of such benefits, $\rho e g n(x) [1 - h(x)]$.

Burdett and Wright (1989b) write the Lagrangian function to find an equilibrium contract $C(x) = [n(x), h(x), w(x), b(x)]$ for the maximization problem in Equation 10 as follows:

$$L = \int \{v[\pi(x)] + \lambda[U(x) - \underline{U}] + \theta(x)[1 - n(x)]\} dF(x), \quad (13)$$

where λ and θ are the Lagrange multipliers on the expected utility constraint and the employment constraint ($n(x) \leq 1$), respectively. \underline{U} is the reservation utility and $U(x)$ represents the expected utility of the worker such that

$$U(x) = n(x) u[y_e(x), 1 - h(x)] + [1 - n(x)] u[y_u(x), 1]. \quad (14)$$

When employed, the worker earns wage income and receives STC benefits on the reduced hours such that his/her income is equal to

$$y_e(x) = w(x) h(x) + g [1 - h(x)]. \quad (15)$$

When unemployed he/she collects direct payments from the firm, $b(x)$, and UI benefits, g , such that his/her income is equal to

$$y_u(x) = b(x) + g. \quad (16)$$

For simplicity, the tax rate on wage income and benefits is assumed to be zero in equations 15 and 16. Using equations 12 to 16, the first order conditions for the model in which the experience rating of layoffs differ from that of STC can be written as follows:

$$\begin{aligned} \frac{\partial L}{\partial n} = v'(\pi)[f_1(l, x)l_1(n, h) - wh + b + egh - \rho eg(1 - h)] \\ + \lambda[u(y_e, 1 - h) - u(y_u, 1)] = \theta. \end{aligned} \quad (17)$$

$$\begin{aligned} \frac{\partial L}{\partial h} = v'(\pi)[f_1(l, x)l_2(n, h) - nw + (1 + \rho)egn] \\ - \lambda n[u_2(y_e, 1 - h) - (w - g)u_1(y_e, 1 - h)] = 0. \end{aligned} \quad (18)$$

$$\begin{aligned} \frac{\partial L}{\partial w} = v'(\pi) - \lambda[u_1(y_e, 1 - h)] = 0. \\ \Rightarrow \lambda = \frac{v'(\pi)}{u_1(y_e, 1 - h)} \end{aligned} \quad (19)$$

$$\frac{\partial L}{\partial b} = v'(\pi) - \lambda[u_1(y_u, 1)] = 0. \quad (20)$$

Inserting equations 15, 16, and 19 into Equation 17 and assuming that layoffs are part of the contract ($n < 1$, hence $\theta = 0$) yields the marginal condition of employment:

$$f_1(l, x)l_1(n, h) = y_e - y_u + \frac{u(y_e, 1-h) - u(y_u, 1)}{u_1(y_u, 1)} + (1-e)gh + \rho eg(1-h). \quad (21)$$

The last term in Equation 21, $\rho eg(1-h)$, is the only difference between the original Burdett and Wright model (1989b) and this model; and exists only because I allowed the experience rating factors to differ between STC and layoffs. Since this term is positive, I conclude that a high experience rating of STC compared to layoffs leads to more employment adjustments.

Furthermore, the assumption of different experience ratings yields an hours adjustment response below what is predicted in the original model as the first order condition for hours adjustment (Equation 18) becomes

$$\begin{aligned} & v'(\pi)[f_1(l, x)l_2(n, h) - nw + (1 + \rho)egn] \\ &= \frac{v'(\pi)}{u_1(y_e, 1-h)} n[u_2(y_e, 1-h) - (w - g)u_1(y_e, 1-h)] \\ &\Rightarrow f_1(l, x)l_2(n, h) = \frac{u_2(y_e, 1-h)}{u_1(y_e, 1-h)} n + ng[1 - (1 + \rho)e], \end{aligned} \quad (22)$$

after inserting the value of λ from Equation 19. Assuming a simple case of labor input function where $l = nh$, Equation 22 becomes

$$f_1(l, x) = \frac{u_2(y_e, 1-h)}{u_1(y_e, 1-h)} + g[1 - (1 + \rho)e]. \quad (23)$$

Equation 23 indicates that the marginal product exceeds the marginal rate of substitution by the amount of the non-experience rated portion of the STC benefits, $g[1 - (1 + \rho)e]$ (or the subsidy obtained by the firm due to incomplete experience rating of STC). In the original case (Burdett & Wright, 1989b), this subsidy was equal to $g(1 - e)$ and exceeded the

subsidy in the case shown in Equation 23, because $\rho > 0$ and $e < 1$. In summary, the Burdett and Wright model (1989b) leads to a lower subsidy for hours reduction when experience rating of STC is allowed to be higher than that of layoffs. Interestingly, more complete experience rating of STC does not appear to lead to lower STC use. The six states mentioned earlier in this section that probably experience rate the STC benefit charges more completely than others do not have consistently lower STC use (see tables 5 and 6 in Chapter 2). This observation implies that factors other than experience rating might cause low STC use in the U.S.

4.2 Generosity of STC

An important aspect of most STC programs in the U.S. and abroad is that the STC benefits are calculated as pro-rated share of regular UI benefits. Van Audenrode (1994) develops an implicit contract model to argue that if STC programs are less generous than the regular UI, then the model will predict layoffs and inefficient hours. On the other hand, generous STC programs make work sharing more attractive by reducing workers' layoff incentive caused by the exogenously determined, government-mandated employer-provided severance payments. Furthermore, STC in combination with firing restrictions tilts preferences of workers and firms towards work sharing and provides employment to all the attached workers. Less generous STC programs still provide hours flexibility but their net effect on employment is not clear.

Van Audenrode analyzes the generosity of STC programs and firing restrictions across selected OECD countries using an optimal contracting model with risk neutral, profit-maximizing firms. The financing of UI is not included in this partial equilibrium model and the number of workers attached to the firm is fixed. STC in this model is not

restricted to be proportional to general unemployment benefits and technology is neutral across the hours/employment trade-off in contrast say to Burdett and Wright. Van Audenrode (1994) argues that work sharing will not occur unless government mandated severance payments and STC exist together: The severance payments make layoff option valuable for workers but STC counters this incentive with providing compensation to workers for work sharing. On the other hand, mandatory severance payments make the layoff option costlier and work sharing preferable for firms. The empirical evidence provided by Van Audenrode (1994) shows that countries with generous STC programs adjust total manhours in response to demand fluctuations as quickly as the United States. Similar flexibility does not emerge in countries with less generous STC programs, resulting in underemployment and inefficient work hours.

STC benefits are usually less generous in the U.S. than in other countries although STC benefits are calculated as a pro rata share of regular UI benefits in the U.S. and abroad. The rule of thumb for calculating weekly UI benefits in the U.S. is approximately 50 percent of normal weekly earnings subject to a maximum amount that varies across states (UWC, 2007). An employee experiencing a 20 percent hours reduction would replace 90 percent of his/her usual earnings by participating in STC, through which he/she receives 80 percent in wage income and 10 percent in STC benefits. However, in Germany, regular UI replaces 60 percent of the after-tax-earnings of a worker. If the worker has at least one dependent child, the replacement rate increases to 67 percent (subject to a monthly maximum of EUR 5,400 in gross earnings) (Social Policy Division Directorate of Employment Labour and Social Affairs, Organisation for Economic Co-operation and Development, 2002). The same replacement rates are applied to STC such that a family

head participating in an STC program with 20 percent hours reduction would earn 93.4 percent of his/her usual earnings, 80 percent of which is wage earnings and 13.4 percent is STC benefits (20 percent of the 67-percent replacement rate)(Vroman, 2009). In summary, less generous benefits may be one of the reasons for the low STC use in the U.S.

4.3 UI Tax Wage Base and Fringe Benefits as Fixed Cost

In the U.S., on average, the total cost of employee compensation to civilian employers is \$29.52 per hour worked. About 69.6 percent of this is wages and salaries, and the other 8.8 percent is insurance benefits (health, life, and disability insurance). Federal and state UI costs on average in the U.S. across all states are only 0.7 percent of the total cost (United States Department of Labor Bureau of Labor Statistics, 2010, June). UI tax wage bases are often fixed costs of labor. While UI taxes are often per-worker fixed cost, fringe benefits are in the form of per hour fixed costs, therefore, their effect on hours-employment decision can differ. In this section, I discuss the impact of UI tax and fringe benefits on work sharing.

4.3.1 UI Tax Wage Base

Neither of the Burdett and Wright models considers fringe benefits as part of the optimization question. In the endogenous firm size model (Burdett & Wright, 1989a), the firm's UI tax bill is defined as, $t = e \cdot g \cdot (N - n) + \delta \cdot N + T$, where $\delta \cdot N$ is a payroll tax (or a subsidy if $\delta < 0$) and hours per worker are indivisible.³⁸ Hence UI taxes become fixed costs in the model without STC. A high δ increases the UI tax burden and reduces the profits for the firm. The payroll tax, δ , in Burdett and Wright (1989a) can be thought of as

³⁸ This term does not exist in the previous model (Burdett & Wright, 1989b) because the firm size, N , is fixed there. The lump sum tax T could be set to balance this firm's UI budget in the long term, but a balanced budget does not necessarily avoid distorting effects of experience rating (e) and unemployment insurance benefits (g). Burdett and Wright (1989a) suggest in a multi-firm model that taxes on one firm could subsidize the UI account of another over time.

the taxable wage base in practice such that if a firm lays workers off and rehires new ones in a year, it pays δ twice the UI taxes it would if it kept them employed and reduced their hours. Hence, the firm can reduce its UI tax costs by maintaining a steady workforce.

In addition, Hamermesh (1990) argues that firms tend to employ more skilled workers with higher wages because of the low tax base, and rely on overtime in expansionary periods and normal hours during the downturns. Low-skilled workers, on the other hand, are more likely to be laid off. Levenson (2001) appears to confirm this; hours reductions are more prevalent in industries such as manufacturing and construction, and in jobs such as skilled laborers.

4.3.2 Fringe Benefits

Although it is not a requirement in the federal STC guidelines, 11 states require fringe benefits to be maintained during the plan period. Of these, three states—Minnesota, Rhode Island, and Washington—allow employers to prorate employee benefits based on the hours reduction stated in their plans (Walsh et al., 1997). Except for these three states, this program requirement (not a technological one) makes fringe benefits a fixed cost of employment. Unless prorated by the hours reduction, firms can reduce the fringe benefit costs only through layoffs during downturns because unit cost of fringe benefits for each work hour as work hours per worker increases during downturns. However, as Jehle and Lieberman (1985) point out, from a risk-averse worker's viewpoint, the monetary equivalent of fringe benefits provides utility just like wages and can favor hours reduction over layoffs in downturns. Expected utility of fringe benefits as a share of wage income is higher in a contract with work sharing than it is in a contract with layoffs if contributions to fringe benefits are maintained at 100 percent of cost because they are paid in the former

regardless of the state of the economy, while they are paid only in the high demand state in the latter (Jehle & Lieberman, 1992).

4.4 STC's Impact on Productivity is Ambiguous

STC's impact on worker productivity is found to be ambiguous (Kerachsky, Nicholson, Cavin, and Hershey, 1986; Vroman & Brusentsev, 2009; Walsh et al, 1997). STC is promoted to reduce hiring and training costs by helping a firm compensate for the income loss in case of short hours in a downturn and protect firm's general and specific human capital investments. The firm can hire workers with better skills but accrues larger hiring costs. Similarly, the cost of training new workers to improve their firm-specific skills depends on the desired skill level. If no other distortions, firms take all these considerations into account to start. As argued by Boulier, Fon, and Goldfarb (1990), firms with larger initial hiring and training costs with respect to wages prefer workers to work longer hours to recuperate these costs. Following Rosen (1968) and assuming that initial hiring and training costs are positively correlated with the skill level, for a given level of labor input (effective manhours) an increase in these fixed costs of employment increases the marginal cost of employment relative to hours, hence, yields more hours per worker. One implication that follows Rosen's argument is that firms prefer high-skill workers to keep attached and to work more hours compared to low-skill workers. Therefore, firms might be better off by laying off low-skilled workers and putting high-skill workers on STC during downturns. In this case, high-skill workers would work longer hours than they would in the case in which both high- and low-skill workers were put on STC.

A probable obstacle for STC to achieve the objective of maintaining skilled workers is that usually all workers (both more productive and less productive) in a business

unit are covered by an STC plan. Unless a firm defines its business units to place more productive and less productive into separate business units (which is unlikely given that usually a business unit can be a plant, department, or a shift), STC compensates all workers regardless of their productivity levels. If layoffs are used instead of STC, more productive and more skilled workers are more likely to be kept and continue to work normal hours while less productive and less skilled workers are laid off. Thus, one possible outcome of using STC instead of layoffs is that while more productive and more skilled workers experience an income loss, low productivity workers experience a gain. As Parsons (1986) suggests “an employment contract that specifies complete worker immobility subsequent to specific human capital investment will typically not be efficient since worker productivities both inside the firm and out are likely to fluctuate randomly over time. . . .efficiency may require a reassignment of the individual to a different job (p. 820)”. If more skilled and productive workers, who are more likely to find outside job opportunities that would make them better off than staying and participating in STC, leave the firm, then the average worker productivity in the STC firm declines, which would be an impediment to STC’s purpose to maintain the skilled workforce.

4.5 Conclusion

The theoretical literature on STC analyzes the trade off between layoffs and STC within an implicit labor contracting setup, which suggests that increasing the experience rating of STC and UI benefits reduces firms’ incentive to use layoffs and allows work sharing if work sharing does not make firms worse off.

When STC benefits are less generous than regular UI benefits, workers might prefer layoffs if they receive the exogenously determined, government-mandated employer-

provided severance payments but work inefficient hours. If STC benefits are more generous than the regular UI, STC increases the value of work sharing to workers relative to severance payments.

Some assumptions of the theoretical STC models may not hold in practice as STC program features differ across states. For example, the prevalent assumption of equal experience rating of STC and regular UI benefits will not be valid in states where regular UI benefits are charged to all of the base period employers while STC benefits are charged only to the employer that used STC or where surtaxes and higher UI tax rate limits are imposed for STC benefits. Such program features make STC more effectively experience rated than layoffs, hence making the STC program a costlier alternative to layoffs for employers. However, more complete experience rating of STC does not appear to lead lower STC use implying that factors other than experience rating might cause low STC use in the U.S.

In addition, the low UI tax base in the U.S. constitutes a fixed cost of employment. Fitzroy and Hart (1985) and Hamermesh (1990) suggest that increasing the taxable wage base makes layoffs costlier and work sharing more attractive for the firm. However, as in the case of initial hiring and training costs, high fixed costs of employment suggest longer hours and smaller workforces. Whether STC is costlier for a firm than layoffs depends on a state's experience rating rules, UI tax schedules, and program features.

The impact of fringe benefits on the hours-workers adjustment decision depends on their value to workers and their costs to firms. The STC program requirement to keep or at least prorate the fringe benefits increases the value of STC for employees but it also

increases the cost for each work hour for employers who can reduce these costs only through layoffs facing a downturn.

The most emphasized advantage of STC here in the U.S. and abroad is that it helps firms maintain their skilled workforce when faced with temporary demand shocks. However, not all participating workers may be better off depending on their skills and outside opportunities. For unskilled workers who are more likely to be laid off and less likely to find outside opportunities, STC increases their expected utilities. However, the skilled, highly productive workers who would keep their jobs and normal hours in case of layoffs may be worse off under STC due to short hours even they are compensated by the program. Therefore, the effect of worker heterogeneity may be important to understand why STC is not used.

CHAPTER 5: SHORT-TIME WORK AND SHORT-TIME COMPENSATION

In this chapter, I examine whether reduced work hours as a response to economic downturns are still widespread as shown earlier by Levenson (2001) and whether workers on reduced hours are eligible for partial unemployment insurance (UI) compensation for their lost hours through the short-time compensation (STC) program where available. Levenson (2001) finds that the incidence of reduced hours per worker is about 50 to 70 percent of the incidence of layoffs. Frequent use of reduced hours indicates that firms use not only layoffs but also short-time work to reduce their labor input. More importantly, a comparison of the total number of short-time workers, the number of workers on reduced-hours who are eligible for STC, and the number of actual STC participants will address the question of whether workers with reduced hours are actually eligible for STC and will show whether a large portion of workers who are eligible for the program actually use it. A finding that workers have short-time schedules with hours reductions large enough to make them eligible for STC do not use. It would suggest that uncompensated short-time work is preferred to work compensated through government administered STC.

There is a variety of alternative workforce strategies available to a firm facing a negative product demand shock. It can use temporary or contract workers in high demand periods and release them in low demand periods. It can use overtime in high demand periods and eliminate it in low demand periods. Alternatively, it can reduce its permanent workforce by layoffs and/or short-time work. Usually, a firm's initial response to a demand shock is to reduce hours of work (Rones, 1981; Bednarzik, 1983) after discontinuing overtime work. If the hours reduction is not sufficient or the slack demand persists, the firm

may resort to layoffs (Bednarzik, 1983). Reduced-hours employment below normal work hours is called short-time work (STW). Factors, such as the firm's industry, skill composition of its workforce, employment protection regulations, and existence of collective bargaining agreements or unions will affect the type and the sequence of labor adjustment strategies.

Levenson (2001) argues that the primary beneficiaries of STC programs are likely to be those who would be on STW in the absence of an STC program. He constructs an STW measure for the U.S. for the 1979-1993 period and finds that STW is widely used in the U.S. During this period, the STW rate was approximately 50 to 70 percent of the layoff rate, and the difference diminished throughout the 1990-recession. The impact on total hours adjustment of STW compared to layoffs remained low because hours adjustments per worker through STW are usually a fraction of hours adjustments through layoffs. He also suggests that STC programs are not the reason for the existence STW in the U.S.; indeed STW rate was greater for states that never had an STC program than for states that did.

I extend Levenson's work, investigating the changing importance of STW between 1979 and 2009. The major objective is to develop a sense of current usage of STW in the U.S. by investigating the industrial and demographic characteristics of short-time workers. High STW usage during downturns indicates that it is used to keep workers attached to their employers and acts as an insurance against job losses. I also explore whether short-time workers would be eligible for STC based on their observed hours reduction levels if STC is available in their state. Furthermore, if STW is prevalent among groups that STC is targeting (namely, manufacturing industry, women, minorities, and younger workers) then STW is can be an alternative to STC.

The rest of the chapter is organized as follows. I explain the data source and the time period in the next section and describe how the STW and layoff rates are constructed and describe the historical trend in these rates across industries and within demographic groups (gender, race, and age) Section 5.2. The hours reduction criteria used by states to determine STC eligibility is explained, and based on this criteria, the percentages of short-time workers who would have participated in STC is shown in Section 5.3. The last section concludes.

5.1 Data: Outgoing Rotation Group Files of the Current Population Survey

I use the same basic data source, the Current Population Survey's Outgoing Rotation Group files as Levenson (2001). The data used in this chapter is obtained from the National Bureau of Economic Research's (NBER) annual data extracts of Outgoing Rotation Group files drawn from the Current Population Survey (CPS) and prepared by the Bureau of Labor Statistics (BLS). The extracts contain a sample of the civilian non-institutional population of age 16 or over in 50 states and District of Columbia.

CPS is a monthly survey of about 60,000 households³⁹ conducted by the Census Bureau for the BLS and is the primary source of information on the labor force characteristics, such as employment, unemployment, earnings, and hours of work. This information is available by geographic unit (e.g. state, county, city, metropolitan statistical area), by demographic characteristics (e.g. age, sex, race, etc), and by occupation, industry, and class of worker (Current Population Survey, 2010).

Every household that enters the CPS is interviewed for four consecutive months, then ignored for eight months, then interviewed again for four more consecutive months.

³⁹ The monthly CPS sample used to cover 50,000 households. Effective in July 2001, it was expanded to cover 60,000 households (U.S. Census Bureau & Bureau of Labor Statistics, 2002).

Starting in 1979, usual weekly hours and earning questions are asked only of households in their fourth and eighth (which is the last) interview months. Individuals at their fourth and eighth interview months form the outgoing rotation groups. Each year the BLS collects all these interviews together into a single Merged Outgoing Rotation Group (MORG) file (National Bureau of Economic Research MORG [NBER MORG], 2010) and since 1979, the NBER extracts selected employment variables and produces the annual MORG files (National Bureau of Economic Research MORG Annual Data [NBER MORG Annual Data], 2010). These annual MORG files contain one record per individual for about 360,000 individuals in any file year. An individual appears only once in a yearly file but may appear again in the following year's file (Feenberg & Roth, 2007, p. 3). The MORG files contain employment variables such as hours worked, earnings, industry, occupation, education, and unionization. The extracts also contain demographic and background information on the sample population such as age, sex, race, ethnicity, and geographic location. When necessary, the NBER standardizes the variable names and the codes used in the census over time to maintain consistency across its MORG data files (Feenberg & Roth, 2007, p. 2).

The analysis covers data starting from 1979 through 2009, although in 1994, a new questionnaire was introduced to allow computer-based interviewing. The new design reduced the interviewer error and allowed interviewers to update past responses (U.S. Census Bureau & Bureau of Labor Statistics, 2002). Due to this major design change in the CPS in 1994, the data from earlier years are not directly comparable to the data in 1994 or later.

CPS is a sample in which each individual is assigned a weight based on his/her representation in the population. The sum of weights in each monthly survey is the U.S. non-institutional population. An Outgoing Rotation Group includes one-fourth of that population. Hence, one single month MORG file is a quarter of the population 16 years of age and over, and a year of MORG would sum to three times that population (Feenberg & Roth 2007, p. 10). Throughout this chapter, weights are used for all the descriptive values and tabulations.

5.2 Short-Time Work and Layoffs

Hamermesh (1978) indicated that STC would act as a transfer payment to workers who would face reduced hours in the absence of STC. Best (1981) disagrees with Hamermesh and claims that not only the incidence of STW in the U.S. is rare but also the magnitude of the hours reduction is lower than 10 percent—the usual minimum level of hours reduction required to be eligible for STC benefits. In support of Hamermesh’s argument, Levenson estimates the average hours reduction⁴⁰ under STW to be approximately 30 percent for each occupation and industry. This estimate falls inside the range of work reduction required to be eligible for STC for all states with an STC program.

In an earlier study, Bednarzik (1980) tracks the percentage of involuntary part-time workers among all non-farm workers for the 1956-1979 period. This percentage was positively correlated with the unemployment rate but was much smaller. The percentage of involuntary part-timers was usually less than 2 percent and never exceeded 3 percent (except in 1958). The unemployment rate ranged between 4 percent in 1956 and 9 percent in 1976. Bednarzik (1980) defines short-time workers as individuals who are involuntary

⁴⁰ Levenson (2001) calculates average hours reduction under STW as a ratio of “STW as a percentage of total hours” over “STW as percentage of employment”.

part-timers due to slack demand and focuses⁴¹ on the labor market transition of individuals out of involuntary part-time status into unemployment, voluntary part-time employment, and full-time employment using the CPS monthly data. He finds that women, blacks, young, non-white collar occupations, and construction, trade, and manufacturing sectors were overrepresented among short-timers compared the working population in 1976. Short-time workers according to Bednarzik's definition include two groups of involuntary part-time workers: (a) Workers who usually work part-time and (b) who usually work full-time. Levenson (2001), on the other hand, limits the short-time workers to a group of individuals who usually work full-time but whose hours are cut because of slack demand or other business related reasons such as material shortage or plant/machine repair.

Levenson (2001) calculates an incident rate for layoffs indicating the share of individuals who were on layoff during the survey week in the labor force, and another incidence rate for STW indicating the percentage of individuals in the labor force whose hours are reduced less than normal due to business related reasons. Individuals on short-time work are defined as those who usually work 35 hours or more in a week but were employed less than 35 hours during the survey week, and the reason for these reduced hours is business-related. The business related reasons can be either slack demand or material shortage or plant/machine repair for 1979-1993 period, or "slack demand/business related" in later years.

⁴¹ Bendarzik (1980) examines the characteristics of short-time workers and their transition into unemployment, other part-time jobs, and full-time employment and finds that men, whites, younger workers, and union members were more likely to move into a full-time work schedule (in the same job or another job). Surprisingly, whether an individual searched for a full-time job during the short-time work period did not affect the probability of getting into the full-time schedule, probably because, while on the short-time schedule, individuals did not look for a full-time position as intense as they would have done if they were unemployed.

Levenson (2001) uses this measure of STW incidence to compare the occurrence of STW to layoffs in the labor force. The labor force definition captures wage and salary workers age 16 or over who are working or with a job but not at work or on layoff during the survey week. Self-employed individuals and those who are looking for a job are excluded. Levenson (2001) limited the unemployed to those who are on layoff. Therefore, those who are looking for a job, doing housework, attending school, unable to work, working without pay, unavailable for work, or classified as other (including retired) are excluded from the labor force definition of this chapter following Levenson (2001).

I develop a second measure to illustrate how commonly STW is used among those who usually work more than 35 hours. This new measure of STW uses the sum of individuals who usually work 35 or more hours (usual full-timers)—whether they are on STW or not—as the denominator instead of the labor force as in Levenson’s STW rate. The numerator remains the same as it is in the Levenson’s rate, which is the number of individuals on STW. Layoffs contain individuals who used to usually work full-time or part-time. The new rate removes layoffs from the calculation to solely measure how common STW is among usual full-timers.

Using the NBER’s annual MORG files for 1979-2009 period, I first replicate Levenson’s STW and layoff rates (Levenson, 2001, Table 1 on page 325). The original and replicated series are show in Figure 1. The replicated STW and layoff rates follow the same pattern as Levenson’s rates, but they consistently underestimate Levenson’s rates by about 10 percent as shown in Figure 1. The difference in these measures is due to differences between the MORG files used in Levenson (2001) and those used in my

analysis.⁴² Also included in Figure 1 is the new STW rate among full-timers. Except for the recession of 1981-1982, the new STW rate exceeds Levenson's STW.

The most important result that emerges from Figure 1 is the countercyclicality of STW. It does appear to be a mechanism for reducing work time in the face of slack demand. Indeed, year-to-year movements of the layoff rate and STW rates are comparable. The correlation coefficient between the new STW rate and the layoff rate is 0.85 between 1979 and 2009.⁴³ Both follow countercyclical patterns, increasing early in recessions and reaching their peaks during recessions. The disconnect between 1993 and 1994 is to emphasize the major design change in CPS, which shifts the STW rate down by about a third and the layoff rate by approximately 14 percent.⁴⁴ With three recessions, workers in the pre-1994 period experienced more fluctuations in layoffs and STW than the post-1994 period. The back-to-back recessions of 1980 and 1981-1982 reinforced the economic downturn, pressuring firms to reduce their labor input through both layoffs and STW. Layoffs and STW remained relatively stable and low after 1984 except throughout the recessions of 1990 and 2001. After 2006, STW and layoff started an upward trend and with the onset of the 2007 recession reached their highest levels of the analysis period. The 1982 levels appear to be higher than 2009 levels in Figure 1, but; if the downward shift due to the 1994 change in CPS questionnaire is taken into account, 2009 levels are usually higher.

⁴² I would like to thank Dr. Alec Levenson for providing his programs used in Levenson (2001) and his feedback (personal communication, April 24, 2010). The files and the coding in his study are provided by Unicon Research Corporation (www.unicon.com). I extracted my files from the NBER's website and wrote the code based on my understanding of the measures described in Levenson (2001). The number of observations in the two data sources is not the same. Differences between Unicon's approach to creating consistent coding across the years and mine may be a source of the discrepancy between our calculations.

⁴³ The correlation coefficient between the new STW rate and the layoff rate is 0.87 between 1979 and 1993, and 0.89 between 1994 and 2009.

⁴⁴ Levenson (2001) reports a shift of 25 percent in the STW rate and 10 percent in the layoff rate.

During the analysis period, the STW rate of the labor force and the STW rate among full-timers follow almost identical patterns. The STW rate among full-timers is higher and ranges between 1 percent and 2 percent during 1979-1993 period, floating a little below 1 percent in the post-1994 period until 2007, and suddenly approaching 3 percent in 2009. The STW rate among full-timers and layoff rate remain around the same levels particularly from 1979 to 1984 and from 1994 to 2001. With the recession of 2001, the two rates diverge as the STW rate experiences a faster increase.

Although the annual layoff rates and the new STW rates are correlated, they have different trends and drift apart over time. If these two rates have a common relationship in the long run, even though they move in opposite directions in some years, they are called cointegrated (Maddala, 1992, p. 597). I test whether these two rates are cointegrated using the augmented Engle-Granger method (Engle & Granger, 1987) and test statistics and critical values calculated by MacKinnon (2010). In its simplest form, if they are cointegrated, the following relationship exists between the layoff rate (y_t) and the STW rate (x_t) such that the error term (ε_t) is stationary:

$$y_t = \beta x_t + \varepsilon_t \quad (1)$$

Thus, if the two series are integrated of degree 1, or $I(1)$, the partial difference between them is stable and reverts to a fixed mean (Greene, 2002, p. 650). I find that both the layoff rate and the STW rate are $I(1)$ by performing the Augmented Dickey-Fuller (ADF) test for unit root.⁴⁵ I then regress the layoff rate on the STW rate to obtain:

$$\hat{y}_t = -0.007 + 0.842x_t, \quad (2)$$

⁴⁵ The ADF test is performed in Stata using “dfuller” command (Stata Online Help, 2010). The ADF test statistic is -1.856 for the layoff rate and -1.487 for the STW rate, both of which are less than the critical value of -2.986 (in absolute value) at the 5-percent level of significance. Hence, the null hypothesis of a unit-root process (non-stationarity) cannot be rejected.

where the coefficient of determination is 0.71 and the t-values is -0.05 for the intercept term and 8.66 for x_t . The residuals obtained from this regression have a unit-root process,⁴⁶ and therefore, the layoff rate and the STW rate are not cointegrated between 1979 and 2009.⁴⁷ This is probably because the existence of the long term relationship between the STW and the layoff rate varies across industries. As shown later in this chapter (section 5.2.2), these two rates are cointegrated in agriculture and transportation industries, but not in manufacturing, construction, trade, and other services.

⁴⁶ The Engle-Granger test on the residuals is performed in Stata using “egranger” command (Schaffer, 2010). The test statistic (-1.852) is less than critical value of -2.964 (in absolute value) at 5-percent level (“egranger” command in Stata reports critical values based on MacKinnon (2010)). Hence, the null hypothesis of no cointegration cannot be rejected.

⁴⁷ The same conclusion of no cointegration holds when the cointegration test is performed separately for the 1979-1993 and 1994-2009 periods.

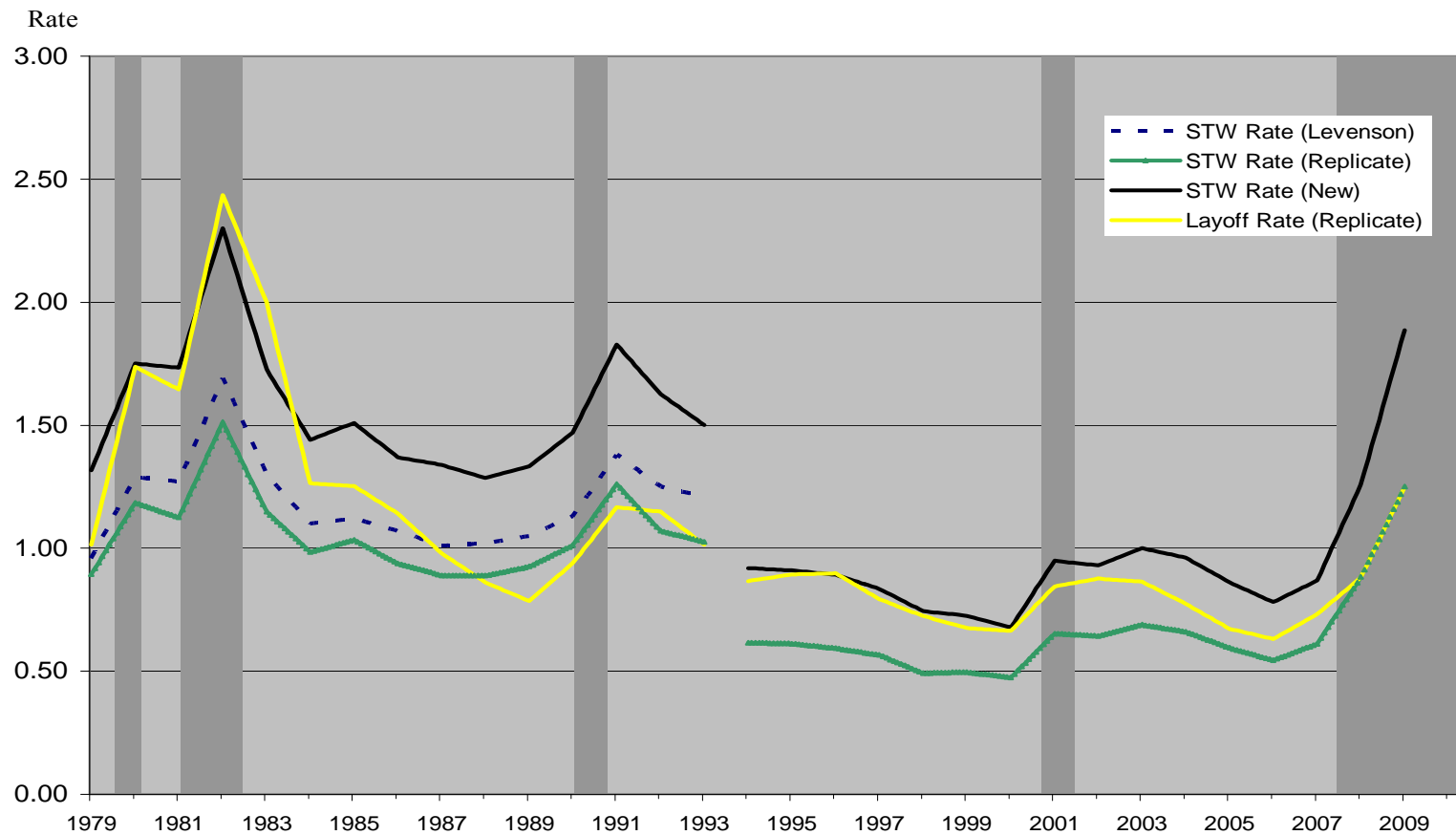


Figure 1. The Incidence of Short-Time Work and Layoffs from 1979 to 2009.

Levenson (2001) calculates STW rate (and layoff rate) as the share of those on STW (layoff) in the labor force. These calculations are replicated using the NBER's MORG files for 1979-2009. The new STW rate indicates the share of individuals on STW among those who usually work 35 or more hours. Disconnect between 1993 and 1994 is to emphasize the major design change in CPS. Shaded columns show the recessions defined by the NBER (National Bureau of Economic Research Recessions, 2010; National Bureau of Economic Research, 2010, September). The data for the line indicating STW rate (Levenson) are adapted from Levenson (2001) with permission of the author.

5.2.1 Overtime

Before reducing work hours less than normal, firms eliminate overtime. To measure how frequently usual full-timers work overtime, I calculate an incidence rate for overtime indicating the percentage of usual full-timers who worked overtime. Usual full-timers who worked more than 40 hours (but less than 80 hours to eliminate outliers) during the survey week are flagged as overtime workers. Overtime hours for these workers calculated as the difference between the total work hours during the survey week and 40. Contrary to layoffs and STW, overtime is procyclical. Weekly average overtime per worker is 2.47 hours between 1979 and 2009, and varies between 2 and 3 hours, declining during recessions. In addition, overtime rate (OT rate) is much higher than the STW and layoff rates (Figure 2): About a third of usual full-timers work overtime between 1979 and 2009. Since reductions in overtime do not qualify for STC, frequent overtime work is another reason for low STC use.

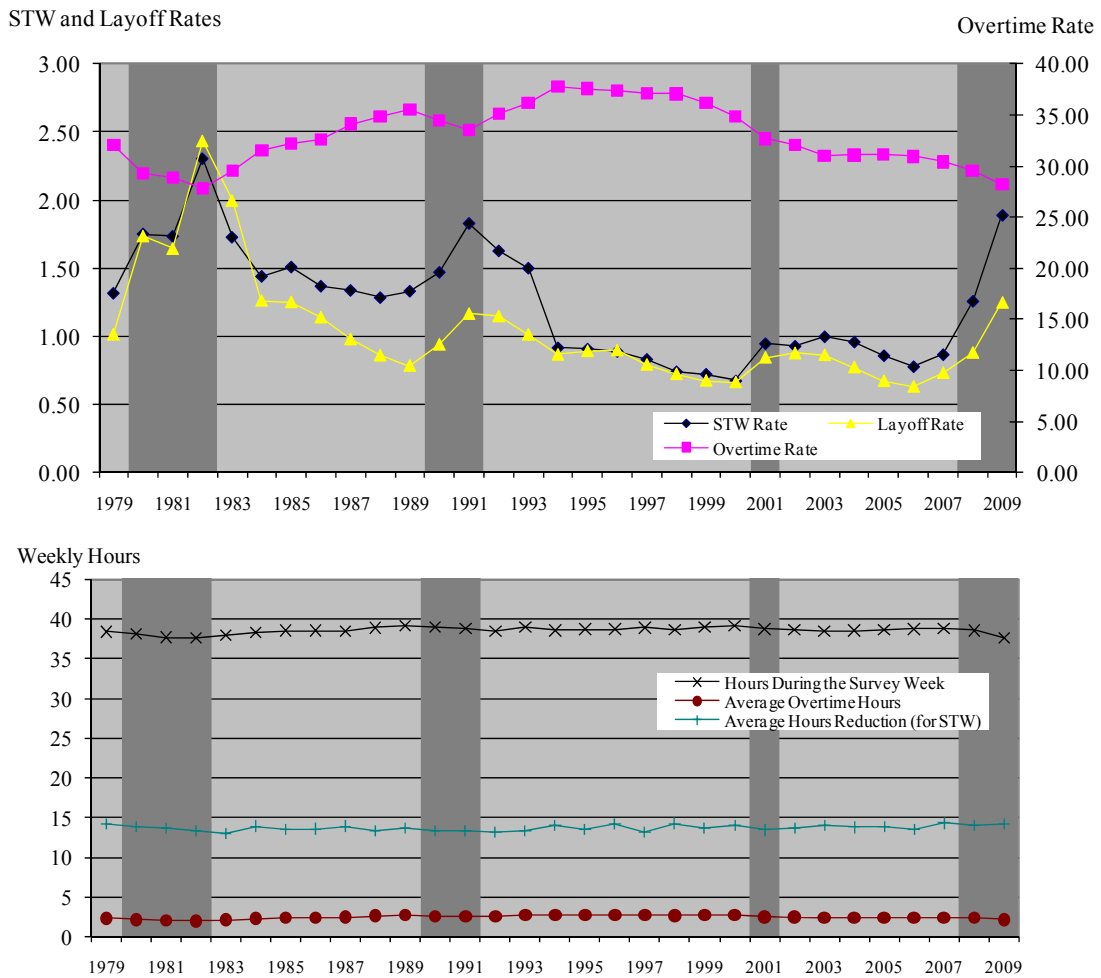


Figure 2. The Incidence of Overtime, Short-Time Work, and Layoffs from 1979 to 2009. Using the NBER's MORG files for 1979-2009. The overtime rate indicates the share of individuals who work more than 40 hours during survey week among those who usually work 35 or more hours. The STW rate indicates the share of individuals on STW among those who usually work 35 or more hours. The layoff rate measures the number of layoffs in labor force. Shaded columns show the recessions defined by the NBER (National Bureau of Economic Research Recessions, 2010; National Bureau of Economic Research, 2010, September).

5.2.2 STW by Industry

Various industry codes have been used in the CPS over time.⁴⁸ In this chapter, I group industries to major categories in order to have consistent measures across years. Figure 3 draws the STW rate among full-timers and the layoff rate in all industries and in selected industries (the durable manufacturing and construction industries and public administration).^{49,50} Levenson (2001) found that highly cyclical industries, such as construction and manufacturing, have the highest rates of STW in the 1979-1993 period. I confirm this finding for the longer period (1979-2009) as well (see Table 1 and Table 2). Table 3 and Table 4 show that the same is true for the layoff rates. Within manufacturing, manufacturing of durable goods has a more cyclical pattern than does manufacturing of other goods. Through a comparison of the layoff rates and the STW rates within industries, I find that these two rates are not cointegrated, that is, they do not share a common trend in the long run in manufacturing, construction, trade, and other services.⁵¹ On the other hand, agriculture and transportation industries persistently rely on layoffs more than STW between 1979 and 2009.⁵² This difference in the relationship between layoffs and STW in

⁴⁸ The standardized industry group names are as follows: Manufacturing (durable and other together), Construction, Public administration, Mining, Agriculture including forestry, and fisheries, Trade (retail and wholesale together), Transportation, Communications, Utilities including sanitary services, Banking including finance, insurance, and real estate, Health including hospitals, and Other services.

⁴⁹ For the underlying data used in drawing this figure, see Table B1 and Table B2 in Appendix B.

⁵⁰ A separate analysis by class of worker shows that on average workers in private sector about five times more likely to experience STW and about four times more likely to experience layoffs than government workers (including federal, state, and local government workers).

⁵¹ Following the EG ADF methodology described earlier in Section 5.2, I test the layoff rate and the STW rate within each industry. The Engle-Granger test statistic values for cointegration in manufacturing (-2.072), construction (-2.116), trade (-2.229), and other services (-2.118) are less than the 5-percent critical value (-2.986) in absolute values. Therefore, the null hypothesis of no cointegration cannot be rejected for these industries. The Dickey-Fuller unit root test for public administration, mining, utilities, banking, and health shows that either or both of these rates are stationary.

⁵² The Engle-Granger test statistic values for cointegration in agriculture (-3.418) and transportation (-4.057) are greater than the 5-percent critical value (-2.986) in absolute terms. Therefore, the null hypothesis of no cointegration is rejected for these industries.

the long run across industries suggests that the labor adjustment responses are different across industries and STW may not substitute for layoffs in all industries.

To identify the industries with seasonal patterns, monthly STW and layoff rates over the 1994-2009 period are calculated by summing the total number of individuals in the relevant categories for both the numerators and denominators for all months during this period and shown in Table 5.⁵³ A series of figures (Figure C1 to Figure C4) based on this table are provided to in Appendix C⁵⁴ to illustrate the seasonal differences STW and layoffs rates across industries. Month-to-month movements of STW rate across all industries show visible increases in January, July, and November compared to the previous months. STW appears to have a smaller variation than the layoff rate over months. The seasonal variation in layoff rate is more pronounced, with peaks in July and December and lows in May and September. STW shows seasonal patterns but it is used to reduce work time throughout the year.

The seasonal pattern for manufacturing, transportation, communications, health, and other service industries is visible but not as pronounced as in construction and agriculture (including forestry and fisheries). The manufacturing industry appears to reduce work hours during winter and summer through both STW and layoffs. This industry experiences a very significant spike in layoffs in July, while STW experiences a significant but smaller spike in December. Trade including wholesale and retail experience seasonally high rates in January and to a lesser degree in February following the holiday and shopping season at the end of the year. Construction and agriculture industries display strong

⁵³ Monthly STW and layoff rates for 1979-1993 period are shown in Table B3 in Appendix B.

⁵⁴ “Communications” and “Utilities and sanitary services” industries are not shown in the appendix because these two industries have a very few observations in the CPS sample for a given industry and month (the number of observations is on average less than 10 and never exceeds 20 for both industries).

seasonal patterns, with high layoff and STW rates in winter and spring, but the layoff rate fluctuates much more than the STW rate. The layoff rate in agriculture peaks at 7.6 percent of the labor force in March while the STW rate reaches its maximum level of 3.9 percent in February. The layoff rate of the construction industry peaks at 6.7 percent of the labor force in February while the STW rate reaches its maximum level of 4.3 percent in March.

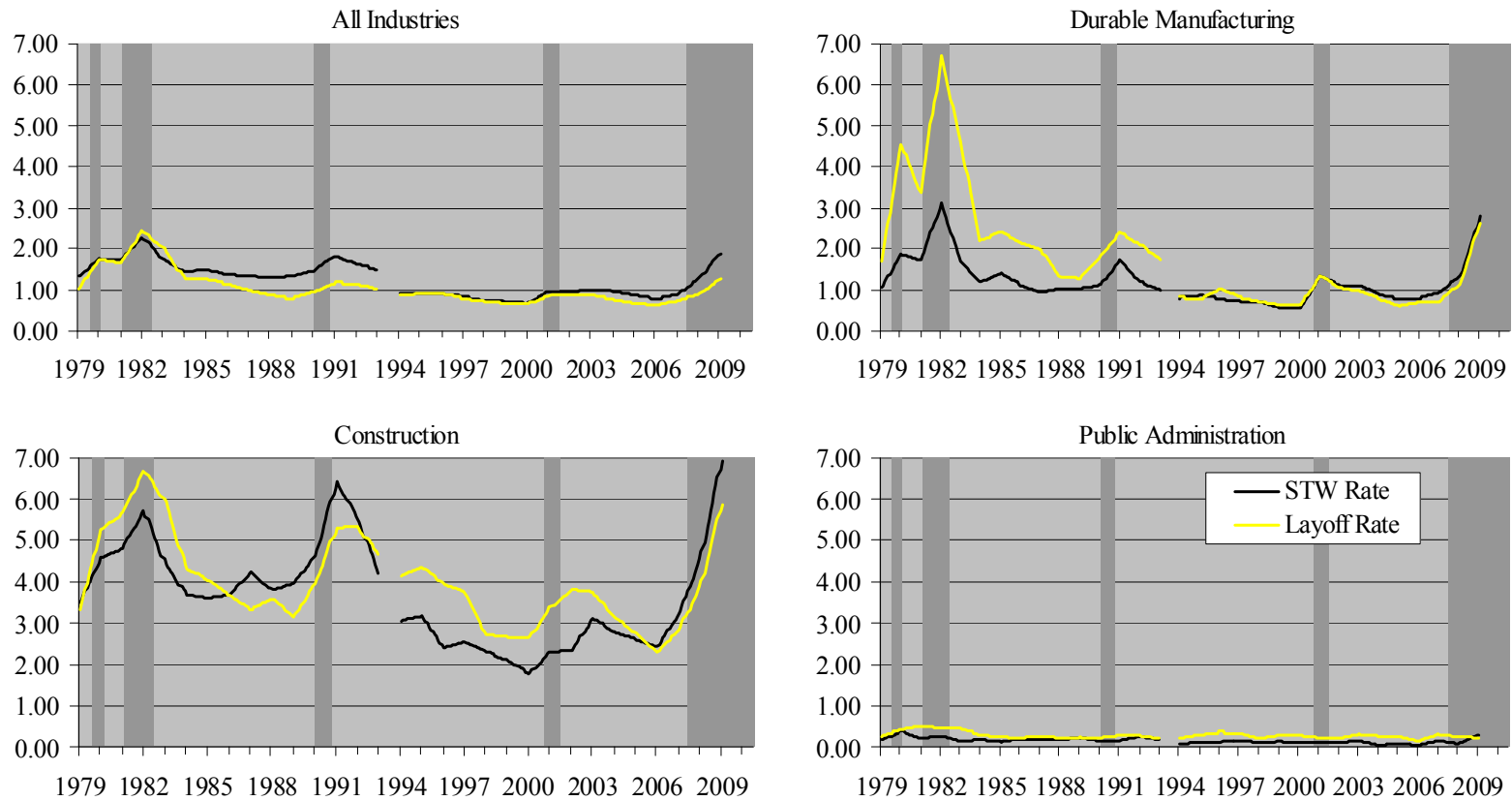


Figure 3. The Incidence of Short-Time Work and Layoffs in Selected Industries: 1979-2009.

Data for the charts are from the NBER's MORG files. An additional STW rate indicates the share of individuals on STW among those who usually work 35 or more hours. Disconnect between 1993 and 1994 is to emphasize the major design change in CPS. Shaded columns show the recessions defined by the NBER (National Bureau of Economic Research Recessions, 2010) and National Bureau of Economic Research (2010, September).

Table 1

STW Rate of Usual Full-Timers by Industry: 1979-1993

Year	All	Mfg (Durable and Other)	Constr.	Public Admin.	Mining	Agri. incl. Forestry	Trade (Wholesale and Retail)	Transp.	Comm.	Utilities and Sanitary	Banking, Fin. Inst. and R.E.	Health incl. Hospitals	Other Services
1979	1.32	1.71	3.51	0.18	1.44	3.96	1.26	1.82	0.20	0.18	0.48	0.37	0.94
1980*	1.75	2.44	4.57	0.41	1.48	5.29	1.70	2.43	0.22	0.12	0.55	0.46	1.12
1981*	1.73	2.40	4.82	0.22	1.33	5.82	1.47	2.68	0.36	0.13	0.44	0.46	1.28
1982*	2.30	3.71	5.72	0.29	3.52	4.74	2.05	2.87	0.38	0.23	0.67	0.70	1.51
1983	1.73	2.36	4.43	0.15	2.35	3.94	1.84	1.99	0.34	0.08	0.48	1.02	1.18
1984	1.44	1.85	3.70	0.19	1.72	4.09	1.38	1.39	0.32	0.16	0.33	0.90	1.22
1985	1.51	2.04	3.62	0.14	2.00	4.53	1.50	1.50	0.37	0.09	0.27	0.70	1.33
1986	1.37	1.67	3.70	0.21	1.95	3.73	1.39	1.46	0.36	0.07	0.31	0.55	1.28
1987	1.34	1.40	4.23	0.21	1.80	4.83	1.40	1.25	0.19	0.04	0.40	0.69	1.18
1988	1.29	1.48	3.80	0.19	0.96	4.22	1.37	1.37	0.26	0.05	0.28	0.44	1.20
1989	1.33	1.43	3.97	0.25	0.91	5.16	1.38	1.48	0.24	0.22	0.36	0.59	1.22
1990*	1.47	1.72	4.62	0.16	0.63	5.69	1.54	1.10	0.25	0.21	0.43	0.64	1.25
1991*	1.83	2.14	6.41	0.17	1.04	4.02	2.00	1.95	0.19	0.20	0.49	0.68	1.65
1992	1.63	1.67	5.54	0.28	0.53	4.53	1.97	1.48	0.05	0.44	0.32	0.69	1.58
1993	1.50	1.47	4.21	0.19	1.13	3.92	1.82	1.48	0.10	0.40	0.41	0.97	1.58

Note Recession years are indicated by *.

Table 2

STW Rate of Usual Full-Timers by Industry: 1994-2009

Year	All	Mfg (Durable and Other)	Constr.	Public Admin.	Mining	Agri. incl. Forestry	Trade (Wholesale and Retail)	Transp.	Comm.	Utilities and Sanitary	Banking, Fin. Inst. and R.E.	Health incl. Hospitals	Other Services
1994	0.92	1.12	3.05	0.07	0.99	1.75	0.97	0.79	0.05	0.14	0.15	0.83	0.76
1995	0.91	1.15	3.18	0.13	0.62	2.47	0.78	0.99	0.04	0.02	0.13	0.74	0.75
1996	0.89	1.15	2.41	0.13	0.37	1.91	0.96	0.78	0.22	0.08	0.23	0.70	0.77
1997	0.83	0.98	2.57	0.17	0.80	2.61	0.92	0.77	0.14	0.03	0.13	0.67	0.64
1998	0.74	0.89	2.31	0.11	0.60	2.37	0.74	0.82	0.28	0.16	0.06	0.60	0.59
1999	0.73	0.75	2.10	0.14	1.08	1.64	0.80	0.75	0.15	0.19	0.15	0.64	0.63
2000	0.68	0.78	1.79	0.11	0.43	1.42	0.72	0.47	0.14	0.27	0.35	0.47	0.64
2001*	0.95	1.42	2.29	0.13	0.44	1.95	1.08	0.92	0.34	0.16	0.16	0.52	0.76
2002	0.93	1.14	2.34	0.11	0.55	2.29	0.94	1.20	0.17	0.13	0.15	0.65	0.93
2003	1.00	1.29	3.12	0.16	1.22	3.04	0.85	0.68	0.23	0.05	0.34	0.62	0.94
2004	0.96	1.19	2.78	0.04	0.30	3.56	0.85	0.91	0.20	0.02	0.17	0.62	0.96
2005	0.86	0.91	2.62	0.08	0.07	2.77	0.84	0.57	0.22	0.29	0.24	0.47	0.90
2006	0.78	1.07	2.43	0.04	1.20	1.31	0.59	0.97	0.32	0.12	0.15	0.48	0.69
2007*	0.87	0.98	3.21	0.16	0.49	2.46	0.76	0.60	0.30	0.26	0.22	0.54	0.73
2008*	1.26	1.41	4.54	0.08	0.36	2.23	1.10	1.32	0.78	0.50	0.31	0.72	1.20
2009*	1.89	2.82	6.92	0.32	1.06	3.24	1.58	1.89	0.60	0.21	0.53	1.13	1.63

Note Recession years are indicated by *.

Table 3

Layoff Rate by Industry: 1979-1993

Year	All	Mfg (Durable and Other)	Constr.	Public Admin.	Mining	Agri. incl. Forestry	Trade (Wholesale and Retail)	Transp.	Comm.	Utilities and Sanitary	Banking, Fin. Inst. and R.E.	Health incl. Hospitals	Other Services
1979	1.01	1.74	3.35	0.29	1.74	1.46	0.71	0.96	0.19	0.39	0.16	0.25	0.51
1980*	1.74	3.69	5.25	0.43	2.93	1.55	0.80	2.17	0.41	0.39	0.34	0.35	0.71
1981*	1.64	3.08	5.67	0.52	1.58	2.97	0.88	2.48	0.24	0.39	0.27	0.28	0.85
1982*	2.44	5.47	6.69	0.47	6.39	3.84	1.31	3.59	0.54	0.60	0.43	0.45	0.83
1983	2.00	3.82	5.93	0.45	7.44	3.36	1.22	2.86	0.43	1.10	0.43	0.48	0.93
1984	1.26	2.14	4.31	0.32	4.04	3.16	0.75	1.59	0.39	0.60	0.29	0.40	0.65
1985	1.25	2.33	4.06	0.26	3.42	2.59	0.80	1.44	0.04	0.56	0.19	0.34	0.66
1986	1.14	2.06	3.68	0.24	4.77	2.35	0.64	1.50	0.76	0.50	0.27	0.23	0.63
1987	0.98	1.72	3.33	0.29	2.57	2.23	0.56	1.21	0.24	0.54	0.25	0.28	0.59
1988	0.86	1.33	3.60	0.24	2.58	1.96	0.51	1.02	0.33	0.27	0.31	0.20	0.50
1989	0.79	1.23	3.15	0.25	1.48	2.31	0.54	0.87	0.26	0.24	0.21	0.18	0.44
1990*	0.94	1.65	3.96	0.24	2.01	2.34	0.56	0.97	0.07	0.29	0.23	0.30	0.48
1991*	1.17	2.10	5.30	0.31	2.67	2.38	0.65	1.38	0.45	0.55	0.36	0.22	0.62
1992	1.15	1.88	5.32	0.29	2.07	2.97	0.77	1.14	0.46	0.23	0.38	0.28	0.68
1993	1.01	1.67	4.68	0.23	1.83	2.58	0.74	0.71	0.33	0.22	0.31	0.30	0.63

Note Recession years are indicated by *.

Table 4

Layoff Rate by Industry: 1994-2009

Year	All	Mfg (Durable and Other)	Constr.	Public Admin.	Mining	Agri. incl. Forestry	Trade (Wholesale and Retail)	Transp.	Comm.	Utilities and Sanitary	Banking, Fin. Inst. and R.E.	Health incl. Hospitals	Other Services
1994	0.87	0.88	4.12	0.24	0.95	4.15	0.64	1.05	0.12	0.21	0.27	0.21	0.74
1995	0.89	0.88	4.37	0.31	1.32	4.39	0.55	0.84	0.09	0.27	0.31	0.31	0.80
1996	0.90	1.04	3.96	0.37	1.34	4.63	0.58	1.09	0.14	0.15	0.15	0.20	0.75
1997	0.79	0.92	3.74	0.35	1.07	3.61	0.41	0.91	0.01	0.22	0.27	0.22	0.67
1998	0.72	0.76	2.73	0.22	1.22	4.00	0.44	0.89	0.29	0.19	0.20	0.33	0.68
1999	0.68	0.70	2.66	0.30	1.85	3.96	0.44	0.55	0.23	0.21	0.24	0.27	0.59
2000	0.66	0.63	2.64	0.31	1.17	3.39	0.43	0.74	0.28	0.37	0.13	0.15	0.63
2001*	0.84	1.19	3.37	0.25	1.39	4.56	0.47	0.66	0.30	0.66	0.16	0.24	0.69
2002	0.88	0.92	3.81	0.23	2.23	5.50	0.42	0.91	0.36	0.41	0.20	0.20	0.82
2003	0.86	0.98	3.74	0.33	0.90	4.48	0.36	0.79	0.19	0.50	0.22	0.18	0.86
2004	0.77	0.71	3.15	0.29	0.98	4.62	0.53	0.61	0.29	0.31	0.12	0.24	0.75
2005	0.67	0.67	2.75	0.27	0.52	2.71	0.44	0.58	0.41	0.21	0.16	0.18	0.66
2006	0.63	0.71	2.30	0.15	0.55	2.93	0.32	0.60	0.20	0.23	0.23	0.15	0.67
2007*	0.73	0.72	2.85	0.34	1.07	2.86	0.39	0.75	0.02	0.29	0.23	0.19	0.76
2008*	0.88	1.07	3.88	0.26	0.89	3.35	0.51	0.97	0.13	0.61	0.27	0.21	0.81
2009*	1.25	2.07	5.87	0.25	3.49	5.39	0.66	1.29	0.27	0.84	0.28	0.31	0.99

Note Recession years are indicated by *.

Table 5

Monthly STW and Layoff Rates by Industry for 1994-2009.

STW Rate of Full-Timers													
Month	All	Mfg (Durable and Other)	Constr.	Public Admin.	Mining	Agri. incl. Forestry and Fishing	Trade (Wholesale and Retail)	Transp.	Comm.	Utilities and Sanitary Services	Banking, Fin. Inst. and R.E.	Health incl. Hospitals	Other Services
Jan	1.19	1.46	3.78	0.10	0.58	3.30	1.38	1.13	0.35	0.32	0.25	0.59	1.09
Feb	1.11	1.49	4.11	0.20	1.19	3.86	0.98	0.97	0.04	0.05	0.17	0.58	0.93
Mar	1.04	1.32	4.26	0.13	1.05	3.34	0.99	0.81	0.39	0.21	0.23	0.59	0.78
Apr	0.88	1.15	2.91	0.11	0.88	1.89	0.77	0.86	0.34	0.03	0.19	0.62	0.76
May	0.86	1.20	2.71	0.10	0.37	1.23	0.75	0.87	0.37	0.17	0.14	0.64	0.74
Jun	0.89	1.00	2.41	0.12	0.24	1.54	1.03	0.59	0.22	0.00	0.18	0.51	0.99
Jul	0.93	1.11	2.18	0.12	0.88	0.98	0.77	1.17	0.15	0.10	0.20	0.77	1.07
Aug	0.90	1.00	2.22	0.17	0.40	1.70	0.85	0.93	0.26	0.12	0.22	0.62	1.03
Sep	0.87	0.95	2.53	0.08	0.51	1.13	0.77	0.92	0.19	0.31	0.29	0.75	0.86
Oct	0.87	1.00	2.81	0.14	0.34	3.02	0.83	0.82	0.33	0.25	0.21	0.68	0.71
Nov	0.95	1.12	3.11	0.12	0.84	3.34	0.80	0.92	0.34	0.19	0.30	0.72	0.75
Dec	0.94	1.13	3.10	0.11	0.70	2.82	0.85	0.81	0.25	0.20	0.28	0.76	0.80

Layoff Rate													
Month	All	Mfg (Durable and Other)	Constr.	Public Admin.	Mining	Agri. incl. Forestry and Fishing	Trade (Wholesale and Retail)	Transp.	Comm.	Utilities and Sanitary Services	Banking, Fin. Inst. and R.E.	Health incl. Hospitals	Other Services
Jan	1.24	1.16	6.23	0.34	2.78	6.04	0.93	1.24	0.15	0.44	0.36	0.24	1.06
Feb	1.14	1.15	6.69	0.20	2.37	7.55	0.60	0.94	0.21	0.51	0.22	0.25	0.83
Mar	1.04	1.02	5.97	0.25	1.90	7.64	0.60	1.08	0.05	0.31	0.19	0.22	0.71
Apr	0.76	0.94	3.82	0.10	1.52	3.86	0.40	0.78	0.25	0.57	0.14	0.21	0.60
May	0.60	0.75	2.54	0.18	1.01	2.24	0.35	0.41	0.09	0.25	0.15	0.20	0.58
Jun	0.73	0.79	2.22	0.17	1.02	2.53	0.39	0.67	0.31	0.31	0.13	0.24	0.92
Jul	0.87	1.30	2.18	0.34	1.07	2.68	0.39	1.12	0.27	0.16	0.22	0.28	1.02
Aug	0.72	0.74	1.93	0.44	0.72	2.30	0.37	1.09	0.26	0.41	0.18	0.19	0.92
Sep	0.52	0.59	1.75	0.35	0.77	2.23	0.34	0.60	0.18	0.18	0.25	0.22	0.48
Oct	0.56	0.70	1.98	0.36	0.37	2.29	0.33	0.59	0.25	0.16	0.21	0.20	0.51
Nov	0.71	0.89	2.29	0.33	0.84	4.91	0.46	0.62	0.30	0.36	0.24	0.24	0.64
Dec	0.88	0.93	4.20	0.28	1.22	5.90	0.54	0.76	0.23	0.54	0.29	0.18	0.72

Note. Month indicates the CPS interview month. Monthly rates for 1979-1993 period are provided in Appendix B Table B3.

The share of manufacturing employment declined about half from 25 percent of the labor force in 1979 to 11.5 percent in 2009. This is important because manufacturing is a major user of STC, more than 50 percent of program participants. During the same time period, however, the labor force expanded by 42 percent. The decline in manufacturing employment is matched by an increasing employment in health including hospitals (up from 7 percent to 12 percent) and other services (up from 20 percent to 36 percent). As the trend of layoff and STW rates demonstrate in Figure 4, the shrinking size of manufacturing industry was accompanied by fewer layoff and STW incidences during recession years.

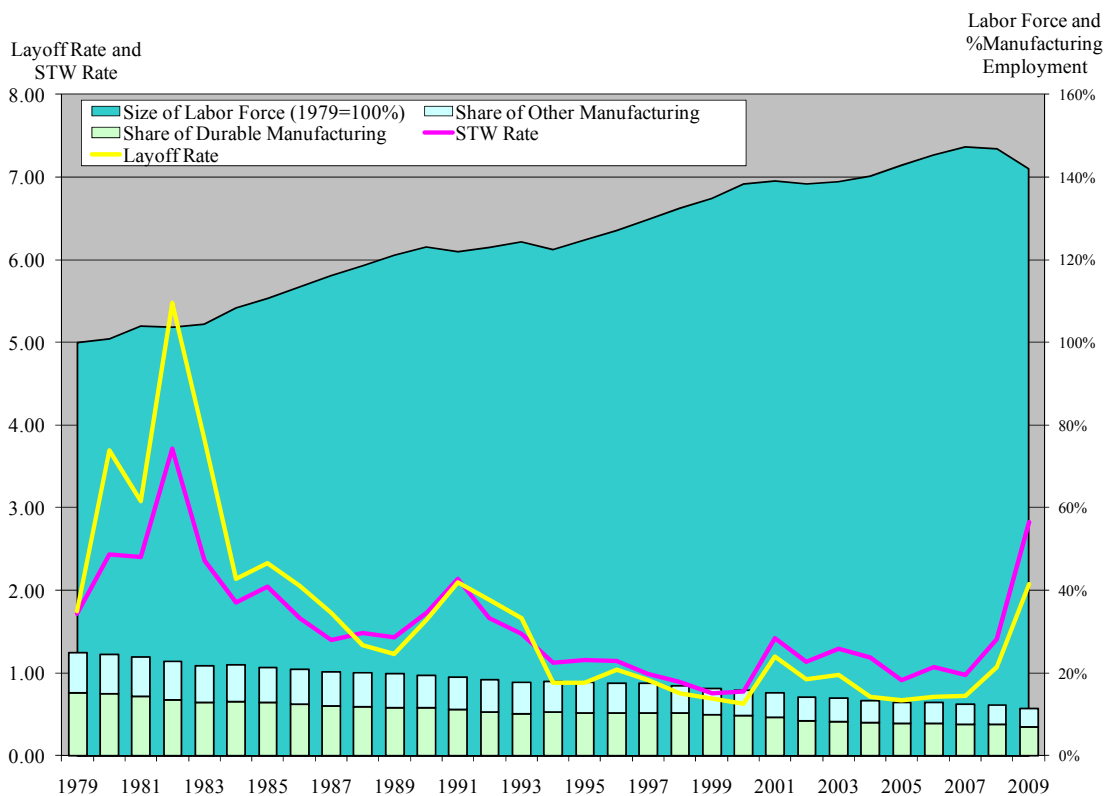


Figure 4. Size of the Labor Force and Share of Manufacturing Employment
 Stacked columns show shares of Durable Manufacturing (lower part) and Other Manufacturing (upper part) within the labor force in a year in the CPS MORG files. The area under the upper line shows the expansion of the labor force. The two fluctuating lines show the STW rate among all full-timers and layoff rate within the labor force.

5.2.3 STW by Gender, Race, and Age

5.2.3.1 Gender. During the 1981-1982 recessions, women who usually worked full-time were more likely to be on STW compared to men. Figure 5 shows the gender composition of full-timers and short-time workers. Until the most recent recession, both men and women experienced similar STW rates, but in recent years, especially with the onset of the recession in 2007, the men's STW rate exceeded that of women's. This switch in STW rates is due to a continuous increase of women's share among the usual full-timers (up from 42 percent to 44 percent between 1994 and 2009) accompanied by steady decrease of women's share among short-time workers (down from 40 percent to 34 percent between 1994 and 2009). Through the EG ADF methodology,⁵⁵ I find that the men's and the women's STW rates are not cointegrated supporting the different progression of these two rates over time.

Women's percentage share in part-time employment has been increasing (68.4 percent in 1973, 69.8 percent in 1979, and 70.3 percent in 1983) (Hart, 1987, p. 26). Recall that the STW definition in this study captures only the business-related hours reductions. Therefore, women's percentage share in STW is not as high as in part-time employment. Women's percentage share in STW drops during downturns as men's percentage share increases probably because on average men work longer hours and are more likely to experience hours reductions during downturns.

⁵⁵ Following the EG ADF methodology described earlier in Section 5.2, I test the STW rates of men and women for cointegration. The ADF test statistic is -1.413 for the men's STW rate and -1.434 for the women's STW rate, both of which are less than critical value of -2.986 (in absolute value) at the 5-percent level. Therefore, both rates are $I(1)$. I regress the men's STW rate on the women's STW rate to obtain $y(t) = 0.363 + 0.717x(t)$, where the coefficient of determination is 0.71 and the t -value is 3.31 for the intercept term and 8.71 for $x(t)$. The residuals of this regressions have an Engle-Granger test statistic (-0.363) less than the critical value (-2.986) in absolute terms at the 5-percent level. Thus, the null hypothesis of a unit-root process cannot be rejected for the residuals and these two rates are not found to be cointegrated.

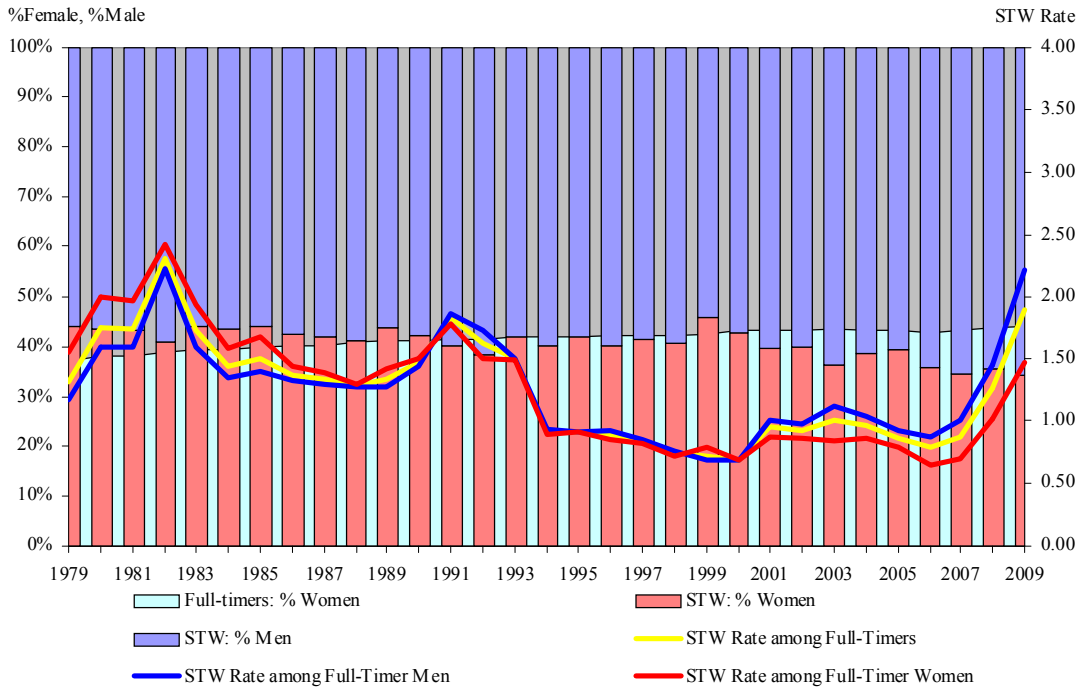


Figure 5. Gender Composition of Full-Timers on STW

Stacked columns show the gender composition of individuals who are on STW in a year. While the lower part of a column shows female percentage, the upper part shows the male percentage. The horizontal line dividing the chart into two regions around 40 percent level shows the gender composition of individuals who usually worked full-time (full-timers). While the lower region shows female percentage, the upper region shows the male percentage. The three fluctuating lines show the STW rate among all full-timers, STW rate among full-timer men, and STW rate among full-timer women.

Figure 6 shows the gender composition of the labor force and layoffs. During the most recent recession in the data, women's share in layoffs dropped sharply to 31 percent in 2008 and to 29 percent in 2009 from 39 percent in 2007. Layoff rate among men jumped to 1.72 percent in 2009 from 1.17 percent in 2007, while the same rate among women went to 0.75 percent in 2009 from 0.59 percent in 2007. As women's share in the labor force increased more than their share among the layoffs, women are less likely to be laid off than men. This relationship is found to be persistent during the analysis period as these two rates are found to be cointegrated. Following the methodology described earlier in Section 5.2, I perform the EG ADF test for cointegration between the layoff rates of men and women.

The ADF test statistic is -2.033 for the men's layoff rate and -1.582 for the women's layoff rate, both of which are less than critical value of -2.986 (in absolute value) at the 5-percent level of confidence. Therefore, both rates are $I(1)$. I regress the men's layoff rate ($y(t)$) on the women's layoff rate ($x(t)$) to obtain the regression $y(t) = -0.011 + 1.667 \cdot x(t)$, where the coefficient of determination is 0.89 and the t -value is -0.13 for the intercept term and 15.62 for the coefficient of $x(t)$. The Engle-Granger test statistic for the residuals of this regressions (-3.455) is greater than the critical value (-2.964) in absolute terms at the 5-percent level. Thus, the null hypothesis of a unit-root process is rejected for the residuals and these two rates are found to be cointegrated.

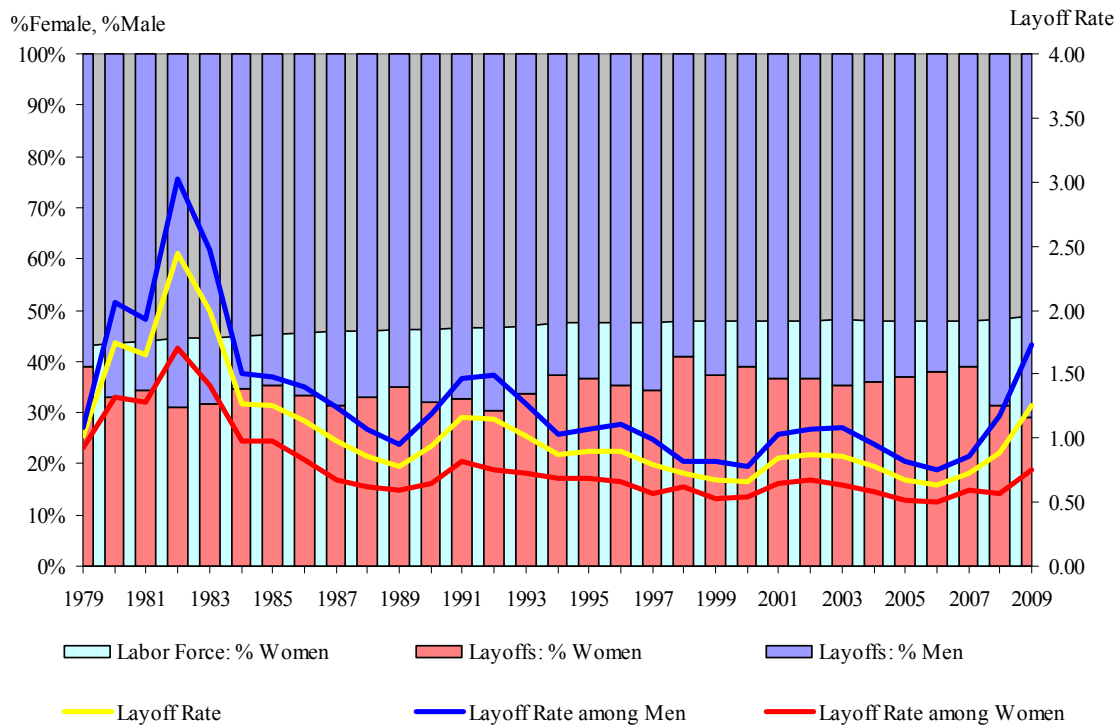


Figure 6. Gender Composition of Layoffs and Labor Force.

Stacked columns show the gender composition of individuals who are laid off in a year. While the lower part of a column shows female percentage, the upper part shows the male percentage of layoffs. The horizontal line dividing the chart into two regions around 45-50 percent level shows the gender composition the labor force. While the lower region shows female percentage of the labor force, the upper region shows the male percentage. The three fluctuating lines show the layoff rate, layoff rate among men, and layoff rate among women in the labor force.

5.2.3.2 Race and ethnicity. Based on race and ethnicity information provided in the data, I break race and ethnicity into two categories, white and minority. The white category contains those whose race is white *and* whose ethnicity is not Hispanic. The minority category contains everybody else. Therefore, all individuals with Hispanic ethnicity regardless of their race and those with “other” race⁵⁶ are placed in the minority category. Minorities constituted an increasing share of all full-timers, but they also had an increasing share among the short-time workers (see Figure 7). Overall, the STW rate among minority full-timers always exceeded the STW rate of their white counterparts. Like the layoff rates for whites and minorities, the STW rates are found to be cointegrated.⁵⁷ It also appears that the share of the minority STW is much higher than in layoffs. This is probably because whites are more likely to find full-time jobs when laid off and therefore less willing to accept short hours.

⁵⁶“Other” race exists only until 1996 in the data. Starting in 1996, the Census Bureau began to allocate all “other” race responses into one of the four main categories, which are white, black, American Indian, or Asian or Pacific Islander (the last category is split into Asian only and Hawaiian/Pacific Islander only starting in 2003, making five major race categories) (Feenberg & Roth, 2007).

⁵⁷ Following the EG-ADF methodology described earlier in Section 5.2, for the layoff rates of whites and minorities, the augmented Engle-Granger test statistic (-4.436) is greater than the critical value (-2.964) in absolute terms at the 5-percent level, indicating cointegration between the two rates. Similarly, for the STW rates of the whites and minorities, the test statistic (-3.908) is also greater than the critical value (-2.964) in absolute values, indicating cointegration between the white STW rate and the minority STW rate.

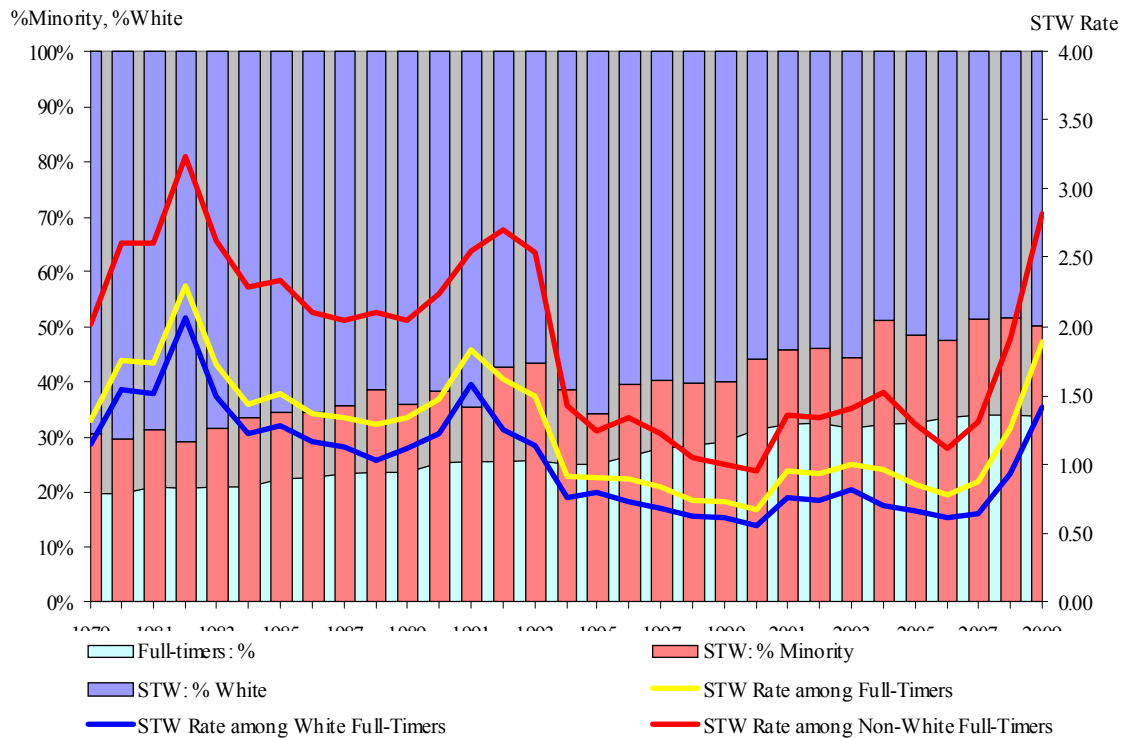


Figure 7. Race Composition of Full-Timers on STW.

Stacked columns show the race composition of individuals who are on STW in a year. While the lower part of a column shows the minority percentage, the upper part shows the white percentage. The horizontal line dividing the chart into two regions around 20 percent-30 percent level shows the race composition of individuals who usually worked full-time (full-timers). While the lower region shows the minority percentage, the upper region shows the white percentage. The three fluctuating lines show the STW rate among all full-timers, STW rate among the white full-timers, and STW rate among the minority full-timers.

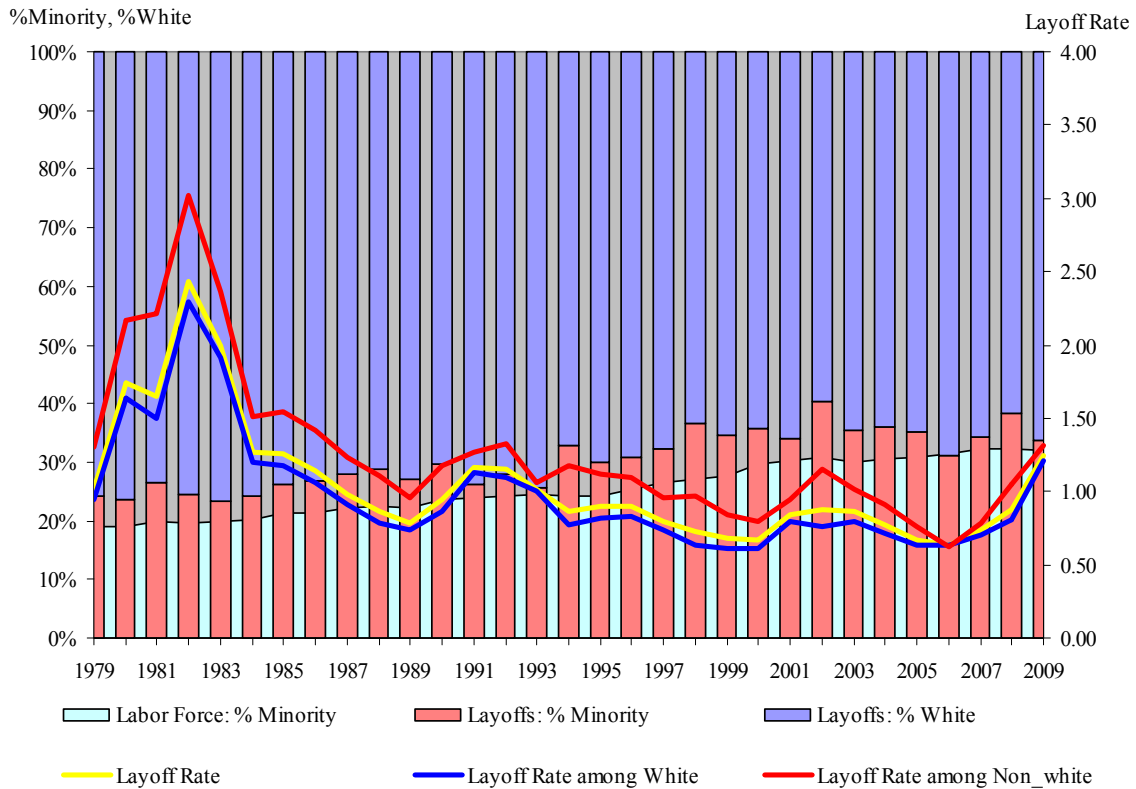


Figure 8. Race Composition of Layoffs and Labor Force.

Stacked columns show the race composition of individuals who are laid off in a year. While the lower part of a column shows the minority percentage, the upper part shows the white percentage of layoffs. The horizontal line dividing the chart into two regions around 20-30 percent level shows the race composition the labor force. While the lower region shows the minority percentage of the labor force, the upper region shows the white percentage. The three fluctuating lines show the layoff rate, layoff rate among whites, and layoff rate among minorities in the labor force.

5.2.3.3 Age. The data are already limited to the population at age 16 or older. In this study, I label individuals age 45 or over as old and those under 45 as young. Figure 9 and Figure 10 show the age group composition of STW among full-timers and of layoffs in the labor force, respectively.

In all years of the analysis period, full-time workers at age 45 or over are less likely to be on STW than those under 45. The share of the full-timers at age 45 and over remained flat at around 30 percent until 1989 and increased steadily to exceed 40 percent in 2009.

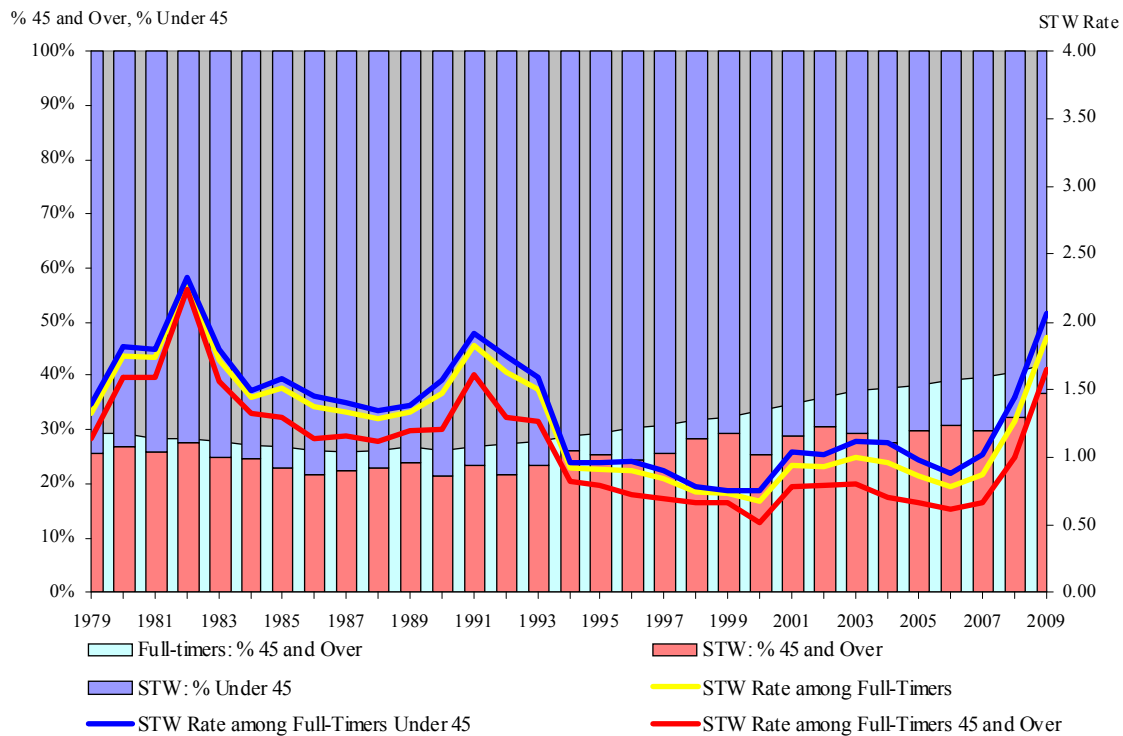


Figure 9. Age Composition of Full-Timers on STW

Stacked columns show the age composition of individuals who are on STW in a year. While the lower part of a column shows the percentage of those at age 45 and over, the upper part shows the percentage of those under 45. The horizontal line dividing the chart into two regions around 30 percent level shows the age composition of individuals who usually worked full-time (full-timers). While the lower region shows the percentage of those at age 45 and over, the upper region shows the percentage of those under age 45. The three fluctuating lines show the STW rate among all full-timers, STW rate among full-timers at age 45 or over, and STW rate among full-timers under age 45.

The share of the short-time workers at age 45 and over displayed an upward trend from 26 percent in 1979 to 37 percent in 2009. As a result, the STW rate was always higher for the old group compared to the young and they are cointegrated at the 10 percent confidence level.⁵⁸ Layoff rate of the young exceeded that of the old until 1984, but layoffs for these

⁵⁸ The Engle-Granger test statistic for cointegration is -2.745, which is, in absolute value, slightly lower than the 5 percent critical value (-2.964) but slightly higher than the 10 percent critical value (-2.621). Therefore, the STW rates for the old and the young are found to be cointegrated at the 10 percent confidence level.

two groups display an almost identical trend after that. Throughout the analysis period, I find that the layoff rates for the old and the young are cointegrated.⁵⁹

When the STW rate and the layoff rate for each age presented separately, it is observed⁶⁰ that both rates display a U-shape, although much more strongly for STW. The STW rate is highest among the youngest full-timers, steadily decreasing before flattening around ages 45 to 56, and then increasing after 56. This U-shape pattern is not symmetrical and the young experiences more STW than the old. The layoff rate is high among the young, flattening around ages 23 to 56, and increasing after 56. The layoff rate exhibits an almost symmetrical U-shape and the youngest and the oldest are more likely to be laid off where the middle ages are less but equally likely to be laid off.

⁵⁹ The Engle-Granger test statistic for cointegration is -3.268 and the 5% critical value is -2.964.

⁶⁰ See Figure C5 in Appendix C for a chart showing the STW and layoff rates for ages 16 to 70.

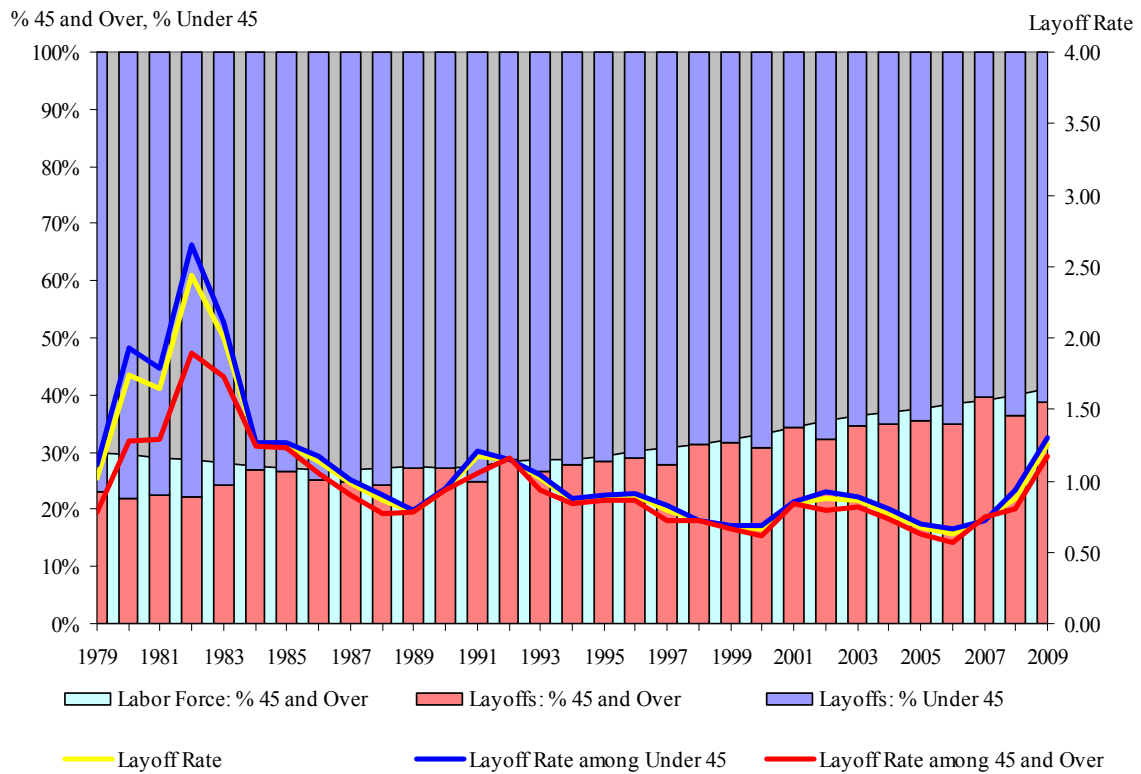


Figure 10. Age Composition of Layoffs and Labor Force

Stacked columns show the age composition of individuals who are laid off in a year. While the lower part of a column shows the percentage of laid-off individuals at age 45 or over, the upper part shows the percentage of laid-off individuals under 45. The horizontal line dividing the chart into two regions around 45-50 percent level shows the age composition the labor force. While the lower region shows percentage of those at age 45 or over in the labor force, the upper region shows the percentage of those under 45. The three fluctuating lines show the layoff rate, layoff rate among those at 45 and over and layoff rate among under 45 in the labor force.

5.3 Determining Short-Timer Workers who are Eligible for STC but do not Participate

States with STC programs impose limits on how much a work unit's hours can be reduced under the program. For example, the hours reduction for short-time workers is used to determine the percentage of short-time workers who would be eligible to participate in an existing STC program. I investigate in this section whether the existing short-time workers would have been eligible for STC if available in their states based on the actual hours reduction occurred and the minimum level of reduction required by the programs. If the hours decline for short-time workers is below the program's minimum levels, then it cannot be said that STW is a substitute for STC. However, if the opposite is true, it provides evidence that short-time work is prevalent and preferred to STC.

To evaluate short-time workers' eligibility for STC, I calculate the percent hours reduction for each individual on STW as the difference between usual weekly hours and actual hours worked during the survey week divided by usual weekly hours. STC eligibility is based on the program's allowable hours reduction. For example, short-time workers in Washington are considered not eligible before 1983 regardless of their percent hours reduction, but flagged as eligible in 1983 and later if their hours reduction is between 10 percent and 50 percent. None of the short-time workers in Illinois is considered eligible for STC in these calculations since nobody has participated in its program since its adoption in 1983 (Walsh, London, McCanne, Needels, Nicholson, & Kerachsky, 1997). Short-time workers in Louisiana are eligible for STC only between 1986 and 1988 if their STW rate falls between 20 percent and 40 percent because no employers have participated in the program since 1988.

Nine of the 18 states with operational STC programs impose 10 percent and the remaining STC states impose 20 percent as the lower limit for hours reduction required for a firm to be eligible for STC (Table 2, Chapter2). Maximum allowable hours reductions vary from 40 percent to 60 percent, except California, which has no upper limit, and Maryland, whose upper limit of 50 percent can be increased by state⁶¹. The eligibility rule I used in this section depends only on the percent hour reduction. Other employee and employer eligibility requirements, such as minimum tenure with the firm or the minimum number of employees, are not taken into account. Therefore, the eligibility percentages calculated in this chapter provide an upper limit to the percentage of short-time workers who would have been eligible for the program in STC states.

Figure 11 is a histogram of hours reduction percentages observed among short-time workers between 1979 and 2009. As shown in the figure, the 20 percent-to-30 percent reduction is by far the most common reduction level among the short-time workers between 1979 and 2009, with about 39 percent of short-timer workers falling into this range. The second most common reduction range is the 40 percent-to-50 percent, containing 14 percent of the short-time workers. A little over 11 percent of short-time workers have their usual hours cut by 10 percent to 20 percent, making this the third most common range. Almost half of all short-time workers (47.6 percent) experienced a reduction of 20 percent to 40 percent. This is the range of hours reduction that is covered by all existing STC programs. Thus, if all states had a typical STC program during the entire analysis period, almost half of short-time workers would have been eligible for the program. The potential program eligibility is greatly affected by STC programs' allowed

⁶¹ In eligibility calculations, the upper limit of allowed hours reduction for California and Maryland is assumed to be 99 percent.

reduction level restrictions. If 10 percent was used as a minimum hours reduction required by an STC program and the program was available in all states, 95 percent of all short-time workers would have been eligible for STC. However, if more restrictive cutoff of 30 percent was used to determine eligibility, 43 percent of all short-time workers would have been eligible.⁶²

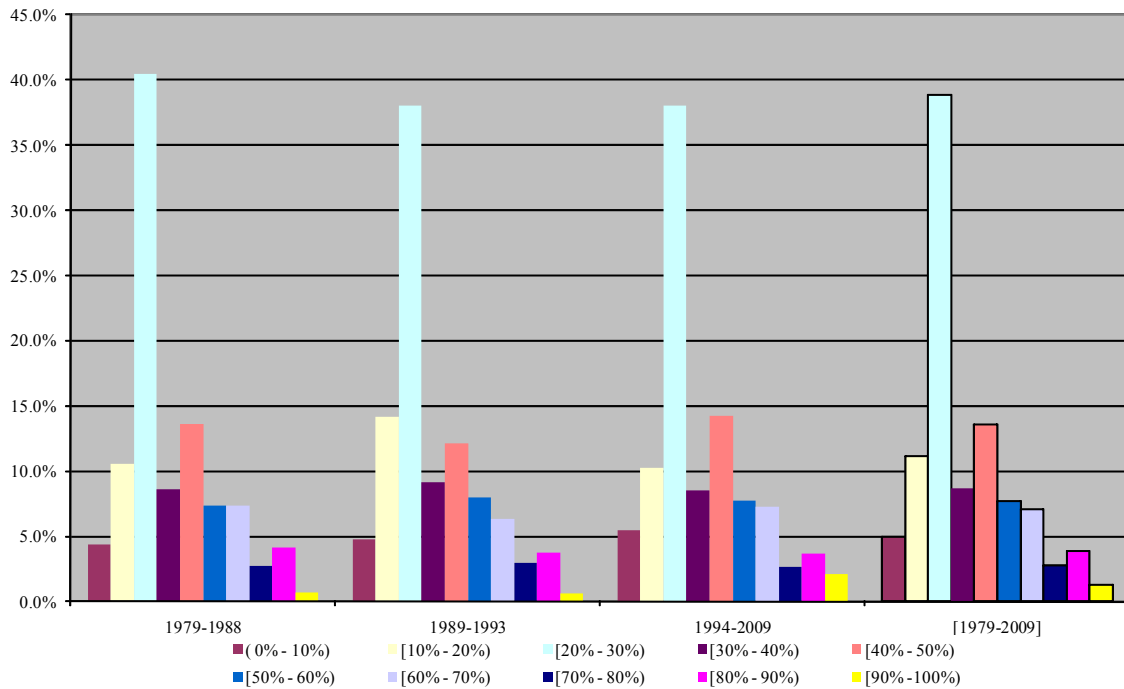


Figure 11. Distribution of Percent Hours Reduction for Short-Time Workers in 1979-2009 Period

Percent hours reduction is calculated as the ratio of hours reduction during the survey week to the usual weekly hours. Height of a column shows the percentage of all short-time workers experiencing an hours reduction percentage within the range indicated by that column.

To evaluate the utilization of existing STC programs’ potential among short-timers, the number of short-time workers and the number of STC beneficiaries are compared in

Table 6 and Table 7. The labor force (as defined in this chapter) of the STC states expanded

⁶² Annual distribution of hours reduction deciles are shown in Appendix B, Table B4.

from 9.3 million in 1979 to a little over 52 million in 1994 as the number of states with the program went from 1 to 17. The number of layoffs and short-time workers show countercyclical patterns, increasing more during the recession years than normal times. Between 1979 and 1993, the number of short-time workers was 96 percent of the number of layoffs, but between 1985 and 1993 the number of short-time workers exceeded that of layoffs by about 30 percent. This relationship was reversed after 1994, with about 25 percent more layoffs occurred than short-time work. With the latest recession, the relationship was reversed one more time as short-time work became more common. During recessions, short-time work tends to increase more than layoffs.

Using each STC program's minimum and maximum hours reduction restrictions, the percentage of short-time workers that are eligible for STC can be calculated. The average number of STC recipients⁶³ between 1982 and 2007 was little more than 45,000, reaching 100,000 during and following the recent recession years. A small number of STC states utilized the program more than others (Wandner 2008). The actual number of STC beneficiaries was 14.5 percent of the number of short-time workers across the years in which both series were available. Both series followed similar countercyclical patterns. The average level of utilization of STC's potential is small compared to its peak of 34.6 percent reached during the recession of 2001.⁶⁴

⁶³ The number of STC recipients shows the number of workers who were covered by the UI system and paid STC benefits (Wandner, 2008).

⁶⁴ 2007 is also a recession year with a peak with all programs but the recession did not start until the year-end. National Bureau of Economic Research announced that December 2007 is the start of the most recent recession. On the other hand, the recession in 2001 started in March and ended in November.

Table 6

Comparison of the Number of STC Beneficiaries and Short-Time Worker: 1979-1993

Year	No of States with STC	Labor Force	No of Layoffs	No of STW	STW as a % of Layoffs	No of STW Eligible for STC	% STW Eligible for STC	No of STC Beneficiaries	Utilization of STC's Potential
1979	1	9,278,271	65,154	85,469	131.2%	82,524	96.6%		
1980*	1	9,500,587	99,636	108,870	109.3%	106,443	97.8%		
1981*	1	10,019,229	125,282	123,473	98.6%	121,123	98.1%		
1982*	3	12,076,114	221,078	199,648	90.3%	183,956	92.1%	2,649	1.4%
1983	4	13,923,075	211,753	179,015	84.5%	152,915	85.4%	1,593	1.0%
1984	6	20,748,915	204,788	199,694	97.5%	155,873	78.1%	3,189	2.0%
1985	8	28,911,523	258,379	336,849	130.4%	270,654	80.3%	4,387	1.6%
1986	11	39,348,088	358,049	377,076	105.3%	290,535	77.0%	12,956	4.5%
1987	12	42,821,060	330,278	375,697	113.8%	281,272	74.9%	23,019	8.2%
1988	14	47,690,140	320,620	451,067	140.7%	334,717	74.2%	25,588	7.6%
1989	13	46,828,385	311,658	461,892	148.2%	352,749	76.4%	32,474	9.2%
1990*	13	48,499,675	357,021	490,603	137.4%	401,544	81.8%	44,922	11.2%
1991*	14	48,161,122	507,360	633,309	124.8%	506,210	79.9%	94,813	18.7%
1992	16	51,153,048	519,885	631,919	121.5%	494,468	78.2%	97,619	19.7%
1993	16	51,638,823	484,296	614,381	126.9%	498,398	81.1%	65,557	13.2%

Note. Recession years (indicated by *) are based on National Bureau of Economic Research Recessions (2010). The number of STC beneficiaries are reproduced from Table 2 in Wandner (2008, p 22). The remaining columns are based on calculations using the NBER's MORG data files. The number of states with shows only the number of states with an operational program within a year. Illinois is treated as a non-STC state and Louisiana is treated as an STC state only from 1986 to 1988 in this Table. See Chapter 2 and Walsh et al. (1997) more on these two programs. Utilization of STC's potential is calculated as the ratio of the number of STC beneficiaries to the number of individuals eligible for STC.

Table 7

Comparison of the Number of STC Beneficiaries and Short-Time Worker: 1994-2009

Year	No of States with STC	Labor Force	No of Layoffs	No of STW	STW as a % of Layoffs	No of STW Eligible for STC	% STW Eligible for STC	No of STC Beneficiaries	Utilization of STC's Potential
1994	17	52,737,923	491,402	340,367	69.3%	252,860	74.3%	53,410	21.1%
1995	17	53,772,536	509,058	344,169	67.6%	266,508	77.4%	45,942	17.2%
1996	17	54,817,149	491,869	332,345	67.6%	254,098	76.5%	41,567	16.4%
1997	17	56,070,812	428,112	312,866	73.1%	231,506	74.0%	33,577	14.5%
1998	17	57,440,647	430,350	278,720	64.8%	213,679	76.7%	64,331	30.1%
1999	17	58,614,966	393,353	283,770	72.1%	199,853	70.4%	36,666	18.3%
2000	17	60,401,513	404,695	305,766	75.6%	225,980	73.9%	32,916	14.6%
2001*	17	60,595,200	486,746	427,423	87.8%	354,278	82.9%	122,714	34.6%
2002	17	60,442,823	513,119	410,335	80.0%	311,889	76.0%	93,797	30.1%
2003	17	61,029,418	508,687	431,130	84.8%	339,938	78.8%	83,783	24.6%
2004	17	61,678,157	471,594	420,936	89.3%	309,862	73.6%	42,209	13.6%
2005	17	63,153,276	385,919	365,713	94.8%	291,362	79.7%	40,238	13.8%
2006	17	64,108,460	357,903	385,770	107.8%	305,659	79.2%	39,854	13.0%
2007*	17	65,137,459	443,954	412,788	93.0%	307,518	74.5%	49,920	16.2%
2008*	17	65,048,053	557,353	595,163	106.8%	453,717	76.2%		
2009*	17	63,276,175	684,183	863,038	126.1%	664,435	77.0%		

Note. Recession years (indicated by *) are based on National Bureau of Economic Research Recessions (2010). The number of STC beneficiaries are reproduced from Table 2 in Wandner (2008, p 22). The remaining columns are based on calculations using the NBER's MORG data files. The number of states with shows only the number of states with an operational program within a year. Illinois is treated as a non-STC state and Louisiana is treated as an STC state only from 1986 to 1988 in this Table. See Chapter 2 and Walsh et al. (1997) more on these two programs. Utilization of STC's potential is calculated as the ratio of the number of STC beneficiaries to the number of individuals eligible for STC.

5.3.1 Eligibility by Industry

During the analysis period, 80 percent of short-time workers in states with operational STC programs are potentially eligible for STC benefits. Although STW existed in states without an STC program, none of the short-time workers in those states are regarded as eligible. The distribution of eligible short-time workers across industries is reported in Table 8 and Table 9⁶⁵ and reveals that manufacturing with 16.9 percent of all eligible short-time workers, followed by other services⁶⁶ (16.7 percent), construction (16.6 percent), and trade including wholesale and retail (13.9 percent). These sum to more than 64 percent of all eligible short-time workers. Although the manufacturing sector has been the major user of STC programs with more than 50 percent of all participants (Walsh et al., 1997), trade and other services industries could have utilized STC as much as manufacturing. Construction industry with its highly seasonal employment patterns, however, may not be a large participant since seasonal workers are explicitly excluded from participating in most of the STC programs.⁶⁷

⁶⁵ 0 percent in these tables indicates that there were no individuals in MORG files in the corresponding year and industry on short-time work (or eligible for STC) in a state with an operating STC program, whose hours reduction is within the limits of the program. It is conceivable that such individuals exist in the population, but they do not exist in the CPS Outgoing Rotation Groups.

⁶⁶ Other services include the following service industries listed in National Bureau of Economic Research MORG Labels (2010):

- a) For 1979-2001 period: Private household services, Business services, Repair services, Personal services except private household, Entertainment and recreational services, Educational services, Social services, and Other professional services.
- b) For 2002-2009 period: Rental and leasing services, Professional and technical services, Management of companies and enterprises, Administrative and support services, Waste management and remediation services, Educational services, Social assistance, Arts, entertainment, and recreation, Accommodation, Food services and drinking places, Repair and maintenance, Personal and laundry services, Membership associations and organizations, and Private households.

⁶⁷ 12 STC states prohibit seasonal workers from participating in the program. Table 1 of Chapter 2 provides the list of states that exclude seasonal workers from participation.

5.3.2 Eligibility by Gender, Race, and Age

Table 10 shows the percentage of short-time workers who are eligible for STC by gender, race, and age. Of the eligible workers, 36.2 percent are women and 63.8 percent are men. While the share of females' decreased among the eligible short-time workers, males' share increased among the eligible. An examination of the racial distribution of these eligible workers shows that, on average, 53.3 percent of short-time workers eligible for STC are minorities while 46.7 percent are white. As the share of the minority short-time workers increased, the share of white short-time workers declined over time. Finally, the age distribution of the eligible short-time workers shows that, on average, about three quarters of short-time workers eligible for STC are under 45 (young). As the share of old short-time workers increased, the share of young short-time workers declined during the analysis period.

Table 8

Percentage of Short-Time Workers Eligible for STC (Eligibility Based on Hours Reduction): Across Industries between 1979 and 1993

Year	All	Mfg (Durable and Other)	Constr.	Public Admin.	Mining	Agri. incl. Forestry	Trade (Wholesale and Retail)	Transp.	Comm.	Utilities and Sanitary	Banking Fin. Inst. and R.E.	Health incl. Hospitals	Other Services
1979	96.6%	22.8%	22.3%	0.7%	0.0%	7.6%	24.9%	3.5%	0.0%	0.0%	1.4%	2.8%	10.6%
1980*	97.8%	24.9%	11.6%	3.6%	0.5%	13.8%	16.9%	4.7%	0.0%	0.5%	2.3%	0.9%	18.1%
1981*	98.1%	25.8%	20.5%	0.5%	0.5%	13.3%	16.7%	5.1%	0.5%	0.0%	2.3%	1.7%	11.2%
1982*	92.1%	29.2%	14.2%	0.3%	2.2%	7.8%	15.9%	2.4%	1.0%	0.0%	3.4%	4.6%	11.1%
1983	85.4%	21.3%	15.1%	0.9%	1.0%	7.5%	20.5%	3.6%	0.3%	0.1%	1.6%	4.3%	9.1%
1984	78.1%	17.2%	13.7%	0.0%	0.0%	9.4%	14.3%	4.3%	0.6%	0.0%	2.6%	3.3%	12.6%
1985	80.3%	21.0%	13.0%	0.4%	1.4%	6.7%	15.1%	3.7%	0.7%	0.2%	1.2%	2.2%	14.9%
1986	77.0%	18.1%	15.9%	1.2%	0.6%	2.9%	15.3%	3.0%	0.4%	0.0%	2.4%	1.9%	15.5%
1987	74.9%	16.0%	14.4%	0.5%	1.4%	6.1%	14.6%	2.6%	0.3%	0.0%	1.6%	3.7%	13.7%
1988	74.2%	17.0%	16.1%	0.7%	0.0%	4.5%	13.4%	3.8%	0.4%	0.1%	1.1%	2.0%	15.2%
1989	76.4%	14.0%	14.5%	1.2%	0.6%	6.8%	13.8%	5.4%	0.2%	0.0%	1.6%	2.0%	16.2%
1990*	81.8%	15.1%	20.6%	0.8%	0.1%	7.9%	13.8%	2.8%	0.3%	0.4%	2.2%	2.9%	15.0%
1991*	79.9%	15.2%	20.0%	0.2%	0.1%	3.4%	15.9%	3.9%	0.1%	0.2%	2.1%	2.1%	16.8%
1992	78.2%	16.2%	14.4%	1.0%	0.1%	5.2%	17.0%	3.1%	0.1%	0.6%	1.2%	2.3%	17.1%
1993	81.1%	12.8%	12.6%	0.6%	0.0%	4.4%	18.7%	5.0%	0.2%	0.8%	1.6%	4.4%	20.0%

Note. * indicates recession years.

Table 9

Percentage of Short-Time Workers Eligible for STC (Eligibility Based on Hours Reduction): Across Industries between 1994 and 2009

Year	Mfg (Durable and Other)		Constr.	Public Admin.	Mining	Agri. incl. Forestry	Trade (Wholesale and Retail)	Transp.	Comm.	Utilities and Sanitary	Banking, Fin. Inst. and R.E.	Health incl. Hospitals	Other Services
	All	Other)											
1994	74.3%	16.8%	14.8%	0.4%	0.0%	2.2%	15.0%	3.5%	0.0%	0.0%	0.7%	6.5%	14.3%
1995	77.4%	17.8%	17.2%	0.6%	0.0%	4.1%	14.4%	3.5%	0.0%	0.0%	1.4%	4.8%	13.5%
1996	76.5%	16.2%	12.7%	1.5%	0.0%	3.4%	13.8%	3.3%	0.2%	0.3%	2.1%	5.5%	17.4%
1997	74.0%	14.3%	16.6%	1.3%	0.6%	4.6%	12.1%	2.6%	0.5%	0.0%	0.4%	6.4%	14.6%
1998	76.7%	16.4%	12.5%	1.1%	0.7%	5.7%	12.6%	4.5%	0.4%	0.4%	0.5%	4.0%	17.9%
1999	70.4%	15.4%	16.3%	0.8%	0.8%	1.7%	11.7%	3.3%	0.6%	0.8%	1.8%	3.3%	14.0%
2000	73.9%	13.2%	15.7%	0.2%	0.3%	3.0%	14.0%	2.1%	0.3%	0.3%	4.0%	3.7%	17.1%
2001*	82.9%	19.3%	16.0%	1.1%	0.3%	3.3%	17.4%	4.1%	1.0%	0.0%	0.7%	3.2%	16.4%
2002	76.0%	15.9%	12.2%	0.5%	0.2%	2.9%	10.3%	5.0%	0.1%	0.0%	0.7%	5.7%	22.6%
2003	78.8%	14.4%	18.0%	1.2%	0.0%	3.7%	9.9%	1.9%	0.6%	0.0%	2.4%	5.5%	21.4%
2004	73.6%	13.1%	18.1%	0.0%	0.0%	2.5%	9.4%	2.8%	0.3%	0.0%	0.8%	5.3%	21.4%
2005	79.7%	12.2%	18.4%	0.8%	0.0%	2.2%	9.4%	1.9%	0.6%	0.7%	1.9%	4.3%	27.3%
2006	79.2%	13.1%	22.8%	0.3%	0.5%	1.9%	9.5%	4.1%	0.0%	0.0%	1.4%	5.4%	20.3%
2007*	74.5%	10.8%	23.1%	0.7%	0.3%	4.0%	8.3%	2.0%	0.7%	0.1%	1.6%	4.3%	18.7%
2008*	76.2%	12.4%	21.8%	0.0%	0.1%	1.6%	8.8%	2.9%	1.0%	0.2%	0.8%	4.3%	22.4%
2009*	77.0%	16.4%	18.5%	1.1%	0.2%	1.3%	6.8%	3.6%	0.6%	0.0%	1.4%	5.6%	21.6%
Average (1979-2009)	79.8%	16.9%	16.6%	0.8%	0.4%	5.0%	13.9%	3.5%	0.4%	0.2%	1.6%	3.8%	16.7%

Note. * indicates recession years.

Table 10

Percentage of Short-Time Workers Eligible for STC (Eligibility Based on Hours Reduction): By Demographic Groups between 1979 and 2009

Year	All	Gender		Race/Ethnicity		Age	
		Female	Male	Non-White	White	Age 45 or Over	Under Age 45
1979	96.6%	41.9%	58.1%	46.2%	53.8%	21.9%	78.1%
1980*	97.8%	43.2%	56.8%	51.8%	48.2%	20.9%	79.1%
1981*	98.1%	36.6%	63.4%	52.1%	47.9%	18.3%	81.7%
1982*	92.1%	29.5%	70.5%	41.6%	58.4%	22.3%	77.7%
1983	85.4%	35.4%	64.6%	43.8%	56.2%	26.9%	73.1%
1984	78.1%	38.3%	61.7%	43.0%	57.0%	23.8%	76.2%
1985	80.3%	33.5%	66.5%	49.6%	50.4%	17.8%	82.2%
1986	77.0%	41.4%	58.6%	42.2%	57.8%	17.5%	82.5%
1987	74.9%	41.0%	59.0%	46.0%	54.0%	20.7%	79.3%
1988	74.2%	36.3%	63.7%	48.0%	52.0%	22.0%	78.0%
1989	76.4%	41.9%	58.1%	45.8%	54.2%	21.1%	78.9%
1990*	81.8%	35.0%	65.0%	51.3%	48.7%	19.1%	80.9%
1991*	79.9%	33.9%	66.1%	47.1%	52.9%	23.6%	76.4%
1992	78.2%	33.7%	66.3%	51.8%	48.2%	17.3%	82.7%
1993	81.1%	36.7%	63.3%	55.3%	44.7%	22.2%	77.8%
1994	74.3%	36.2%	63.8%	49.7%	50.3%	23.3%	76.7%
1995	77.4%	36.2%	63.8%	47.1%	52.9%	22.1%	77.9%
1996	76.5%	34.0%	66.0%	55.6%	44.4%	25.5%	74.5%
1997	74.0%	37.6%	62.4%	55.5%	44.5%	25.3%	74.7%
1998	76.7%	37.4%	62.6%	50.8%	49.2%	25.7%	74.3%
1999	70.4%	39.5%	60.5%	55.1%	44.9%	28.5%	71.5%
2000	73.9%	40.1%	59.9%	55.2%	44.8%	26.7%	73.3%
2001*	82.9%	35.4%	64.6%	56.2%	43.8%	28.5%	71.5%
2002	76.0%	39.4%	60.6%	60.6%	39.4%	29.8%	70.2%
2003	78.8%	34.8%	65.2%	58.5%	41.5%	25.7%	74.3%
2004	73.6%	34.4%	65.6%	70.0%	30.0%	22.9%	77.1%
2005	79.7%	38.1%	61.9%	64.3%	35.7%	30.2%	69.8%
2006	79.2%	28.3%	71.7%	63.8%	36.2%	27.0%	73.0%
2007*	74.5%	27.9%	72.1%	64.8%	35.2%	25.2%	74.8%
2008*	76.2%	31.6%	68.4%	65.7%	34.3%	29.6%	70.4%
2009*	77.0%	32.7%	67.3%	65.5%	34.5%	34.6%	65.4%
Average	79.8%	36.2%	63.8%	53.3%	46.7%	24.1%	75.9%

Note. * indicates recession years.

5.4 Conclusion

This chapter extends an earlier work by Levenson (2001) on STW and layoff rates and finds that the layoff and the STW rates may have different trends and drift apart over time although their year-to-year movements are highly correlated. Throughout the analysis period, the STW rate of labor force and the STW rate among full-timers follow almost identical patterns, although short-time work tends to increase more than layoffs during the recessions. Both layoff and STW start increasing right before recessions and reach their peaks during the recessions. The most important result that emerges from findings of this study that STW is countercyclical and does appear to be a mechanism for reducing work time in the face of slack demand.

Many of these short-time workers in states with STC are potentially eligible for STC benefits. Incorporating the minimum and maximum hours reduction levels imposed by the existing STC programs show that on average 80 percent of short-time workers are determined to be eligible for one of the 17 STC programs during the analysis period. It is found that the most common hours reduction falls into the 20-30 percent range. The limitation on the hours reduction allowed under STC is found to play a significant role on the magnitude of short-time workers who would be eligible for the program. Furthermore, the finding that most short-time workers are eligible for STC implies that states' existing minimum hours reduction requirements does not explain lack of participation in STC.

Increased levels of utilization during the recessions indicate that STW constitutes a pool from which STC participants are drawn. A comparison of the number of short-time workers and the number of STC beneficiaries shows that actual STC participants represent

only a small portion of all short-time workers. This suggests that STW without STC is common. Four probable causes for low STC take-up despite relatively high STW are as follows: (a) overtime is common and reductions in overtime hours do not qualify for STC benefits; (b) the reduction in regular UI benefits if laid off after participation discourages employees to participate; (c) if experience rating is high, the program's value for employers decreases; and (d) the program is not widely known among firms (as a survey of companies showed (Walsh et al., 1997)).

The layoff rates for men and women are found to be cointegrated and women are found to be less likely to be on layoff and on STW than men throughout the analysis period. Therefore, if STC is perceived as a way to protect women's employment it would not be as successful as intended since men are more likely to be in the pool of potential program users. On the other hand, STC may provide some job protection to minorities as they consistently experience STW and layoffs more than whites do. Two concerns with respect to age are the seniority rule working against the young and the potential age discrimination working against the old in case of layoffs. When the STW rate and the layoff rate within each age is examined separately, it is found that the young and the old experience STW and layoff more than middle-aged workers. Therefore, it is conceivable that STC would benefit the young and the old more than the middle aged workers.

STC is an insurance program that helps maintain purchasing power during low demand periods by sharing available work hours and keeping people employed. Patricia Schroeder describes the main objective of STC as "to keep people attached to their jobs during lean times" (1984, p. ix). STW without STC also achieves this by keeping

individuals employed. I showed that work hours are frequently reduced to less than normal due to business related reasons such as slack demand during economic downturns and a great majority of workers on reduced time schedules (short-time workers) are eligible for STC, but do not participate in the program as reflected in the low STC participation rates. This, in turn, implies that firms use layoffs and short-time work without resorting to the partial compensation for the lost hours through government administered STC.

CHAPTER 6: EXTENSION OF ANALYSIS TO AN ADDITIONAL COUNTRY: CANADA

Canada provides a useful comparison to the U.S. The Canadian STC program⁶⁸ shares many of the features of the U.S. programs but has some important differences. The Canadian program is a part of the unemployment insurance system and financed through a flat rate payroll tax and is not experience rated. Furthermore, the Canadian employment protection laws are slightly more stringent as, in some provinces and the Federal government, they require modest severance pay and advance notice in case of layoffs. These two factors, in addition to the slightly more generous STC benefits to those whose hours are reduced, should increase STC participation in Canada because employment protection makes layoffs costlier to employers and non-experience rated taxes provides incentives for employers to adjust hours. In addition, generous benefits make STC more appealing to employees in Canada. As it happens, program utilization, as shown in Figure 1, remains similarly low in both countries during normal times but the Canadian program is more responsive to recessions during which its utilization rates is closer to those in European countries. In this chapter, I compare program characteristics in the two countries and test whether the experience rating and employment protection can explain the differences in program participation.

Before comparing the two programs, it will be useful to summarize the Canadian system. The program's development over time and its legislative history is presented in the

⁶⁸ Short-time compensation program in Canada is called Work Sharing Program.

next section. Then, the Canadian program rules are explained. Program utilization section describes program participation rates for the 1990-2002 period. In the last section I provide a comparison of program features and employment protection laws with those in the U.S.

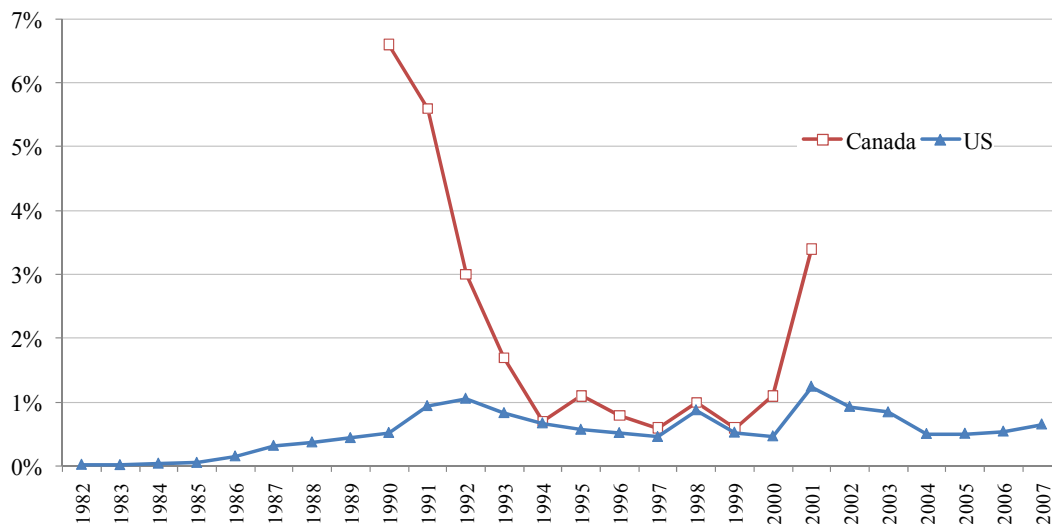


Figure 1. First STC Claims a percentage of Regular UI Claims: Canada and the U.S. The Canadian percentages are from Exhibit 2.1 (Basic Estimates: Work Sharing claims vs. layoffs due to work shortage) in HRDC (2004). A year for the Canadian data points run from April 1 in that year to March 31 of the next year. The U.S. data points are from Table 2 “Short-Time Compensation (STC) and Regular Unemployment Insurance (UI) Beneficiaries, 1982–2007” in Wandner (2008) on page 20. The number of UI beneficiaries used to calculate the STC percentage in the U.S. captures the weekly initial claims in STC states only. Information on the Canadian program comes from an official work that is published by the Government of Canada (HRDC, 2004) and this chart has not been produced in affiliation with, or with the endorsement of the Government of Canada.

6.1 Program History and Legislation

The STC program is managed and operated by the Human Resource Development Canada under the authority of the Employment Insurance Act. As elsewhere, the Canadian

program attempts to avert temporary layoffs during low demand periods by sharing the available work across workers. The Canadian STC began as a pilot program in 1977 as part of the country's unemployment insurance (UI) system⁶⁹ under Bill C-27 as part of an experiment involving 24 pilot studies that lasted until 1979 (Meltz & Reid, 1983). The program proved to be 2.4 times costlier than layoffs, and was discontinued. Higher costs associated with STC were attributed to three features of the pilot program (Reid, 1982): First, STC benefits were two-thirds of the lost earnings and more generous than regular UI benefits. Second, the waiting period and the limit on the 26-week benefit receipt period imposed on regular UI benefits were eliminated in two of largest firms participating in the experiment. Third, STC benefits did not reduce the program participant's UI benefits if they were laid off after participating. When recession and high unemployment hit the economy in 1981, the STC idea became popular again and the federal government made changes in the program features to avoid the cost problems that were experienced in the pilot programs. The STC benefits were made equivalent to regular UI benefits (55 percent of usual earnings up to a maximum) and the duration of benefits was limited to 26 weeks. It became a nationwide program in 1982 and was made permanent in 1985 (Human Resource Development Canada [HRDC], 2002a).

The program received widespread acceptance by media and the public (MaCoy & Morand, 1984). Unions and business organizations initially objected to the program but supported it as they became aware of its advantages (Human Resource Development Canada [HRDC], 2002b). However, support from organized labor and business

⁶⁹ Unemployment insurance in Canada is called "Employment Insurance" (EI).

organizations was not uniform. While central labor organizations objected to the program, local unions supported it. Trade union federations were concerned that STC would weaken the government policies against unemployment by lowering the measured unemployment rate. The seniority principle was another reason for objection, because of STC's uniform treatment of workers regardless of experience with the firm. This caused resistance among union members. On the other hand, local unions firmly supported the work sharing concept, even without UI compensation for reduced hours. Meltz and Reid (1983) ascribe this difference to local unions' short-run perspective. The effects of layoffs are felt more strongly at the local level by union leaders, hence making STC an attractive alternative. Conversely, central associations were more concerned with the program's long-run policy implications.

Businesses often objected to the program because they might subsidize inefficient businesses, and they preferred work arrangements that did not involve government interference through the UI Commission (HRDC, 2002a). Nonetheless businesses also differed in their evaluations of the program. Local employers supported the program because of short-term concerns, such as potential savings in hiring and training costs of layoffs during the recovery. Central business associations, on the other hand, were more concerned with the program's long-run effects on work incentives, productivity, and efficiency (Meltz & Reid, 1983).

Both the Canadian and the U.S. programs explicitly target temporary layoffs. This design feature probably aims to accommodate the contradicting long-run and short-run perspectives of unions and management discussed in this section, by narrowing the

program's focus to the short-term and by avoiding subsidization of long-run inefficient business practices.

6.2 Program Rules

The Canadian STC program aims to avert layoffs by helping workers and employers during the temporary business downturns until workers return to their normal work hours (Service Canada, 2010). The program is integrated into the UI system and is funded by both employer and employee contributions as is the regular UI. Employers pay 1.4 times the premium paid by employees. The UI premium rate is determined annually such that the aggregate UI account has enough funds to cover the average annual basic program costs that are estimated based on the latest three years. If there is a deficit (surplus), the premium is increased (reduced) (Human Resource and Skills Development Canada [HRDSC], 2010). Approximately 96 percent of the Canadian labor force is covered by UI, which also provides benefits for sickness, maternity, maternal benefits, and funding for supplementary training allowances (Kerr, 1994). Of special importance here, the Canadian government, through its UI system, also provides benefits to eligible workers in approved short-time compensation programs with the purpose of enabling workers to retain their jobs and skills during slack times and firms to reduce labor input without layoffs and avoid rehiring and training expenses (Service Canada, 2010).

Work sharing schemes designed to avoid layoffs due to seasonal unemployment or permanent downsizing are not permitted by the program guidelines.⁷⁰ Details of the

⁷⁰ In 1993, Bell Canada requested the Work Sharing program to contribute \$30 million to compensate workers who would accept a shortened work week to avoid about 5,000 layoffs in Quebec. Human Resources

Canadian STC program, participation and eligibility rules, and program benefits are summarized in Table 1.

According to the Canadian government, the Canadian UI system replaces 55 percent of a laid off worker's usual earnings up to CAN\$43,200 (HRDSC, 2010). The STC benefits are calculated based on this replacement rate such that a worker receives 55 percent of his/her earnings lost due to work shortage. For example, a worker earning \$500 in a normal week earns \$400 in wages and receives \$55 (55 percent times \$100 lost earnings due to short-time) STC benefits while participating in an STC plan with 20 percent hours reduction. Hence, this participant's income loss would be only 9 percent of his/her usual earnings while he/she works 20 percent less (HRDC, 2002b). When the progressive tax system is taken into account, his/her income loss could be as low as 5 percent of his/her normal after-tax income (Meltz & Reid, 1983). Taxes are not deducted at the time of benefit payments, but are paid by employees when filing tax returns. If a participant's net income from all sources exceeds a limit (CAN\$54,000) in a tax year, he/she may be required to repay 30 percent of the excess amount or 30 percent of the total STC benefits collected in that year (Service Canada, 2010).

The two-week waiting period required for regular UI benefits is waived when collecting STC benefits. Employers are required to maintain all existing employee benefits during the STC plan, and statutory holidays during the plan period are the responsibility of the employer and not compensated by STC.

Development Canada denied this request because the plan was explicitly intended to reduce the cost of a permanent downsizing (Gray, 2000).

STC plans in Canada can last for a minimum of 6 weeks up to a maximum of 26 weeks, which can be extended up to 38 weeks under exceptional circumstances (Service Canada, 2010). During the recession of 2009, the maximum agreement duration was extended to 52 weeks for applications received between February 2009 and April 2010 (Service Canada, 2009). If participating employees are laid off after the program, the benefits received under the STC plan are not deducted from their regular UI benefit amounts or duration (Service Canada, 2010).

Table 1

Rules and Requirements of the Canadian STC Program

Plan Requirements	
Minimum program duration	6 weeks
Plan Duration Before New Approval	26 ^a
Union consent required	Yes
Business recovery plan required	Yes
New hiring allowed in participating unit	No
Replacing a worker allowed in participating unit	Yes
Employer Participation Rules	
Minimum no. of workers affected	2
Minimum decrease in sales/orders	10%
Reduction in hours allowed	20% to 60%
Required to maintain employee benefits	Yes
Minimum no. of years in business	2
Employee Participation Rules	
Managerial workers	Not eligible
Part-timers	Eligible
Seasonal workers	Not eligible
Students	Not eligible
Contract workers	Not eligible
Foreign workers	Not eligible ^b
Minimum tenure required with employer	420-910 hours ^c
Program Benefits	
Maximum duration of benefit receipt	52 weeks
Weekly earnings replacement rate	55% ^c
Two-week waiting period to collect benefits	Waived
Allowed earnings from another job	40% of weekly benefits or \$75 (whichever is greater)
Benefits taxable	Yes but when filing tax returns
UI benefit rate if laid off after the program	Not affected
UI benefit duration if laid off after the program	Not affected

Note. Information on this table is obtained from HRDC (2004) and Service Canada (2010).

^aCan be extended up to 38 weeks for agreements that started on April 4, 2010. ^bExcept those whose jobs are essential parts of the business. ^cSame as regular UI.

Approval of both the government and all workers (as well as union if exists) is required before a new plan can be initiated or before modifications can be made to an existing plan. If some workers who have the same job descriptions as the participants decide not to participate, they must work the same reduced hours as the participants but cannot receive STC benefits. Employers are required to demonstrate that business activity decreased significantly beyond the control of the employer; that the firm's sales or orders decreased more than 10 percent compared the last two years; and that the proposed hours reduction is necessary to avoid layoffs. For a plan to be approved, the proposed hours reduction must be at least 20 percent of regular work hours and cannot exceed 60 percent. The reduction level can vary from one week to the next but cannot vary within the same week (Service Canada, 2010). Hours were reduced by about 29 percent between 1990 and 2002 (HRDC, 2004).

Employers are also required to provide an estimate of the number of layoffs to be averted by the plan as well as a business recovery plan describing actions to be taken to return to full employment levels (Service Canada, 2010). Employers' estimates of layoffs avoided in their program applications exceed greatly the actual layoffs avoided (Halpern, 2003). According to a survey of participating companies (HRDC, 2004), the most common type of recovery activity involves increasing marketing effort or finding new customers. Employees responsible for generating new business in a firm—usually the managers such as senior management, marketing and sales managers, sales agents who perform activities that are essential to the recovery of the business—are not allowed to participate in the program. They are expected to work full-time to get back to normal work schedules.

Similarly, employees who are responsible for deciding work hours and responsibilities of other employees cannot participate (Service Canada, 2010). Seasonal employees, students, and contract workers are also ineligible for STC. Eligible participants must be the permanent full-time or part-time employees. A minimum of two employees is required for an STC plan (HRDC, 2004; Service Canada, 2010).

6.3 Program Utilization

Participation in the work sharing programs is relatively low compared to regular unemployment insurance claims and comparable to that in STC states in the U.S. during normal times but greatly exceeds the U.S. participation during recessionary periods probably because while the strong employment protection regulations makes it costlier to lay off workers in Canada, the experience rating of STC in the U.S. makes the hours adjustment costlier in the U.S. This is discussed in detail in the next section. In 2003, Human Resources Development Canada undertook an evaluation of STC program use between 1991 and 2002 and published the evaluation report in 2004 (HRDC, 2004). This report analyzes program features, participation rates, and characteristics of the participants. This section summarizes the report's findings.

As shown in Table 2, the average proportion of STC claims to regular UI claims in Canada between 1991 and 2002 was 2.4 percent.⁷¹ However, this ratio varied significantly across years, ranging from 6.6 percent in fiscal year 1991-92 to 0.6 percent in 1997-98 and 1999-2000. During this period, program utilization fluctuated considerably even though it

⁷¹ The average is based on the fiscal year, which runs from April 1 to March 31 for the Canadian federal government and the provincial and territory governments in Canada.

depicted a countercyclical pattern as expected. The average number of new STC claims between 1990 and 2002 was 36,219. However, this number reached a high of 112,357 during the 1991-92 recession, falling to only 7,683 by 1997-98. The average STC payment for these new claims was CAN\$87 per week and lasted about 12 weeks on average.

HRDC (2004) reported that STC averted or delayed a significant number of potential layoffs. The STC program is estimated to have prevented 10,302 layoffs annually between 1991 and 2002. Given that 5,218 STC participants per year during the same time period collected regular UI benefits in the six months after their STC plan ended, at least half of the layoffs seem to have been averted only temporarily. While on STC, participants rarely search for a new job (HRDC, 2004). A survey on a focus group of 100 STC participants and 100 laid off workers revealed that none of the program participants engaged in job search activities (Prairie Research Associates, 2002). Among the cited reasons for this inactivity are as follows. (a) The STC participants did not feel that they were unemployed and required to look for a new job or did not know they were allowed to look for other jobs while on STC; (b) the risk of not finding a job with the same benefits deterred some of the participants; (c) the risk of not finding a job at all was a discouraging factor; (d) some participants perceived the short-time schedule as a time-off; and (e) changing or uncertain work schedules while on STC was said to be an obstacle to job search activities (Prairie Research Associates, 2002).

The great majority of program participants (67 percent) are employed in the manufacturing sector. The second biggest sector in STC participation is wholesale trades (10 percent). The ratio of STC claims to regular UI claims in manufacturing is 8.4 percent,

which is about four times higher than the overall average of 2.3 percent. The number of male participants is almost twice that of female participants, probably because men are overrepresented in manufacturing. Almost three-quarters of all participants are concentrated in Ontario and Quebec (HRDC, 2004).

Siedule, Guest, and Wong (2001) find that the union status of a Canadian firm has only a slight negative impact on the probability that a firm will utilize STC. It is more likely to be used by firms that employ skilled workers as one might expect because STC is intended to help firms to maintain their workforce intact.

The cost of the STC program to the UI account is somewhat higher than if the employee is simply laid off to achieve the same amount of hours reduction. The higher costs can be attributed to the following factors: An earlier STC evaluation (Employment and Immigration Canada [EIC], 1993) reported that about 30 percent of laid off workers do not collect unemployment insurance benefits probably because they find alternative jobs. Under STC programs, however, almost all of those in the work unit receive STC benefits, which are on average somewhat higher than regular UI benefits. Because, compared to laid off workers, STC participants were more likely to have longer tenures with the employer, therefore, have higher wages and benefit amounts (EIC, 1993; HRDC, 2002b). However, this difference is probably small because of the ceiling imposed on unemployment insurance benefits. Furthermore, administration costs are higher because more workers receive benefits under work sharing programs than would under the layoff alternative. Moreover, layoffs can occur after an STC plan ends, and the employees can collect regular UI benefits for their full entitlement period. In addition, there is no waiting period before

participants collect their STC benefits, while there is a two-week waiting period for collecting regular UI benefits (HRDC, 2004).

Table 2

STC Claims versus Layoffs

Fiscal Year	STC Claims ^a			Layoffs due to Work Shortage					
	No of new claims	Average weeks of benefits ^b	Average weekly benefit amount	No. of ROEs due to work shortage	No of regular UI claims ^c	Average weeks of benefits	Average weekly benefit amount	STC claims as a % of ROEs due to work shortage	STC claims as a % of UI claims due to work shortage
1990-91	112,357	13.1	\$80	3,186,360	1,694,376	25.3	\$242	3.5%	6.6%
1991-92	105,963	12.8	\$84	3,170,594	1,880,689	26	\$250	3.3%	5.6%
1992-93	55,900	12.6	\$89	2,980,929	1,877,181	25.6	\$257	1.9%	3.0%
1993-94	29,851	11.4	\$85	2,875,923	1,735,127	24.4	\$251	1.0%	1.7%
1994-95	11,214	11.9	\$81	2,795,162	1,559,182	20.8	\$251	0.4%	0.7%
1995-96	18,160	10.8	\$80	2,912,484	1,615,407	20.1	\$254	0.6%	1.1%
1996-97	11,522	10.6	\$84	2,939,710	1,485,865	19.7	\$250	0.4%	0.8%
1997-98	7,683	11.1	\$92	3,093,438	1,376,007	19.4	\$255	0.2%	0.6%
1998-99	13,115	12.3	\$99	3,107,158	1,361,488	18.8	\$261	0.4%	1.0%
1999-00	7,965	10.1	\$86	2,937,410	1,254,747	18.4	\$263	0.3%	0.6%
2000-01	14,222	12.1	\$89	3,040,272	1,252,915	18.2	\$278	0.5%	1.1%
2001-02	46,678	12.3	\$89	3,115,480	1,359,753	18.8	\$287	1.5%	3.4%
Average	36,219	11.8	\$87	3,012,910	1,537,728	21.3	\$258	1.2%	2.4%

Note. Table is reproduced from HRDC (2004), Exhibit 2.1 Basic Estimates: Work Sharing claims vs. layoffs due to workshor tage. This reproduction is a copy of an official work that is published by the Government of Canada and that the reproduction has not been produced in affiliation with, or with the endorsement of the Government of Canada. Fiscal year is from April 1 to March 31. “\$” indicates the Canadian Dollar. The Record of Employment (ROE) is issued by an employer when an employee terminates his/her employment or participates in STC (Kapsalis & Tourigny, 2003).^aSTC claims are those with at least \$1 CAN of benefits. They are shown in the fiscal year in which the first week of STC benefits was paid. ^bBased on all benefit weeks including those continued into the next year and excluding zero-benefits weeks. ^cExcluding individuals who had an STC claim in the 1990-2001 period.

6.4 Comparison of the STC Programs: Canada v. U.S.

The most significant difference between the U.S. STC programs and the Canadian Work Sharing program is the way these programs are funded. Benefits under these programs are paid from the unemployment insurance funds in both countries, but, while the U.S. firms pay experience-rated payroll taxes, Canadian employers and employees pay a flat rate payroll tax determined mostly at the federal level. Non-experience rated taxes in

Canada allows more volatile regions and industries to be subsidized by the more stable ones. As noted earlier, the Canadian premium rate is set each year to keep the Employment Insurance Account in balance over time. For employees, it is reduced to 1.73 percent from 1.80 percent of insurable earnings, effective January 1, 2008. The rate paid by employers falls to 2.42 percent from 2.52 percent of insurable earnings. The rates for Quebec are somewhat lower. The 2008 premium rates are 1.39 percent for employees and 1.95 percent for employers, because Quebec finances its own parental benefits. The insurable earnings amount is set to \$43,200 in 2010 (HRDSC, 2010).

The other difference between the two countries is that employment protection laws and their enforcement are modestly more rigid in Canada than in the U.S. For instance, a firm in Canada cannot terminate most labor contracts without cause or an advance warning notice (which range from one week to eight weeks as determined by a worker's tenure with his employer). Eleven jurisdictions have even more stringent advance notice requirements—eight to 18 weeks, depending on the number of layoffs—if a firm is to terminate 50 or more employees in a four-week period. In addition, federal law requires a minimum severance payment of two days of wages per year of service. Ontario imposes additional provisions regarding severance pay. Although these provisions apply only to employees with at least five years of service, they require much higher severance payments than the federally required minimum: one week of wages per year of service up to 26 years (Kuhn, 2000).

The U.S., however, does not impose any advance notice or severance requirements to terminate an employment contract except in cases of plant closings or mass layoffs.

Severance payments, however, can be required by contract, by employer's personnel policies, or employee handbooks (U.S. Department of Labor, Employment and Training Administration [ETA], 2003). The Worker Adjustment and Retraining Notification Act (WARN) of 1988 requires firms with 100 or more full-time workers to give 60-day written notice of plant closings or mass layoffs at a single site of employment (ETA, 2003; Kuhn, 2000).

To illustrate the impact of these variations on the STC programs of Canada and the U.S., I discuss two implicit contracting models representing a simple version of each program. These models are based on the STC model developed by Burdett and Wright (1989b)⁷² and the initial assumptions described in Chapter 4 are also made in this section. However, I additionally assume that the Canadian and the U.S. programs are identical except for two parameters: (a) the experience rating factor, and (b) direct payments to laid-off workers. I set the experience rating factor, e , to zero only in the Canadian model so that the firm pays a flat rate payroll tax in Canada; and set the direct payments from the firm to laid off workers, b , to zero only in the U.S. model to indicate the lower cost of layoffs in the U.S. due to the weaker employment protection laws. Before making these new assumptions, I first rewrite the original Burdett and Wright (1989b) model with STC to set the stage. In the original model, the firm's utility function is

$$V(x) = v[\pi(x)]$$

$$\text{where } \pi(x) = f[l(x), x] - n(x)h(x)w(x) - [1 - n(x)]b(x) - t(x)$$

$$\text{and } t(x) = eg[1 - n(x)] + egn(x)[1 - h(x)] + T \tag{1}$$

⁷² A detailed description of the Burdett and Wright model is provided in Chapter 4.

and the worker's utility is

$$U(x) = n(x)u[y_e(x), 1 - h(x)] + [1 - n(x)]u[y_u(x), 1], \quad (2)$$

where $y_e(x) = w(x)h(x) + g[1 - h(x)]$ is income when employed, and $y_u(x) = b(x) + g$ is income when unemployed, assuming zero tax rate on wage income and benefits. The Lagrangian function to find an equilibrium contract $C(x) = [n(x), h(x), w(x), b(x)]$ for the maximization problem in Equation 10 of Chapter 4 then is written as

$$L = \int \{v[\pi(x)] + \lambda[U(x) - \underline{U}] + \theta(x)[1 - n(x)]\}dF(x), \quad (3)$$

where λ and θ are the Lagrange multipliers on the expected utility constraint and the employment constraint ($n(x) \leq 1$), respectively, and \underline{U} is the reservation utility. The first order conditions in the original model are

$$\begin{aligned} \frac{\partial L}{\partial n} = v'(\pi)[f_1(l, x)l_1(n, h) - wh + b - eg(1 - h)] \\ + \lambda[u(y_e, 1 - h) - u(y_u, 1)] = \theta. \end{aligned} \quad (4)$$

$$\begin{aligned} \frac{\partial L}{\partial h} = v'(\pi)[f_1(l, x)l_2(n, h) - nw + egn] \\ - \lambda n[u_2(y_e, 1 - h) - (w - g)u_1(y_e, 1 - h)] = 0. \end{aligned} \quad (5)$$

$$\begin{aligned} \frac{\partial L}{\partial w} = v'(\pi) - \lambda[u_1(y_e, 1 - h)] = 0. \\ \Rightarrow \lambda = \frac{v'(\pi)}{u_1(y_e, 1 - h)} \end{aligned} \quad (6)$$

$$\frac{\partial L}{\partial b} = v'(\pi) - \lambda[u_1(y_u, 1)] = 0. \quad (7)$$

After inserting the value of λ from Equation 6 into Equation 4 and assuming that layoffs are part of the contract ($n < 1$, hence $\theta = 0$), the marginal condition of employment is written as

$$f_1(l, x)l_1(n, h) = y_e - y_u + \frac{u(y_e, 1-h) - u(y_u, 1)}{u_1(y_u, 1)} + (1-e)gh, \quad (8)$$

where $y_e(x) = w(x)h(x) + g[1 - h(x)]$ and $y_u(x) = b(x) + g$ indicating income when employed and unemployed, respectively.

Similarly, using the value of λ from Equation 6 in Equation 5, the marginal condition of hours becomes

$$\begin{aligned} & v'(\pi)[f_1(l, x)l_2(n, h) - nw + egn] \\ &= \frac{v'(\pi)}{u_1(y_e, 1-h)} n[u_2(y_e, 1-h) - (w-g)u_1(y_e, 1-h)] \\ \Rightarrow & f_1(l, x)l_2(n, h) = \frac{u_2(y_e, 1-h)}{u_1(y_e, 1-h)} n + ng(1-e). \end{aligned} \quad (9)$$

To study the employment and hours predictions of these simplified Canadian and U.S. programs, I derive the first-order conditions. After setting $e = 0$ for Canada, the firm's profit function becomes

$$\pi(x) = f[l(x), x] - n(x)h(x)w(x) - [1 - n(x)]b(x) - T. \quad (10)$$

Since the worker's income is not affected by experience rating in the model, the marginal condition of employment and marginal condition of hours for the Canadian model can be written, respectively, as follows:

$$f_1(l, x)l_1(n, h) = y_e - y_u + \frac{u(y_e, 1-h) - u(y_u, 1)}{u_1(y_u, 1)} + gh, \quad (11)$$

$$f_1(l, x)l_2(n, h) = \frac{u_2(y_e, 1-h)}{u_1(y_e, 1-h)} n + ng, \quad (12)$$

where $y_e(x) = w(x)h(x) + g[1 - h(x)]$ and $y_u(x) = b(x) + g$.

On the other hand, setting $b = 0$ for the U.S. model yields the following profit function for the firm:

$$\pi(x) = f[l(x), x] - n(x) h(x) w(x) - t(x) \quad (13)$$

where $t(x) = e g [1 - n(x)] + e g n(x) [1 - h(x)] + T$. Then, the marginal conditions of employment and hours for the U.S. model becomes

$$f_1(l, x) l_1(n, h) = y_e - y_u + \frac{u(y_e, 1-h) - u(y_u, 1)}{u_1(y_u, 1)} + (1-e)gh, \quad (14)$$

$$f_1(l, x) l_2(n, h) = \frac{u_2(y_e, 1-h)}{u_1(y_e, 1-h)} n + ng(1-e), \quad (15)$$

where $y_e(x) = w(x) h(x) + g[1 - h(x)]$ and $y_u(x) = g$.

The difference in the marginal conditions of employment between the Canadian and the U.S. models (Equation 11 – Equation 14) equals $-b + egh$, which depends on the relative size of the direct payment to a laid-off worker in Canada (b) and the unsubsidized portion of the UI and STC benefits borne by the firm due the experience rating (egh) in the U.S. If the direct payments in Canada exceed the UI/STC subsidy in the U.S., the Canadian employment will adjust less than the U.S. employment in this model. On the other hand, the Canadian model always leads to higher levels of hours adjustments as the difference between Equation 12 and Equation 15 is a positive amount, egn . In summary, Burdett and Wright model (1989b) can explain the relatively higher STC use in Canada during downturns.

Next, I present a simple numerical example comparing the earnings of STC participants and the UI tax payments in Canada and in the U.S. to highlight the other

differences between the STC programs in these two countries (see Table 3). For the U.S., I use the STC rules and the UI tax rates of California in this example. I consider two workers employed by two firms, one in Canada (outside of Quebec) and the other in California, each earning \$43,200 annually, which is equal to the Canadian taxable base wage. For simplicity, I assume the exchange rate between the Canadian dollar and the U.S. dollar is 1,⁷³ both workers work 40 hours a week and 52 weeks a year, hence earning \$830.77 a week during normal times. If he/she works a full year, the Canadian worker pays \$747.36 as an insurance premium, while no UI taxes are imposed on the Californian worker. If laid off, the Canadian worker will receive \$456.92 as a weekly UI benefit, which is equal to 55 percent of his/her insurable earnings. The Californian worker, on the other hand, can receive \$415.38, which is the one-twenty-sixth of his/her high quarter earnings in the base period and less than the maximum benefit amount of \$450 (United States Department of Labor, 2010). I further assume that the firms implement similar STC plans in the second half of the year, requiring a 20 percent hours reductions for 26 weeks. During the first 26 weeks of the year, employees earn their usual weekly wages of \$830.77. While on STC, however, their weekly wages drops to \$664.62. The STC benefits for each worker are computed as 20 percent of weekly UI benefits. The STC benefit amount is calculated as \$91.38 for the Canadian worker and \$83.08 for the Californian worker.⁷⁴ With the STC benefits, the Canadian worker is able to earn 91 percent of his/her usual weekly earnings, while the Californian worker earns 90 percent. For the entire STC period, the Californian

⁷³ On October 29,2010, CAN\$1.02 = US\$1 according to wsj.com.

⁷⁴ If the annual earnings of these workers were higher, the weekly STC benefit amount for the Canadian worker would still be larger since the maximum weekly benefit amount in Canada (\$456,92) is larger than that in California (\$450).

worker collects STC benefits for 25 weeks, which is one week less than the Canadian worker because of the one-week waiting period. Throughout the entire year, however, the Californian worker's annual income is larger since he/she does not pay UI premiums.

The Canadian firm is required to pay a fixed payroll tax (2.42 percent of wages) to the federal government. The firm's UI premium is \$1,046.30 for this worker if he/she works full-time the entire year, but \$941.67 he/she participates in the STC plan since his/her earnings drop below the maximum insurable earnings. On the other hand, the Californian firm's UI taxes are more complicated to calculate because of the experience rating. In the U.S., the Federal Unemployment Tax Act (FUTA) imposes a 6.2-percent federal UI tax on covered employers on wages up to \$7,000 a year but effectively reduces this tax by 5.4 percent if employers pay their state UI taxes on time and their experience rated tax is less than the state's highest UI tax rate. Hence, the FUTA tax rate is 0.8 percent for punctual employers (United States Department of Labor, 2010). A state imposes its own tax schedule on each covered firm based on the balance of state UI funds and the firm's past layoff (and STC experience where the program is available).

Table 3

A Comparison of Earnings, STC benefits and UI Taxes in Canada and California

Worker	Canada		California	
	Value	Formula	Value	Formula
(a) Usual weekly hours	40		40	
(b) Annual wage	\$43,200.00		\$43,200.00	
(c) Weekly wage	\$ 830.77	(b / a)	\$ 830.77	(b / a)
(d) UI premium rate	1.73%		N/A	
(e) Annual insurable earnings	\$43,200.00		\$ 7,000.00	
(f) Maximum annual premium	\$ 747.36	(d * e)	N/A	
(g) Weekly premium amount	\$ 14.37	(f / 52)	N/A	
(h) Weekly income after UI premium	\$ 816.40	(c - g)	N/A	
(i) Weekly benefit amount	\$ 456.92	(55% * (e / 52))	\$ 415.38	min(450,b / 104)
(j) STC plan duration (weeks)	26		26	
(k) Hours reduction under STC	20%		20%	
(l) Non-STC period total wages	\$21,600.00	((52 - j) * (b / 52))	\$21,600.00	((52 - j) * (b / 52))
(m) STC Period				
(n) Reduced weekly hours	32	((1 - k) * a)	32	((1 - k) * a)
(o) Weekly wages	\$ 664.62	((1 - k) * c)	\$ 664.62	((1 - k) * c)
(p) Weekly STC benefits	\$ 91.38	(i * k)	\$ 83.08	(i * k)
(q) Weekly total income	\$ 756.00	(o+p)	\$ 747.69	(o+p)
(r) Weekly replacement rate	91.00%	(q / c)	90.00%	(q / c)
(v) Total wages	\$17,280.00	(j * o)	\$17,280.00	(j * o)
(s) Total STC benefits	\$ 2,376.00	(j * p)	\$ 2,076.92	(j * p)
(t) Total income	\$19,656.00	(v + s)	\$19,356.92	(v + s)
(u) Annual wages	\$38,880.00	(l + v)	\$38,880.00	(l + v)
(v) Annual insurance premium	\$ 672.62	(min(u,e) * d)	N/A	
(w) Annual STC benefits	\$ 2,376.00	(s)	\$ 2,076.92	(s)
(x) Annual income	\$40,583.38	(u - v + w)	\$40,956.92	(u + w)
Firm				
(aa) Annual usual payroll	\$43,200.00	(b)	\$43,200.00	
(ab) Average base payroll			\$ 7,000.00	
(ac) UI tax rate last year			1.40%	
(ad) Reserve balance			\$ 120.00	
(ae) Reserve ratio			1.71%	(ab / ad)
(af) FUTA			0.80%	
(ag) UI premium rate	2.42%	(1.4 * d)	4.90%	
(ah) Federal UI tax	\$ 1,046.30	(g * 52 * 1.4)	\$ 56.00	(af * min(7000,ab))
(ai) State UI tax	N/A		\$ 343.00	(ab * ag)
(aj) Payroll in non-STC Period	\$21,600.00	(l)	\$21,600.00	(l)
(ak) Payroll in STC Period	\$17,280.00	(v)	\$17,280.00	(v)
(al) Annual payroll	\$38,880.00	(aj + ak)	\$38,880.00	(aj + ak)
(am) Annual UI premiums				
(an) Federal UI tax	\$ 941.67	(min(al,e) * af)	\$ 56.00	(af * min(7000,al))
(ao) State UI tax	N/A		\$ 343.00	(ag * min(al,ab))
(ap) Annual payroll and UI payments	\$39,821.67	(al + an)	\$39,279.00	(al + an + ao)
State and Federal Government				
(aq) Total UI premiums collected	\$ 1,614.30	(v + an)	\$ 399.00	(an + ao)

While other states have taxable wage bases higher than the federal tax base of \$7,000,⁷⁵ California's is equal to the federal tax base. I assume that the Californian firm in this example has been in business for four years without any layoffs or STC expense until the year hypothesized in this example. California's experience rating rules prescribe 3.4 percent UI tax rate on wages up to \$7,000 for the first three years and the state's experience rating formulas prescribe 1.4 percent for the fourth year. With the STC benefits paid in the example year, however, the firm's UI reserve account declines and the firm moves to a less favorable tax schedule that requires 4.9 percent UI tax rate (or \$343) for the year in which the STC is implemented. Since the tax base is very low compared to the worker's earnings even during the STC plan, the total UI taxes (FUTA and state) paid by the Californian firm is about 40 percent of the UI taxes paid by the Canadian firm (\$941.67).⁷⁶

The total UI taxes collected from the firm by the federal government and the state of California sums up to \$399. The Canadian firm's UI premiums collected by the government are calculated as \$1,614.30, the sum of the premiums paid by the worker (\$672.62) and the firm (\$941.67).

Another Canadian–U.S. difference is that under most American state programs, workers who collect STC benefits face decreased UI benefits, if they are subsequently laid off. Program participation, however, does not affect workers' entitlement to regular UI

⁷⁵ States' the taxable wage bases vary from \$7,000 in California and Puerto Rico, to \$38,800 in Hawaii (United States Department of Labor, 2010)

⁷⁶ However, if the taxable wage base in California was equal to Washington's base (\$36,800), the firm's total taxes would be \$1,589.20 (not shown in the table). Moreover, if the tax bases in California and Canada were to be equal (\$43,200), the Californian firm's total taxes would be \$1,961.12, which is much larger than the Canadian firm's taxes because of higher experience rated tax rate. Furthermore, Californian firms with previous layoff or STC experience are required to pay higher tax rates (maximum 6.2 percent in 2010 (UWC, 2010)) than the firm in this example.

benefits in Canada (HRDC, 2004). Also 13 out of 17 U.S. states with active STC programs have a one-week waiting period⁷⁷ (UWC, 2007).

While Canadian employers are required to maintain fringe benefits for the affected workers when participating in the program, only 10 American states have this requirement. STC in the U.S. can be more expensive because of fixed labor costs, such as health insurance (Reid & Meltz, 1984). In the U.S., firms often pay a fixed rate of health insurance for their employees. In Canada, health care is subsidized by the state.

The Canadian STC program, like most of the U.S. programs, specifically targets the temporary layoffs. Although the Canadian program has a provision allowing the program to be used for permanent layoffs (HRDC, 2002b), the Canadian government does not always grant the use of STC in cases of permanent downsizings (see Footnote 70) and this provision has rarely been used (HRDC, 2002b). The U.S. programs are very explicit about excluding any use in case of structural employment reductions and layoffs that are expected to be permanent. Arizona's program is an exception. It makes no distinction between temporary and permanent layoffs but imposes a 26-week limit on benefits. This limit may be ignored during periods of severe recession.

The slight differences in STC benefits and employment protection laws may be the reason for small variations in STC participation in Canada. Generous STC benefits make work sharing more attractive by reducing workers' layoff incentive caused by severance payments, while employment protection makes layoffs costlier to employers. STC in

⁷⁷ Remaining four STC states (Connecticut, Iowa, Maryland, and Vermont) have no waiting period before collecting UI benefits (UWC, 2007).

combination with firing restrictions tilts preferences of workers and firms towards work sharing. The STC benefits are slightly higher for the Canadian workers because the Canadian UI system replaces 55 percent of the lost earnings while the state UI systems in the U.S. usually replace 50 percent. STC participants in Canada receive benefits for all the weeks while participating, but not all programs in the U.S. waive the waiting period, making the Canadian program modestly more generous one. In addition, if participating employees are laid off after the STC program in Canada, the benefits received under the STC plan are not deducted from their regular UI benefits. Under most American state programs, however, employees who collect STC benefits face decreased UI benefits if they are subsequently laid off. This difference provides more incentives for Canadian workers to participate in STC. Moreover, the UI cost of the STC program for the U.S. employers with prior layoffs and STC use is larger because of the experience rating. Another reason for higher program costs in the U.S. is that the U.S. firms often pay a fixed rate of health insurance for their employees. In Canada, health care is subsidized by the state. Therefore, maintaining workers through STC impose the additional cost of health care to the U.S. firms.

Despite the differences between the two countries, overall, both programs have similarly low utilization compared to major STC programs in Europe (for example, Germany's *Kurzarbeit*). The absence of experience rating of either STC or UI in Canada suggests that low utilization in the U.S. is not driven by experience rating. Furthermore, the fact that Canada has a state health plan, not an employer plan, yet behaves similarly to the

U.S. seems to exclude fringe benefit maintenance, at least as a substantial disincentive to
STC use in the U.S.

CHAPTER 7: CONCLUSION

This dissertation explores the reasons for low utilization of short-time compensation (STC) in the U.S. Theory would seem to suggest that STC would be quite popular with workers and, without additional costs, with employers. That is not the case. Not only do many states not provide STC as an option in their consumption support systems for workers, employers rarely use the program in states which do. This is in sharp contrast to STC utilization rates in Germany and elsewhere in Europe. Is this difference in behavior the result of onerous restrictions on STC in the U.S. or on the ease of layoff?

An important finding emerges in Chapter 5. Short-time work in the U.S. is a reasonably common form of work time reduction, but STC is not. Work hours are frequently reduced to less than normal due to business related reasons such as slack demand during economic downturns (short-time work (STW)). A great majority of workers on reduced time schedules are eligible for STC in states with a plan, but firms nonetheless do not participate in the program. Short-time work without the costs associated with a compensation scheme for the lost hours is apparently a major alternative to STC in the U.S. What makes partial compensation for the lost hours through government administered STC unappealing to employers?

Four probable causes for low STC take-up despite relatively high STW are considered here: (a) overtime is common and reductions in overtime hours do not qualify for STC benefits; (b) the reduction in regular UI benefits if subsequently laid off discourages employees; (c) experience rating of STC may be higher, placing the full cost of

the program on the individual employer; and (d) the program is not widely known among firms (as a survey of companies showed (Walsh et al., 1997)). Limitation on the hours reduction permitted under STC is also a possible source of difficulty, but the finding that most short-time workers are in fact eligible for STC implies that states' existing minimum hours reduction requirements do not explain lack of participation in STC.

Limits on STW usage, and therefore STC, also may be important. STW's uniform treatment of workers regardless of their experience might cause resistance among senior workers and among union members if the workers are organized. The seniority rule, as opposed to STC, may provide better job protection for senior workers and union members. In all states with an STC option, workers covered by a collective bargaining agreement can refuse to participate in an STC plan through employee representatives. However, nonunion workers usually do not have a say in a plan's approval process, except in Connecticut where employers are required to include the affected workers' input on a proposed STC plan before applying for state approval.

The heterogeneity of workers can be another reason for low STW and STC use. The primary advantage of STC in the U.S. and abroad is that it helps firms maintain their skilled workforce when faced with temporary demand shocks. All participating workers benefit from STC regardless of their skill level and productivity as STC programs require benefits to be provided to all affected workers in a business unit such as a department, shift, or a plant within the firm. That does not mean that some would not do better in another system. For unskilled workers who are more likely to be laid off and less likely to find outside opportunities, STC increases their expected utilities. However, skilled are more

likely to keep their jobs and work at normal hours in case of layoffs. These workers may be worse off under STC due to short hours even after STC compensation. Through layoffs, firms drop the less productive workers and increase average productivity. Under STC, they keep all workers, the highly productive and the less so. Overall, STC's impact on worker productivity is found to be ambiguous (Kerachsky, Nicholson, Cavin, and Hershey, 1986; Vroman & Brusentsev, 2009; Walsh et al, 1997).

Some program requirements such as maintenance of fringe benefits, surtaxes on participating firms, and higher unemployment insurance (UI) tax rates for negative balance employers may cause STC costs to be higher than regular UI for employers. However, none of the program features emerges as a major reason for low STC use in the U.S. The theoretical literature on STC (reviewed in Chapter 4) analyzes the trade-off between layoffs and STC within an implicit labor contracting setting, which suggests that increasing the experience rating of STC and UI benefits reduces the firm's incentive to use layoffs and/or to allow work sharing. However, more complete experience rating of STC does not appear to lower STC use; states that experience rate the STC benefit charges more completely do not have consistently lower STC use than others (see tables 5 and 6 in Chapter 2). While the utilization of the STC program increases with more generous STC benefits, it decreases with the higher costs of employment that can only be reduced via layoffs, such as fringe benefits. The impact of fringe benefits on the hours-worked adjustment depends on their value to workers and their costs to firms. The STC program requirement to keep or at least prorate fringe benefits increases the value of STC to employees, and also increases the cost

of each work hour for employers who can reduce these costs only through layoffs facing a downturn.

One of the reasons for low STC use *nationwide* is that not all states have the program. Only 17 states have an operational STC program. Strong taste for greater government involvement in the economy appears to affect state STC adoption decisions. An analysis of the states' decision to adopt STC in Chapter 3 reveals that liberal political ideology is a significant factor. As expected, high unemployment rate is found to increase program adoption. The percent of the population that is female also increases the likelihood of STC. The share of minority population in a state is not a significant factor, although original interest in the program was stimulated by that concern. Interestingly, manufacturing employment does not play a role in a state's STC adoption decision even though the manufacturing sector is the major user of the program.

The Canadian experience provides some interesting comparisons with the U.S. The Canadian and the U.S. STC programs have similarities and a few interesting differences. In Canada, STC benefits are somewhat higher and employment protection laws slightly more stringent. One important difference is the absence of experience rating of either STC or UI in Canada. The similarity of utilization, relative to Germany for example, provides some evidence that utilization in the U.S. is not driven by experience rating. The fact that Canada has a state health plan, not an employer plan, yet behaves similarly with respect to STC seems to exclude fringe benefit maintenance, at least as a substantial disincentive to use STC in the U.S.

It would seem that the large difference in STC utilization in the U.S. and in Europe is more likely to result from the difficulty of laying off workers in Europe than from the difficulty of adjusting hours and related compensation in the U.S. No obvious regulatory reforms emerged from the analysis that show promise of increasing firm (and therefore worker) participation in a substantial way. It is important to recall that work sharing alone is a form of consumption smoothing (relative to layoff). Perhaps even modest administrative costs make further insurance not quite worth the bother.

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APPENDICES

Appendix A: Additional SPI Measures

Medoff (1997) estimates three different political ideology measures for each state from the votes of state representatives in Congress, in addition to SPI1 described in Description of the Data and Analysis Variables section. These additional measures allow for departure from the assumption that representatives have perfect information about voter preferences and their vote exactly reflects these preferences.

If a representative's ideological ADA rating is determined by not only its constituents but also their economic interests, then the SPI2 is estimated using the following equation:

$$R_i = a + b\mathbf{X}_i + cI_i, \quad (1)$$

where R_i is the ADA 1993 rating of the voting record of legislator i , \mathbf{X}_i is a vector of economic interests of the constituency of legislator i , and I_i is the ideology of the legislator's geographic constituency.

The ADA rating reflects the percentage of a legislator's vote on social, fiscal, defense, foreign policy, and other issues that conforms to the ADA's position. The variables in vector \mathbf{X}_i are (a) the percentage of workers employed in manufacturing; (b) the percentage of urban population; (c) the unemployment rate; and (d) the percentage of households married in district i . These are obtained from the U.S. Census of the Population (1990), Congressional Districts of the 103rd Congress.

The last term, I_i , is not directly observed. Instead, it is estimated as the residual of the logistic regression, where \mathbf{X}_i is regressed on R_i . Average of these residuals for each

state's representative, weighted by the proportion of the state's voting population residing in the representative's district was computed. Then, the state political ideology scores are standardized so that the scores would range between 0 (extremely conservative) and 100 (extremely liberal).

Both SPI1 and SPI2 measures assume that legislator vote exactly in concert with their constituents' ideology. However, sometimes legislators' personal ideology may contradict with their constituents' interests. SPI3 measure is obtained by adding legislators' gender, race, and religion variables to Equation 1 to reflect the possibility that representatives may shirk at the expense of their constituent interests.

The last measure, SPI4, accounts for the possibility that legislators may also shirk when they vote in line with their political party. To allow for this possibility, representatives' political party affiliation is added to economic interests of the constituency and legislators' gender, race, and religion variables when estimating SPI4. Medoff (1997) suggests that SPI4 is the more reliable and effective state political measure among the four described above. State rankings by SPI scores can be found in Medoff (1997).

Appendix B

Table B1

The Incidence of Short-Time Work and Layoffs in Selected Industries: 1979-1993

Year	All Industries				Selected Industries					
	STW Rate Levenson ^a	STW Rate (Replicate) ^b	STW Rate (New) (Among working usually 35+) ^c	Layoff Rate (Replicate) ^d	Construction		Durable Mfg		Public Admin	
					STW Rate Levenson ^a	STW Rate (Replicate) ^b	STW Rate Levenson ^a	STW Rate (Replicate) ^b	STW Rate Levenson ^a	STW Rate (Replicate) ^b
1979	0.96	0.89	1.32	1.01	2.65	2.38	0.84	0.84	0.15	0.13
1980*	1.29	1.19	1.75	1.74	3.37	3.06	1.53	1.50	0.28	0.31
1981*	1.27	1.12	1.73	1.64	3.48	3.14	1.35	1.32	0.15	0.16
1982*	1.69	1.51	2.30	2.44	4.37	3.78	2.58	2.39	0.16	0.22
1983	1.30	1.15	1.73	2.00	3.37	2.97	1.50	1.36	0.11	0.11
1984	1.10	0.98	1.44	1.26	2.84	2.56	1.01	0.98	0.15	0.15
1985	1.12	1.03	1.51	1.25	2.69	2.54	1.21	1.17	0.13	0.11
1986	1.07	0.94	1.37	1.14	2.75	2.60	0.94	0.93	0.16	0.16
1987	1.01	0.89	1.34	0.98	3.17	2.91	0.79	0.75	0.15	0.16
1988	1.02	0.89	1.29	0.86	2.94	2.70	0.91	0.88	0.19	0.14
1989	1.05	0.93	1.33	0.79	3.21	2.84	0.92	0.87	0.22	0.20
1990*	1.13	1.01	1.47	0.94	3.47	3.28	0.95	0.95	0.15	0.13
1991*	1.38	1.26	1.83	1.17	4.81	4.50	1.48	1.44	0.12	0.14
1992	1.25	1.07	1.63	1.15	4.24	3.65	1.05	0.95	0.21	0.20
1993	1.21	1.03	1.50	1.01	3.56	2.93	0.83	0.84	0.14	0.15

Note. The recession years (indicated by *) are obtained from National Bureau of Economic Research Recessions (2010) and National Bureau of Economic Research, (2010, September).

^aThe data in this column are adapted from Levenson's Table 1 (2001, p. 325) with permission of the author. STW rate (and layoff rate) is calculated as the share of those on STW (layoff) in the labor force. ^bLevenson's STW rate calculation is replicated using the NBER's MORG files. ^cThe new STW rate indicates the share of individuals on STW among those who usually work 35 or more hours using the NBER's MORG files.

Table B2

The Incidence of Short-Time Work and Layoffs in Selected Industries: 1994-2009

Year	All Industries			Selected Industries		
	STW Rate (Replicate) ^a	STW Rate (New) (Among working usually 35+) ^b	Layoff Rate (Replicate) ^a	Construction STW Rate (Replicate) ^a	Durable Mfg STW Rate (Replicate) ^a	Public Admin STW Rate (Replicate) ^a
1994	0.62	0.92	0.87	2.19	0.67	0.05
1995	0.61	0.91	0.89	2.29	0.70	0.10
1996	0.59	0.89	0.90	1.69	0.65	0.10
1997	0.57	0.83	0.79	1.86	0.60	0.13
1998	0.49	0.74	0.72	1.63	0.57	0.08
1999	0.50	0.73	0.68	1.58	0.46	0.11
2000	0.47	0.68	0.66	1.36	0.46	0.08
2001*	0.65	0.95	0.84	1.71	1.09	0.10
2002	0.64	0.93	0.88	1.77	0.94	0.08
2003	0.69	1.00	0.86	2.32	0.92	0.13
2004	0.66	0.96	0.77	2.09	0.73	0.03
2005	0.60	0.86	0.67	1.99	0.66	0.06
2006	0.54	0.78	0.63	1.88	0.68	0.03
2007*	0.61	0.87	0.73	2.49	0.78	0.13
2008*	0.88	1.26	0.88	3.42	1.13	0.06
2009*	1.25	1.89	1.25	4.84	2.21	0.24

Note. The recession years (indicated by *) are obtained from National Bureau of Economic Research Recessions (2010) and National Bureau of Economic Research, (2010, September).

^aLevenson's STW rate calculation is replicated using the NBER's MORG files. ^bThe new STW rate indicates the share of individuals on STW among those who usually work 35 or more hours using the NBER's MORG files.

Table B3

Monthly STW and Layoff Rates by Industry for 1979-1993

STW Rate of Full-Timers														
Month	All	Mfg		Public		Agri. incl.		Trade		Utilities		Banking,	Health	Other
		Durable	Constr.	Admin.	Mining	Forestry	and Fishing	Wholesale	Transp.	Comm.	and Sanitary	Fin. Inst.	incl.	Services
		and Other						and Retail			Services	and R.E.	Hospitals	Services
Jan	1.80	2.18	5.44	0.14	1.22	5.79	2.30	1.88	0.30	0.12	0.49	0.55	1.53	
Feb	1.76	2.30	5.42	0.18	1.10	4.83	2.08	1.77	0.17	0.17	0.37	0.63	1.40	
Mar	1.54	2.06	5.12	0.11	1.71	5.43	1.78	1.82	0.28	0.03	0.36	0.48	1.05	
Apr	1.49	1.92	4.92	0.21	1.87	5.00	1.50	1.47	0.28	0.39	0.44	0.62	1.02	
May	1.46	2.08	4.10	0.18	2.08	3.62	1.34	1.71	0.24	0.15	0.40	0.66	1.06	
Jun	1.52	1.84	3.87	0.31	1.42	3.61	1.53	1.66	0.32	0.45	0.31	0.72	1.47	
Jul	1.59	1.85	3.84	0.24	1.64	3.73	1.51	1.76	0.22	0.17	0.32	0.70	1.92	
Aug	1.50	1.87	3.40	0.24	1.67	3.48	1.46	1.57	0.18	0.12	0.38	0.69	1.65	
Sep	1.40	1.64	3.67	0.30	1.68	4.47	1.45	1.58	0.13	0.15	0.28	0.90	1.19	
Oct	1.44	1.80	4.00	0.28	1.00	4.87	1.37	1.42	0.39	0.08	0.47	0.73	1.12	
Nov	1.59	1.99	4.88	0.18	1.59	5.84	1.43	1.77	0.22	0.08	0.56	0.69	1.19	
Dec	1.61	1.94	5.14	0.20	2.19	5.34	1.58	1.79	0.33	0.17	0.54	0.63	1.39	

Layoff Rate														
Month	All	Mfg		Public		Agri. incl.		Trade		Utilities		Banking,	Health	Other
		Durable	Constr.	Admin.	Mining	Forestry	and Fishing	Wholesale	Transp.	Comm.	and Sanitary	Fin. Inst.	incl.	Services
		and Other						and Retail			Services	and R.E.	Hospitals	Services
Jan	1.78	2.90	7.69	0.46	5.21	5.40	1.21	2.10	0.47	0.61	0.31	0.30	0.80	
Feb	1.70	2.89	8.07	0.36	3.86	4.09	1.07	2.09	0.31	0.63	0.34	0.31	0.65	
Mar	1.49	2.48	7.68	0.42	4.06	3.31	0.89	1.61	0.56	0.48	0.34	0.24	0.60	
Apr	1.23	2.24	5.28	0.23	3.02	2.14	0.72	1.35	0.32	0.30	0.32	0.28	0.56	
May	1.13	2.36	3.47	0.31	3.59	1.70	0.65	1.45	0.26	0.46	0.23	0.31	0.51	
Jun	1.07	2.20	2.75	0.24	2.64	1.10	0.60	1.35	0.44	0.31	0.29	0.32	0.66	
Jul	1.20	2.44	3.04	0.30	3.03	1.81	0.67	1.38	0.18	0.49	0.36	0.27	0.80	
Aug	1.15	2.29	2.77	0.29	3.10	1.72	0.70	1.41	0.34	0.46	0.20	0.26	0.77	
Sep	0.98	2.10	2.45	0.25	2.68	1.30	0.55	1.02	0.28	0.52	0.31	0.31	0.56	
Oct	0.99	1.97	2.82	0.30	3.06	1.78	0.54	1.31	0.30	0.45	0.27	0.24	0.54	
Nov	1.17	2.34	3.47	0.27	2.20	3.82	0.69	1.43	0.20	0.38	0.23	0.35	0.58	
Dec	1.37	2.56	5.23	0.40	3.59	3.71	0.73	1.69	0.48	0.38	0.35	0.39	0.65	

Note. Month is the CPS interview month.

Appendix C

All Industries

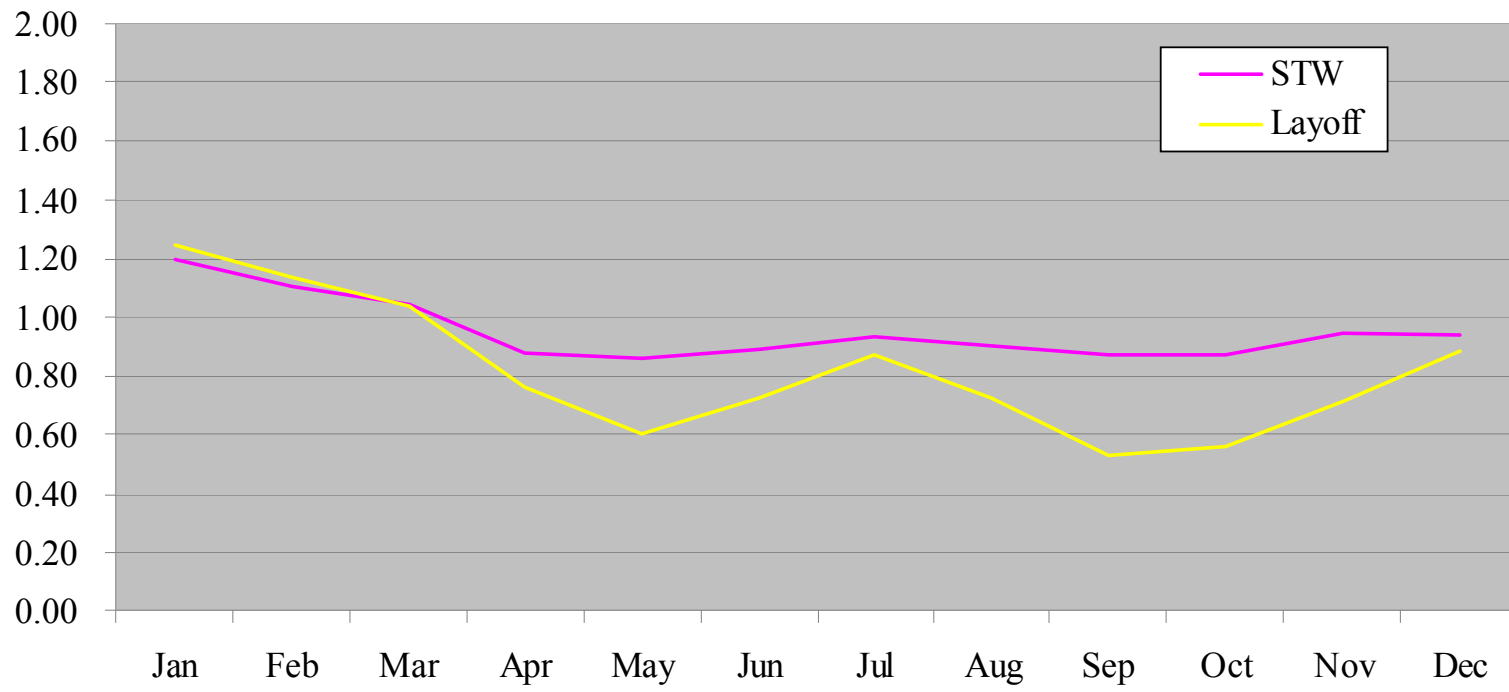


Figure C1. Monthly STW Rate of Full-Timers and Layoff Rate across All Industries for the 1994-2009 Period.

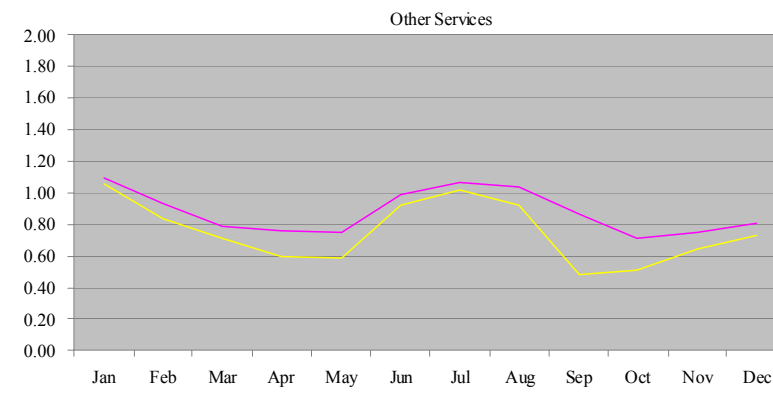
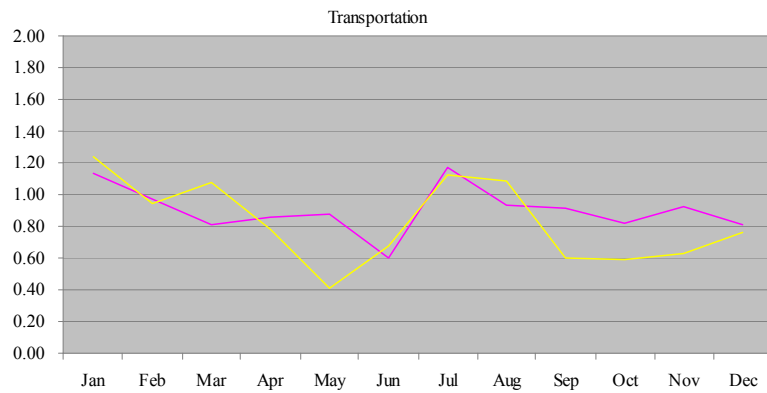
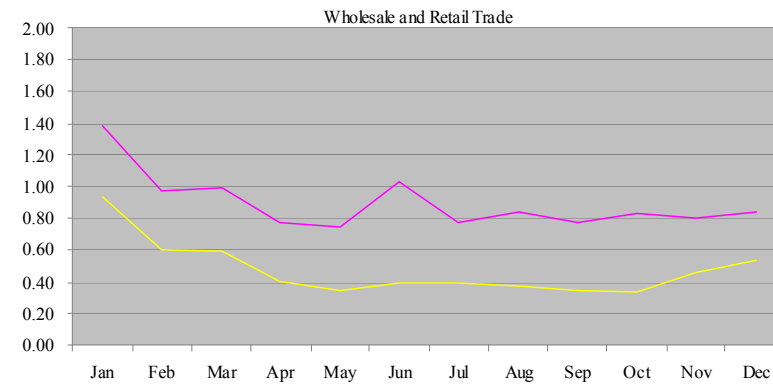
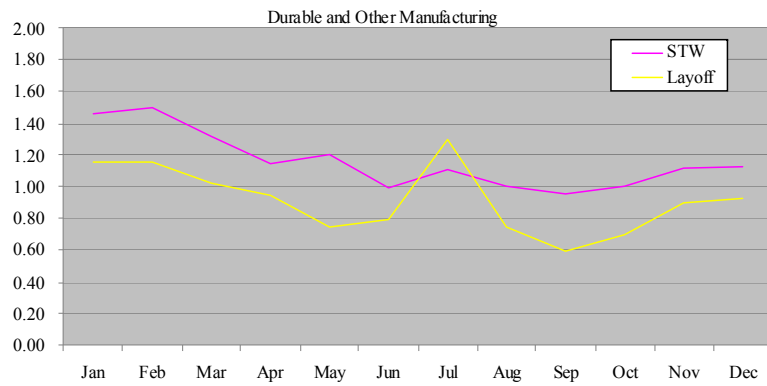


Figure C2. Monthly STW Rate of Full-Timers and Layoff Rate across All Industries for the 1994-2009 Period.

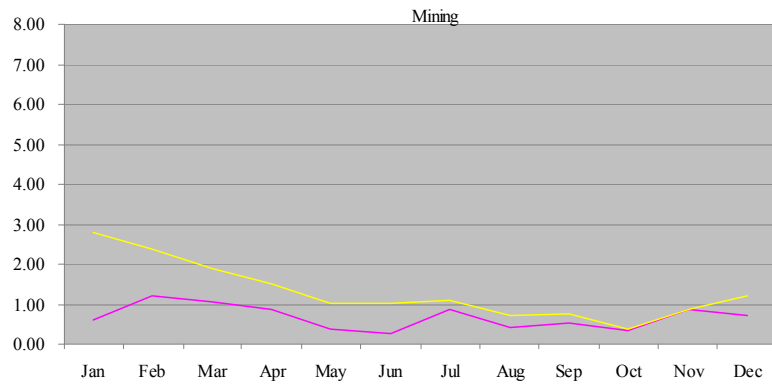
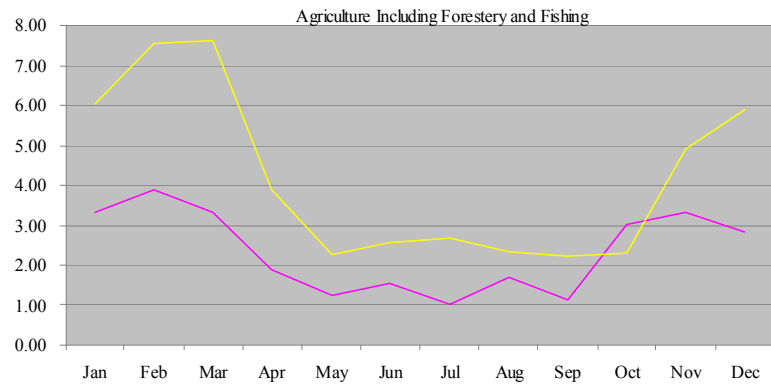
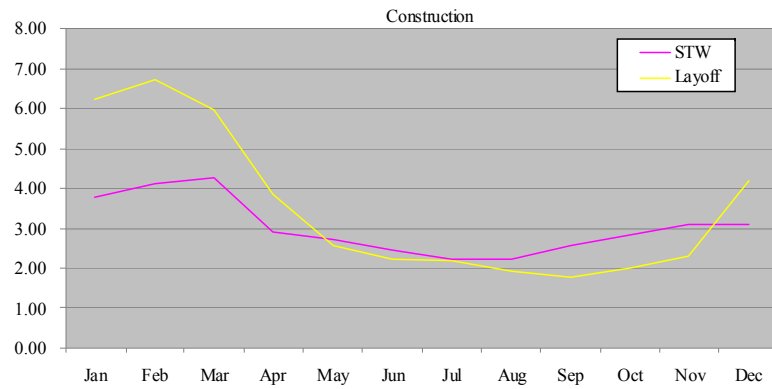


Figure C3. Monthly STW Rate of Full-Timers and Layoff Rate across All Industries for the 1994-2009 Period.

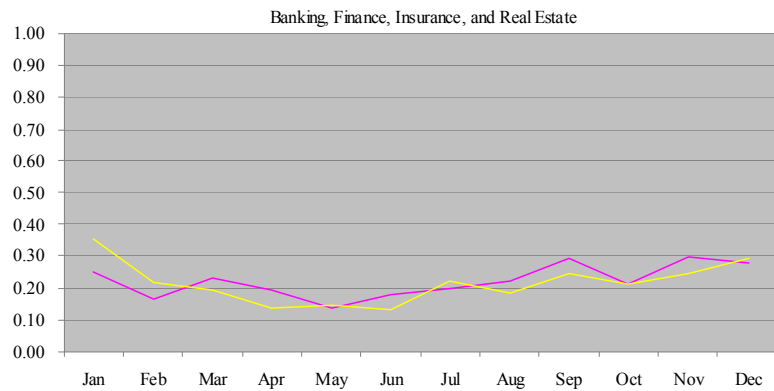
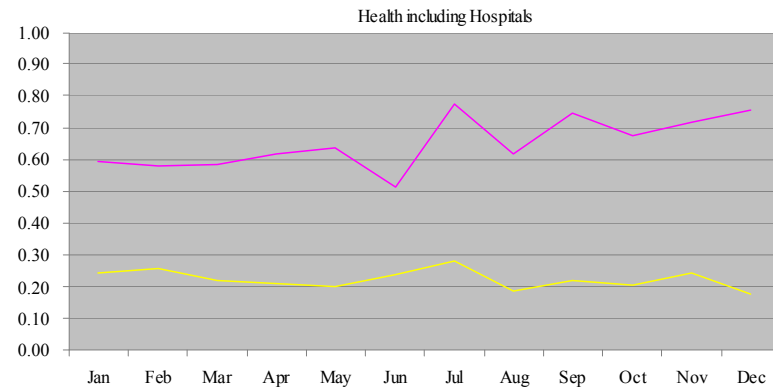
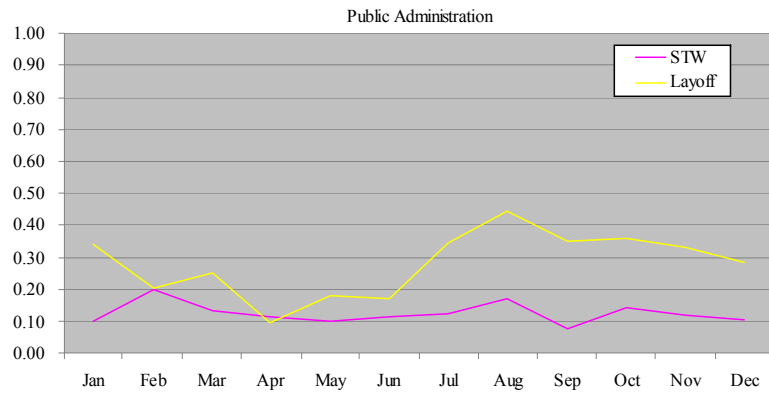


Figure C4. Monthly STW Rate of Full-Timers and Layoff Rate across All Industries for the 1994-2009 Period.

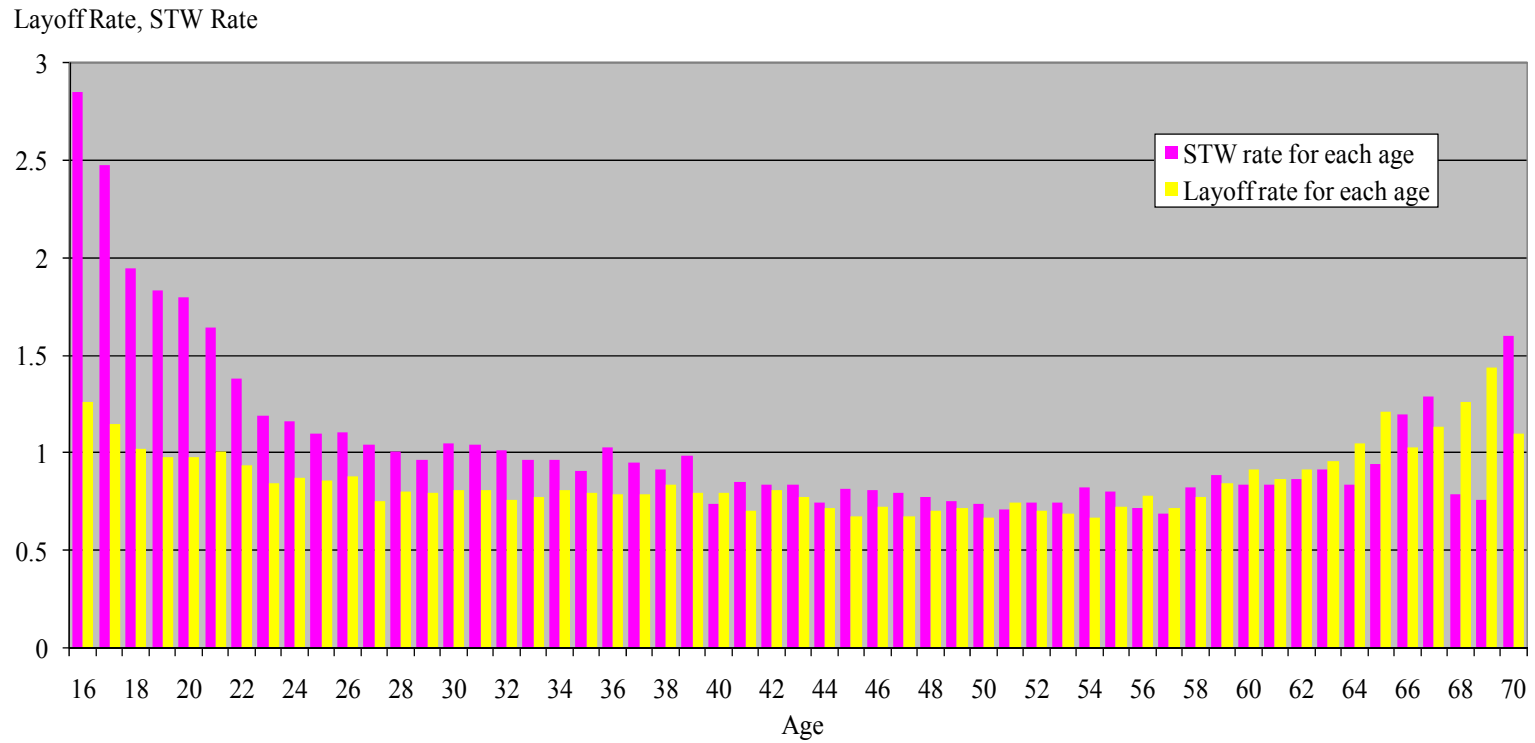


Figure C5. STW and Layoff Rates for Each Age between 16 and 70 for 1994-2009 Period. Each STW rate column shows the STW rate among full-timers at that age and each layoff rate column shows the layoff rate within that age of the labor force.