# The Role of Unemployment Insurance As an Automatic Stabilizer During a Recession

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By

**Dr. Wayne Vroman**
The Urban Institute

**Project Director**

Jacob M. Benus
IMPAQ International, LLC

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# EXECUTIVE SUMMARY

Total U.S. Unemployment Insurance (UI) benefit payments increase automatically during recessionary periods. This increase in UI benefits during recessionary periods cushions the macro economy from further decline by helping unemployed workers partially maintain their purchasing power. That is, by partially compensating the unemployed for the lost earnings, UI benefits help to break the negative cycle of increased unemployment leading to reduced consumption, which leads to a further reduction in economic activity.

The cyclical response of regular UI benefits during recessions is often enhanced through legislation. Specifically, during recessions, typically there has been some form of federally financed UI benefit extension. Thus, the regular UI program together with federally financed temporary benefit extensions can have a substantial impact in cushioning the negative effects of recessions on the U.S. economy.

The UI program incorporates three levels (or tiers) of benefits:

1) Regular UI benefits,
2) Temporary (or emergency) federal benefits (EUC), and
3) Federal-State Extended Benefits (EB).

Regular UI benefits are always available with up to 26 weeks of benefits for most eligible persons. Temporary federal benefits (Emergency Unemployment Compensation or EUC in the 2008-2009 recession) are paid under conditions set by emergency federal legislation. Up to 53 weeks of EUC have been available during the present recession. Federal-State Extended Benefits (EB) are available in periods when unemployment-related triggers activate the EB program. EB in the present recession has been available under temporary unemployment rate triggers with full federal financing (as opposed to 50-50 federal-state financing shares of the permanent EB law). Payments from all three levels contribute to the stabilizing effect of the UI program. While the financing of UI (i.e., UI payroll taxes) offsets part of the stabilizing effects of UI benefits, the net effect of the program is to make the economy more stable.

This report examines the performance of each UI program component as an automatic stabilizer. The analysis relies heavily on macroeconomic simulations generated by the Moody's Economy.com econometric model. Our approach traces the path of the economy with and without each of these components. By comparing paths, we can measure the effect of the UI program as a whole and by component as an automatic stabilizer.

In this report, we examine the impact of the UI program in stabilizing the economy during a deep recession. Rather than simulating an artificial recessionary scenario, we use the experience of the recent recession (2008-2009) and examine the time path of the economy with and without the UI program. Our analysis of the stabilizing performance of the UI program during 2008Q3-2010Q2 yielded the following conclusions:

- The regular UI program closed about one-tenth (0.105) of the real gross domestic product (GDP) shortfall caused by the recession.
- Extended benefits closed about one-twelfth (.085) of the real GDP shortfall caused by the recession.
- Because of lags that reflect experience rating, the response of UI taxes was delayed with little increase in UI taxes occurring in 2009 and 2010. During 2008Q3-2010Q2, increased UI taxes had essentially no effect on real GDP (a gap closing proportion of -0.007).

Combining all UI components, we find that, overall, the UI program closed 0.183 of the gap in real GDP caused by the recession. There is reason to believe, however, that for this particular recession, the UI program provided stronger stabilization of real output than in many past recessions because extended benefits responded strongly. Multiplier effects in real GDP were estimated to average 2.0 for regular UI benefits and also 2.0 for extended benefits.

# CHAPTER 1.

# UNEMPLOYMENT INSURANCE AS AN AUTOMATIC STABILIZER

## 1.1 Introduction and Summary

A primary reason for establishing UI programs was to provide temporary partial replacement for the loss of earnings occasioned by unemployment. Since loss of income from a job is often accompanied by decline in household consumption, an increase in unemployment accompanies declining general economic activity. The UI program, by partially compensating for lost earnings, helps to break the negative cycle of increased unemployment leading to reduced consumption, which leads to a further reduction in economic activity.

The cyclical response of aggregate UI benefit payments to increased unemployment during recessionary periods cushions the macro economy from negative shocks by helping to maintain consumer purchasing power. In other words, UI acts as an automatic stabilizer of real GDP. Benefit payments increase (decrease) automatically in response to higher (lower) unemployment.

The countercyclical response of UI benefits can also be enhanced through legislation. In the past, recession-related federal legislation has temporarily extended unemployment benefits during severe economic downturns. Prior to the present recession, some form of federally financed benefit extension was enacted in every recession extending back to 1958.

This report examines the performance of UI as an automatic stabilizer of economic activity. The analysis relies heavily upon simulations made by the econometric model supported by Economy.com of Moody's Investor Service (Economy.com). The model traces alternative time paths of real GDP, employment, unemployment, other macro variables, and the payment of UI benefits under different assumptions about output and

inflation. The model used in the analysis has been developed to simulate economic activity in the individual states. The principal finding of the analysis is that UI plays a measurable role as an automatic stabilizer of the economy.

This report proceeds as follows: The present chapter provides a brief overview of the legislative enactments that affect the performance of UI in the present recession. The chapter then reviews relevant earlier studies of the UI's stabilizing role. Particular emphasis is placed upon two earlier analyses whose findings were derived from simulations with econometric models. Chapter 2 discusses important behavioral relations that affect the performance of the UI program in individual states. It examines UI recipiency rates, replacement rates, and the determination of UI taxes. The relationships discussed and presented in Chapter 2 have all been incorporated into the Economy.com state model. Chapter 3 briefly describes the structure of the Economy.com model. One purpose of the chapter is to show how UI benefits and taxes are integrated into the model.

Chapter 4 presents the findings from several simulations. This chapter estimates singly and in combination the stabilizing effects of regular UI benefits, extended benefits, and UI taxes. Finally, Chapter 5 summarizes the results and offers concluding comments, including suggestions for ways to enhance the UI program's performance as an automatic stabilizer.

## 1.2 UI in the 2008-2009 Recession

During 2008-2009 the U.S. economy experienced a very serious recession. By the broadest measure of economic activity, real GDP, the economy shrank during five of the six calendar quarters after the fourth quarter of 2007 (the start of the recession) through the second quarter of 2009. The reductions in real output during the fourth quarter of 2008 and the first quarter of 2009, 5.4 percent and 6.4 percent respectively, represented the worst back-to-back quarterly performance in more than 50 years. Many now refer to the present downturn as the "great recession".

As real output and employment decreased and unemployment increased, cash payments from state Unemployment Insurance (UI) programs increased sharply. Payments from regular UI programs (the program that can pay up to 26 weeks of benefits), which had totaled $32.0 billion in 2007, increased to $42.6 billion (33 percent) in 2008. With unemployment increasing persistently from May 2008 through the end of 2009, benefit payouts in the last half of 2008 were 47.5 percent higher than in the last half of 2007. Larger increases in regular UI benefits occurred in 2009, with the year's annual total reaching $79.2 billion. Since July 2008, benefits for those who exhaust their regular UI entitlements have also been available. The annual total of extended benefits reached $49 billion in 2009. Clearly, UI program benefits have responded strongly to the recession. Total (regular plus extended) UI benefit payments in 2009 were $128 billion or 0.9 percent of GDP. The highest payout rate between 1947 and 2009 was 1.05 percent of GDP in 1975 while the third-highest payout rate was 0.82 percent of GDP in 1958.

Table 1.1 summarizes UI benefit payouts in all post-World War II recessions. Annual payments are shown separately for three levels or "tiers" of UI benefits: Regular UI, Federal-State Extended Benefits (EB) and Temporary Federal Benefits (Emergency Unemployment Compensation or EUC in the 2008-2009 recession). For each recession, the year of highest payouts is identified and payouts are shown in current dollars (columns [1]-[4]) and as a percent of GDP (columns [6]-[8]).

Programs paying long-term benefits were first active in the recession of 1958 and EB was first paid in the recession year 1971. The following three observations are drawn from Table 1.1:

1) Total benefits ranged between 0.49 and 1.01 percent of GDP across the 11 recessionary years (this variation reflects both differing recession severity and differing availability of long-term benefits).
2) The highest total payout rate occurred in 1975 and the highest payout of extended benefits (EUC + EB) occurred in 2009.
3) With the addition of 2009 to the table, there is no obvious trend across the 11 recessions (column [8]).

**Table 1.1. UI Benefits by Program and as a Percent of GDP in Recession Years, 1949 to 2009**

| Recession Year | Regular State UI | Federal State EB | Temporary Federal Benefits | Total UI Benefits | GDP | Regular Benefits/ GDP | Extended Benefits/ GDP | Total Benefits/ GDP |
|---|---|---|---|---|---|---|---|---|
| | Total | | | [1+2+3] | | [1]/[5] % | [2+3]/5 % | [4]/[5] % |
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |
| 1949 | 1.7 | - | - | 1.7 | 266 | 0.65 | - | 0.65 |
| 1954 | 2.0 | - | - | 2.0 | 381 | 0.53 | - | 0.53 |
| 1958 | 3.5 | - | 0.3 | 3.8 | 467 | 0.75 | 0.06 | 0.82 |
| 1961 | 3.4 | - | 0.6 | 4.0 | 546 | 0.63 | 0.11 | 0.74 |
| 1971 | 4.9 | 0.7 | 0.0 | 5.6 | 1,129 | 0.44 | 0.06 | 0.49 |
| 1975 | 11.9 | 2.5 | 2.1 | 16.5 | 1,635 | 0.73 | 0.28 | 1.01 |
| 1980 | 14.1 | 1.7 | 0.0 | 15.8 | 2,788 | 0.51 | 0.06 | 0.57 |
| 1982 | 21.3 | 2.4 | 1.2 | 24.9 | 3,253 | 0.65 | 0.11 | 0.77 |
| 1992 | 24.9 | 0.0 | 13.5 | 38.4 | 6,342 | 0.39 | 0.21 | 0.60 |
| 2002 | 41.9 | 0.2 | 10.7 | 52.8 | 10,642 | 0.39 | 0.10 | 0.50 |
| 2009 | 79.2 | 6.1 | 43.1 | 128.4 | 14,256 | 0.56 | 0.35 | 0.90 |

Source: Data from U.S. Departments of Labor and Commerce. Data in $billions.

## 1.3 Recent UI Legislation

The current recession has witnessed a strong policy response intended to help unemployed workers and their families. In late June 2008, the Congress passed and President Bush signed the Emergency Unemployment Compensation Act (EUC). This provided 13 weeks of added benefits to persons who had exhausted their regular UI benefits. During August and September, the number of EUC claimants exceeded 1.25 million per week, but then the numbers decreased as this added entitlement was also exhausted. By November, the EUC weekly numbers had declined to about 0.75 million. During these fall months, the number of regular UI claimants continued a steady ascent, reaching an average of 4.5 million in December 2008.

EUC was given a second legislative authorization in November 2008. This extended the period for new EUC claims to the end of March 2009, and increased potential EUC weeks from 13 to either 20 or 33, depending upon the state's recent three-month average

total unemployment rate (TUR). States with a TUR of at least 8.0 percent could pay up to 33 weeks of EUC; other states could pay up to 20 weeks.[1]

The American Recovery and Reinvestment Act (ARRA) of February 2009 included several UI provisions. The most important were the following:[2]

1) The EUC08 program was further extended to December 31, 2009 with unchanged rules for 20 and 33 potential weeks of EUC benefits. New claims for EUC could be received through the end of 2009, with payments extending into 2010 for eligible claimants. A person filing late in 2009 could potentially receive EUC through May 2010.

2) All recipients of UI benefits had their weekly benefit increased by $25 while ARRA provisions were in effect. In a program where the national average weekly benefit was about $300, this represented an 8 percent increase in the overall weekly benefit. The percentage increase was even larger for low-wage claimants and those in low-wage states.

3) The first $2,400 of UI benefits in 2009 was exempted from the federal personal income tax.

4) For UI claimants faced with the loss of health insurance, coverage could be purchased with the federal government paying 65 percent of the monthly premium.

5) The Federal-State Extended Benefits (EB) program was modified to allow easier access to EB payments and longer potential duration (a maximum of 20 weeks in several states rather than the traditional 13). During 2009, more than half the states modified the unemployment rate triggers that activate EB, modifications that will lapse when ARRA lapses.

Both extended benefits programs (EUC and EB) were modified several times during late-2009-early 2010 to lengthen their availability to the long term unemployed. The most recent extension allows new claims for EUC through the week of June 2, 2010, and EUC payments on established claims can occur as late as the week of November 6, 2010.

[1] Potential weeks of entitlement to extended benefits is usually expressed as a fraction of the potential weeks of regular UI. Thus the original EUC08 program could pay the lesser of 13 weeks or half of potential duration under the regular UI entitlement. Most states provide for a variable duration of regular UI benefits. Thus, someone entitled to 20 weeks of regular UI would be entitled to only 10 weeks of EUC08.
[2] One summary of the UI provisions in ARRA is given in Vroman (2009).

The net effect of the ARRA has been to substantially increase the total volume of UI benefit payments in 2009 and 2010. Estimates of the increase in benefit payouts due to ARRA are necessarily imprecise, since the full depth and duration of the recession are uncertain. A global estimate of all ARRA provisions affecting benefit payouts would be at least $60 billion in calendar year 2009. When these are added to payouts under the regular UI program, the combined total reached $128 billion in 2009. The $128 billion represented 0.9 percent of GDP in 2009, the second highest percentage over the 63 years between 1947 and 2009. A similar percentage may occur in 2010.[3]

## 1.4 Earlier Literature

A primary objective of UI is to provide built-in or automatic stability to the overall economy. The economic literature that assesses the strength of UI as an automatic stabilizer is extensive. For example, Gruber (1997) found that the amount that a family spends on food falls by 7 percent when the head of the household becomes unemployed; it would have declined 22 percent in the absence of unemployment benefits.

Two studies of the stabilizing effect of the UI program were supported by the U.S. Department of Labor. Dunson, et al. (1991) used the Data Resources Incorporated (DRI) macro model to assess UI's stabilizing effectiveness. Chemerine, et al. (1999), in an analysis by Coffey Communications, used the Wharton Economic Forecasting Associates (WEFA) model.[4]

Dunson, et al. (1991) and Chimerine, et al. (1999) both conducted broad reviews of previous literature. The review in Dunson, et al. (1991) described 13 separate studies using an aggregate income-expenditure approach to assess stabilizing effectiveness. These studies, published between 1960 and 1986, differed widely in their methodology.

[3] The model estimates presented in this paper were based on February 2009 ARRA provisions which were slated to fully expire in May 2010. The model-based analysis did not include effects of the post-ARRA extensions of EUC that were enacted in November 2009, March 2010 and July 2010. The simulated phase-down of 2010Q1 and 2010Q2 were based on the phase-down contemplated under ARRA.

[4] The DRI model, the WEFA model, and the model of Chase Econometrics have been combined into the Global Insight macro model, which currently provides forecasting services for several federal agencies, agencies of state government, municipalities, and numerous private businesses.

All concluded that UI helps to stabilize the overall economy, but the estimates of stabilizing effectiveness varied quite widely--from reducing real GNP fluctuations by one-fourth or more (Eilbott 1966), to practically no stabilizing effect. An average estimate from this set of studies would be that UI prevented roughly 15 percent of the decline that would have otherwise occurred in aggregate real output. Among the studies that explicitly considered both UI taxes as well as benefits, most concluded that nearly all of the stabilizing effect was provided by UI benefits and that UI taxes played either a small or an inconsistent role.

Dunson, et al. (1991) utilized the DRI model in their simulation analysis. They noted a downtrend in UI recipiency between the late 1970s and the early 1990s. Their simulations focused on recession-related changes in real GDP and aggregate employment in the late 1970s and the early 1990s. For both periods, there were two simulations: One with the UI program operating in its usual manner and one with UI variables frozen in real terms at levels from the pre-simulation period. The effectiveness of UI was measured during the four quarters of the largest decrease in real output. In each simulation period, the percentage difference in real output and employment was measured and averaged. For the earlier 1970's period, UI reduced the decline in real GNP by an average of 5.5 percent and the decline in employment by 4.9 percent. For the latter (forward-looking) period, UI reduced the decline in real GNP by 3.7 percent and the decline in employment by 3.5 percent. Based on these results, the authors concluded that UI in the 1990s was only 68.5 percent as effective compared to the late 1970s in stabilizing real GNP and 71.4 percent as effective in stabilizing employment. It should be noted that their results focused upon just the regular UI program and did not consider extended benefits programs.

The second large-scale model-based analysis was conducted by Chimerine, et al. (1999) at Coffey Associates. They used the WEFA quarterly econometric model to examine the performance of UI as an automatic stabilizer over five previous recessions (1970, 1974, 1980, 1982, and 1991). Their principal conclusion was that UI provides substantial automatic stabilization to the macro economy. They estimated that recession-related changes in real GDP were reduced on average by about 15 percent by UI benefit

payments. They also concluded the stabilizing effect of UI on the economy had not trended downward over their periods of analysis.

In contrast to Dunson, et al., this study focused upon all three tiers of UI benefit payments (regular UI, temporary federal benefits, and EB). They found (Chapter 5 and Appendices D and F) that the three tiers of benefit payments had very similar stabilizing effects per dollar of expenditures. They also documented the decreased scope of the EB spending after 1981 due to changes in the EB triggers and to a federal bypass option. The latter allowed states during the 1991 recession to bypass EB and pay temporary federal benefits to regular UI exhaustees. Nearly all states exercised this option, since it meant lower EB payments and associated state costs because half of EB is a state fiscal responsibility, whereas none of EUC is state-funded.

Finding that the need for UI as a stabilizer has not diminished, Chimerine, et al., offered suggestions for ways to enhance the stabilizing effectiveness of UI. Three changes to improve effectiveness would be to: 1) raise UI recipiency rates, 2) make the extended benefit programs more automatic, and 3) increase the level of funding of UI programs. They also recommend more quantitative analysis of UI with the objective of improving its performance as an automatic stabilizer. Like the Chimerine, et al. analysis, the present project will examine the effects of extended benefits as well as regular UI program benefits.

## 1.5 Summary

In response to the recession of 2008-2009, federal legislation has increased the scope and level of UI benefit payments. Federal policy, plus the built-in features of regular UI, mean that the program will roughly double benefit payouts in 2009 compared to 2008. Benefit payments in 2009 will be more than triple total payouts in the pre-recession year 2007.

Previous evaluations of the UI program have found it to be an important automatic stabilizer of economic activity. These results, however, have not yielded a consensus estimate of UI's stabilizing effect. In this report we attempt to improve on previous studies by conducting a state-level analysis to assess the program's stabilizing performance during a severe recession similar to the recession of recent in 2008-2009.

# CHAPTER 2.
# KEY UI BEHAVIORAL RELATIONS IN THE STATES

The economies of individual states differ in a variety of ways. Contrasts in industrial structure, money wage levels, demographics (including population growth and labor force age), and cyclical sensitivity are but a few of the state-specific factors important to state economic performance. The Economy.com modeling approach incorporates many state-specific factors into the structure of its state models.[5]

To simulate the performance of unemployment insurance (UI) as an automatic stabilizer, it is important to consider state-level differences in economic structures as well as state differences in UI programs. This chapter focuses on five relationships that characterize key aspects of the UI programs in the individual states:

1) Determination of covered employment,
2) Average tax rate as a percent of UI covered payroll,
3) Average tax rate by detailed industry within each state,
4) UI recipiency rate (beneficiaries as a proportion of total unemployment) and
5) UI replacement rate (the ratio of the average weekly benefit to the average weekly wage).

For 2), 4), and 5), regression relationships were developed using annual time series data. To determine the average tax rate by state and industry, a proportional relationship to the statewide average tax rate in 2007 was calculated and projected to hold for all future years spanned by the simulations. The chapter text summarizes these relationships. (Appendix A displays three sets of state-level regressions.) The relationships yield accurate estimates of UI benefits and taxes in the individual states.

## 2.1 Covered Employment

Nearly all employers and wage and salary workers are covered by the UI program. The only important exceptions are federal government employees, recently discharged service

[5] One description of the state models is given in Cochrane (2006). Chapter 3 describes the models.

members who are covered by separate programs,[6] and some employees of small firms and religious organizations.

Employment covered by UI is of two types: Taxable and reimbursable. Taxable employers account for more than 80 percent of covered employment. Their UI taxes are determined by the experience rating system followed in their state. The details of these systems differ widely, but all set UI taxes in such a way that higher payouts of UI benefits cause future UI taxes to be higher for most individual employers (all but those already at the maximum tax rate). Experience rating is described as imperfect, in that there is not a one-to-one correspondence between changes in UI benefit payouts and changes in UI taxes for individual employers. Taxes paid by employers flow into state UI accounts maintained at the U.S. Treasury. These same accounts are the source of benefit payments to eligible claimants in the regular UI program, that is, the program that can pay up to 26 weeks of benefits (28 weeks in Montana and 30 weeks in Massachusetts).

The remaining covered employers are reimbursable employers. At the end of each year they make a payment to the state UI trust fund for all benefits charged to their accounts. In the aggregate, reimbursable employers account for just under 20 percent of covered employment. In 2007, for example, reimbursable employment totaled 25.8 million, or 19.3 percent of total covered employment of 133.4 million. Current coverage provisions have been in place since 1978. Between 1978 and 2007, the reimbursable share of covered employment increased from 17.6 percent to 19.3 percent.

Two groups of employers have reimbursable coverage: State and local governments and nonprofit employers. Employment in state and local governments is easily identified, but nonprofit employment is widely distributed across the industry structure. According to analysis at the Urban Institute, total nonprofit employment in 2005 was 12.9 million. The three two-digit industries with the largest amount of nonprofit employment in descending

[6] Respectively these are Unemployment Compensation for Federal Employees (UCFE) and Unemployment Compensation for Ex-servicemen (UCX). Payments under these two programs are administered by state UI programs, but they have their own financing that is part of the federal budget. The self-employed also fall outside the scope of UI coverage.

order of size are: Industry 62 – Health Care and Social Assistance; industry 81 – Other Services, Except Government; and industry 61 – Educational Services. These three industries combined accounted for 93.5 percent of nonprofit employment in 2005.[7] Nonprofit employment in industry 62 was 7.0 million in 2005 or 54.2 percent of the nonprofit total. Growth of the nonprofit share of total covered employment undoubtedly reflects the rapid growth of health sector employment.

Because taxable and reimbursable employers have different UI tax treatment, the state-level models should distinguish the two types of employers. Following discussions with staff at the Office of Workforce Security and the Bureau of Labor Statistics, we have partially addressed this question, but limitations on existing data availability have made it necessary to follow a methodology where nonprofit employment has been combined with for-profit private employment. Employment in the government sector (at all levels) was removed from the total employment estimates. However, when the Bureau of Labor Statistics publishes state-by-industry data on UI covered employment and payroll, nonprofit employment is not routinely separated from for-profit employment.[8] In industries with large nonprofit employment, UI-based tax rates will overstate actual tax rates.

At the level of statewide aggregates, the UI reporting system does distinguish each of nonprofit employment and government employment from for-profit employment. The reporting system also records the average contribution rate among for-profit employers.

The Economy.com state models have estimated regressions to determine nonprofit employment. The regressions use NIPA employment[9] in the three industries identified above (NAICS codes 62, 81 and 61) as explanatory variables with different coefficients

[7] Industries are classified according to the North American Industrial Classification System (NAICS) codes. See Table 2.2 in Wing, et. al (2008) for 2005 estimates of nonprofit employment by industry.
[8] These data are commonly referred to as Quarterly Census of Employment and Wages (QCEW)
[9] NIPA (National Income and Product Accounts) employment is estimated quarterly by the Office of Business Economics in the Commerce Department. The Economy.com models have estimates of NIPA employment by state for detailed industries.

estimated for the three industries. The CES employment estimate for the state and local government drives the UI covered employment estimate for this sector.

A regression also determines estimated taxable employment. The explanatory variable for this regression is total CES employment after removing employment in the federal, state, and local sectors, and the nonprofit components of employment in sectors 62, 81 and 61. Total payroll of taxable and of reimbursable employers is also estimated by regression. The ratio of estimated total payroll to estimated employment is then used in the state models to estimate average weekly wages for taxable employers, reimbursable employers, and all employers combined. The estimates of average weekly wages, in turn, are used in the replacement rate regressions (described below).

Although reimbursable employment accounts for a sizable share of total covered employment, UI claims against reimbursable employers are typically modest. In 2007, for example, benefits paid by reimbursable employers totaled $1.7 billion (5.6 percent of total regular UI benefits). The vast majority of regular UI benefits are paid to current and former employees of taxable employers, and these benefits are financed by experience-rated payroll taxes.

## 2.2 UI Tax Rates

State UI programs use two main methods for setting tax rates for individual taxable employers. Of the 51 UI programs examined here, 33 use reserve ratio experience rating, 13 use benefit ratio experience rating, two use a combination of reserve ratios and benefit ratios, three use other systems.[10] Reserve ratio systems use the employer fund balance on a set date (the computation date, most commonly June 30) measured as a percentage of recent (taxable or total) payrolls to calculate the employer's reserve ratio. The reserve ratio then determines where along a schedule of tax rates the employer is located, with higher tax rates for employers with lower reserve ratios. This tax rate applies throughout

[10] Puerto Rico and the Virgin Islands are not included in this analysis. Michigan and Pennsylvania use both reserve ratios and benefit ratios to set tax rates. Delaware and Oklahoma use benefit-wage ratios, i.e., the wages of employers with benefit charges, while Alaska uses payroll declines to set tax rates.

the entire upcoming year. Benefit ratio states use the benefit payout rate (benefits charged to an employer as a proportion of the employer's recent [taxable or total] payroll) to calculate a benefit ratio, which determines next year's tax rate. Most states have several tax rate schedules with higher schedules applicable as the state's trust fund descends to lower levels. Higher payouts in both systems (either higher benefit ratios in benefit ratio systems or lower reserve ratios in reserve ratio systems) cause UI taxes to be higher automatically in later periods unless overridden by state legislation. The determination of tax rates for individual employers also depends upon other factors, such as the prevalence of socialized benefit charges, the turnover rate of covered employers, the minimum tax rate, the maximum tax rate, and the level of the taxable wage base.

We used regression analysis to examine UI tax rates measured as a percentage of total payrolls of taxable employers. The regressions showed that lagged benefit ratios exert a strong positive effect on tax rates while lagged reserve ratios had a negative effect on the tax rate in most states. However, the explanatory power of lagged benefit ratios was much higher than for reserve ratios. As a result, we only use lagged benefit ratios in our analysis.

Table 2.1 displays summary statistics from the regressions (the individual state-level regressions appear in Table A.1 of Appendix A). Note in Panel A, 41 of 51 regressions have adjusted $R^2$s of at least 0.60 and the average adjusted $R^2$ is 0.712. The standard errors are generally small, with all but five smaller than 0.25. The average standard error of 0.174 is less than 0.20 of the overall tax rate, which averaged 0.940 for the entire set of 2,958 state-year observations.

The benefit ratio slope coefficients in Panel B are nearly all positive, as expected. Of the 204 slopes, 200 are positive and 126 are significant (using a t ratio of 2.0 to denote significance). The right-hand column in Panel B indicates that the time profile of the benefit ratio coefficients is quite flat, with the average coefficients ranging between 0.252 (two year lag) and 0.176 (4-year lag). The sum of the four coefficients in Panel B (0.869) is similar to the median of the sum of the four benefit ratio coefficients in Panel C

(0.850). Both of these sums are less than 1.0, indicating that using an alternative specification where the constant term was constrained to 0.0 would have yielded a coefficient sum even closer to 1.0.

One curious aspect of these regression results is the pattern of the residuals during 2000-2007. These eight years generate 408 state-year observations. For each state, the size and sign of each regression residual was noted. If a random process generated the residuals, one would expect roughly 204 to be positive and 204 to be negative. In fact, there were only 111 positive residuals compared to 297 negative residuals. The average residual for these last eight years of the estimation period was negative for 40 of the 51 state programs, meaning that the predicted tax rates were typically higher than the actual rates. This raises the question of why effective tax rates were not higher during these years. This would seem to be a good topic for further research to document state actions that reduced effective UI tax rates during 2000-2007. The state model uses add factors to offset the tendency for the regressions to overestimate tax rates in 2009 and later years.

Overall, these results are as expected given the UI program structure and intent. Increases in the benefit payout rate (benefit ratio) cause the average effective tax rate to change in the same direction. The vast majority of slope coefficients (98 percent) have the expected positive signs and the majority (62 percent) is statistically significant. On average, the regressions indicate the response of the tax rate to changes in benefit payouts is spread over 4 years, and, in most states, the total response is nearly as large as the change in the benefit ratio.

## Table 2.1. Summary of Regressions - Annual UI Tax Rates, 1960 to 2007

### Panel A. Summary Statistics for 51 Programs

| Adjusted $R^2$ | | Standard Error | |
|---|---|---|---|
| | Number of States | | Number of States |
| Below 0.50 | 8 | Below 0.10 | 3 |
| 0.50-0.599 | 2 | 0.10-0.149 | 20 |
| 0.60-0.699 | 9 | 0.15-0.199 | 13 |
| 0.70-0.799 | 13 | 0.20-0.249 | 10 |
| 0.80-0.899 | 18 | 0.25-0.299 | 3 |
| 0.90 Plus | 1 | 0.30 Plus | 2 |
| Average | 0.712 | Average | 0.174 |

### Panel B. Sign and Significance of Coefficients

| | Positive, Significant | Positive, Not Signif. | Negative, Not Signif. | Negative, Significant | Average |
|---|---|---|---|---|---|
| Constant | 21 | 12 | 10 | 8 | 0.103 |
| Ben. Ratio Lag 1 Year | 32 | 19 | 0 | 0 | 0.236 |
| Ben. Ratio Lag 2 Years | 34 | 17 | 0 | 0 | 0.252 |
| Ben. Ratio Lag 3 Year | 27 | 24 | 0 | 0 | 0.205 |
| Ben. Ratio Lag 4 Years | 33 | 14 | 4 | 0 | 0.176 |
| Ben. Ratio Sum | | | | | 0.869 |

### Panel C. Sum of Four Benefit Ratio Coefficients

| | Number of States |
|---|---|
| Below 0.60 | 5 |
| 0.60-0.699 | 8 |
| 0.70-0.799 | 10 |
| 0.80-0.899 | 6 |
| 0.90-0.999 | 9 |
| 1.00-1.099 | 5 |
| 1.10-Plus | 8 |
| Median | 0.850 |

*Source:* All entries based on 51 state-level regressions in Table A.1 of Appendix A.

## 2.3 Detailed Tax Rates by State and Industry

Tax rates on covered employers are known to vary widely across industries within states. Experience rating of UI taxes ensures that industries with higher benefit payout rates are subject to higher effective tax rates (taxes as a percent of total covered payroll) than industries with low payout rates. However, the national UI data reporting system no longer routinely publishes details on state-level tax rates by industry. The last year of published data refers to tax rates in 1994.

The QCEW reporting system does record UI contributions in addition to details on employment, total payroll, and UI taxable payroll. For calendar year 2007, we executed a tabulation at the state level of contribution rates by industry for private (for-profit plus nonprofit) employers. The industry detail was at the level of 2-digit NAICS codes, which span 19 detailed industries. We then divided the industry tax rates by the statewide average contribution rate to yield a set of 19 relative tax rates for each state.

Individual industries in each state have highly varied claims experiences, which (through experience rating) cause their tax rates to differ. Industries such as agriculture and construction, administrative and waste services, and accommodation and food services have persistently high claims relative to the all-industry average, and their tax rates are consistently above average. Conversely, low claims volume and associated low tax rates characterize utilities, finance and insurance, management companies, and health care and social assistance. In the former industries, average tax rates are frequently twice the all-industry average, while in the latter group the tax rate often averages less than half the all-industry average. Relative tax rates within an industry tend to be stable over time for many industries.

The use of NAICS coding for classifying industries also provides helpful detail on tax rates within the broad services sector. NAICS codes identify eight broad service sector industries. For the eight sectors combined, the average tax rate nationwide is only somewhat below the all-industry average (0.58 percent versus 0.61 percent in 2007),

Three of the underlying industries have low and three have high average tax rates. Disaggregation of the services sector provides revealing details about UI tax rate variation that are not suggested by the average tax rate for the overall service industry.

These relative tax rates can then be multiplied by each statewide average tax rate to yield estimated tax rates for 19 broad industries. The average tax rates can be obtained using the tax rate regressions described in the previous section. In simulation results to be discussed in Chapter 4, the relative tax rates from 2007 were used to estimate industry-level tax rates for future years. For each future year in a given state, UI tax rates vary by industry and according to the past 4 years' experience in paying regular UI benefits.

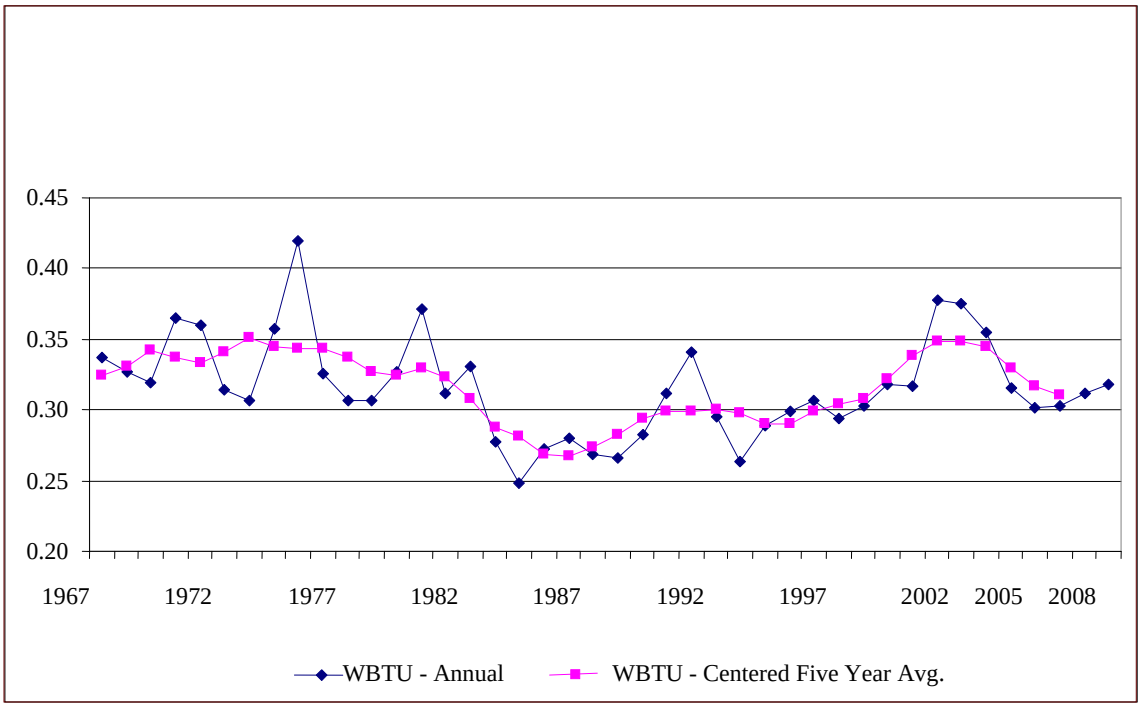
Because the UI tax rate estimates are based on total payroll, they can be directly entered into the Economy.com model estimates of the cost of doing business. Employer UI taxes are one component of labor costs by industry. Thus, within the state models, increases in UI benefit payouts lead to increases in average UI tax rates. This feedback from benefit payouts onto UI taxes allows the analysis to estimate the dampening effect of UI taxes on the performance of UI as an automatic stabilizer of the macro economy.

## 2.4 Regular UI Recipiency Rates

Only a minority of the unemployed collect regular UI benefits at any point in time. The recipiency rate as measured here is the ratio of weekly UI beneficiaries (in the regular UI program or EB) to total unemployment (TU) as measured in the monthly labor force survey of households. This ratio averaged 0.316 between 1967 and 2007. Readers should note that this measure of the recipiency rate differs from the measure used by many in ETA. They often measure the recipiency rate as the ratio of regular UI claimants (insured unemployment or IU which includes some not receiving benefits) to total unemployment (or TU). The IUTU ratio (weekly UI claimants as a proportion of weekly unemployment) averaged 0.367 between 1967 and 2007 as opposed to the 0.316 for the WBTU ratio (weekly UI beneficiaries as a proportion of weekly unemployment).

Chart 2.1 shows the national recipiency rate for the period 1967 to 2008. The chart has two series: The annual WBTU ratio and the centered five-year average of the WBTU ratio. The latter series extends only to 2006, the latest available centered five-year average.

**Chart 2.1. Regular UI Recipiency Rates, 1967 to 2008**




Year-to-year changes in the recipiency rate[11] for the regular UI program can be large, as clearly shown in the annual series in Chart 2.1. The two series, particularly the five-year averages, also show a decrease in recipiency during the early 1980s and an increase in the mid-1990s. In the most recent years, the recipiency rate has returned to levels that approach the levels of the 1970s.

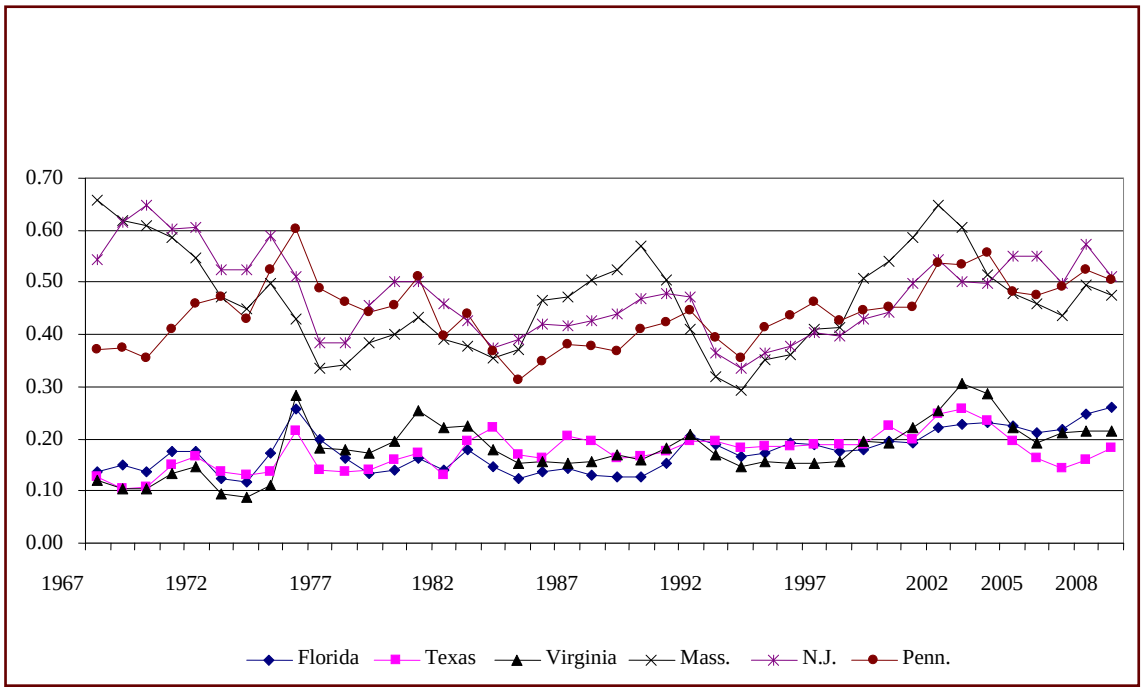
Within a given year, UI benefit recipiency rates exhibit wide variation across states. State-level averages of the WBTU ratio during 1967-2007 were below 0.20 in five states but exceeded 0.45 in four states over the same 41 years.[12]

[11] The WBTU ratio at the state level is first available in 1967. In earlier research, the author has developed state-level estimates of TU for all states starting in 1967.

[12] Averages below 0.20 were present in Colorado, Florida, South Dakota, Texas and Virginia. Averages above 0.45 were present in Connecticut, Massachusetts, New Jersey and Rhode Island.

But state-level WBTU ratios exhibit quite stable relative rankings. Chart 2.2 helps illustrate this relative stability. Three of the six included states exhibit consistently high recipiency rates (Massachusetts, New Jersey, and Pennsylvania) while three exhibit consistently low recipiency rates (Florida, Texas, and Virginia). For both groups, annual recipiency varies, with the variation larger for those with high recipiency rates; but, not a single data point moves a state from one group to the other.

**Chart 2.2. Regular UI Recipiency Rates in Six States, 1967 to 2008**




The contrast in recipiency rates for the two groups of states would seem to have clear implications for UI program performance in stabilizing the economy. States with high recipiency can be expected to exert greater stabilizing effects than states with low recipiency, given that the replacement rates of high recipiency states are not noticeably lower than in low recipiency states. The size of the differential effect would also be influenced by the size of offsetting responses caused by experience-rated UI taxes. These issues are explored in Chapter 4 using the Economy.com state models.

We modeled the recipiency rate for regular UI benefits in each state using four explanatory variables. The unemployment rate for the current year (TUR for total unemployment rate) is expected to enter with a positive coefficient, while the lagged TUR is expected to enter with a negative coefficient. The positive effect of the current TUR reflects the change in the composition of unemployment when unemployment increases. The proportion who are job losers increases with higher unemployment, and job losers are the group most likely to collect UI benefits. The negative effect of the lagged TUR arises from 1) benefit exhaustions, as those with long benefit duration use up their entitlements and 2) the effects of reduced base period earnings and monetary eligibility caused by higher lagged unemployment. These current and lagged effects have been observed for many years.

UI benefit recipiency has also undergone changes during certain periods. Restrictions on benefit eligibility occurred in the early 1980s and a downward shift in recipiency has been widely noted.[13] The shift is apparent in Chart 2.1. Policies at the state and national level were responsible for much of this shift. Less noticed has been an increase in recipiency that dates from the mid-1990s. Two factors provide at least part of the explanation for this recent increase: the aging of the labor force and increased reliance by employers on permanent (as opposed to temporary) layoffs during recessions. The two trend changes are approximated with dummy variables: The first, D1981 equals zero before 1981 and 1.0 from 1981; the second, D1996 equals zero before 1996 and 1.0 from 1996. As will be seen, both dummies make significant contributions to explained variation in state-level WBTU ratios.

In each state, a regression was fitted for the 41 years from 1967 to 2007. Table 2.2 summarizes the regression results; each state regression appears in Table A.2 of Appendix A. The first thing to note about Table 2.2 is the number of low adjusted $R^2$s. Nineteen fall below 0.40 and just 12 exceed 0.60. In other words, on average, the regressions explain less than half the variation in the WBTU ratio over the 1967-2007

[13] Several papers have documented a downward shift in recipiency in the early 1980s: Blank and Card (1991), Burtless and Saks (1984), Corson and Nicholson (1988) and Vroman (1991).

period. The rather large size of the standard errors of the estimates is also apparent. The average of 0.043 indicates that an increase or decrease of 0.043 in the WBTU ratio from one year to the next would not be statistically significant in the majority of states. The regular UI recipiency rate is, thus, a noisy statistical series in individual states.

The coefficients in Panel B are simple averages, but three features are noteworthy. First, the average constant term, 0.336, is similar to the overall average WBTU ratio of 0.314. Second, the sizes of the coefficients for the TUR and the TUR lagged are nearly identical and opposite sign. Recipiency increases when unemployment increases, but the negative pushback from exhaustions and reduced monetary eligibility in the next year is nearly as large. Thus, there is no long-run effect on recipiency when unemployment rises or falls but there is a strong short-run response.[14] On average, an increase in the unemployment rate by one percentage point raises the WBTU ratio by slightly more than two percentage points in the same year, but the ratio falls by about the same amount during the next year. Third, the average sizes of the two trend shift dummies (D1981 and D1986) are nearly identical. The average downward shift in 1981 was 2.7 percentage points and the increase from 1996 was also 2.7 percentage points. Combined, the coefficients indicate that the recipiency rate after 1996 had returned to a level close to its average prior to 1981.

[14] The size of the averages may seem large to some readers. The TUR and the TUR lagged in the regressions were measured as proportions, not as percentages.

## Table 2.2. Summary of Recipiency Rate Regressions, 1967 to 2007

### Panel A. Summary Statistics for 51 Programs

| Adjusted $R^2$ | | Standard Error | |
|---|---|---|---|
| <0.10 | 4 | <=0.030 | 7 |
| 0.10-0.199 | 3 | 0.030-0.0399 | 17 |
| 0.20-0.299 | 4 | 0.040-0.0499 | 17 |
| 0.30-0.399 | 8 | 0.050-0.0599 | 5 |
| 0.40-0.499 | 11 | 0.060-0.0699 | 3 |
| 0.50-0.599 | 9 | 0.070 Plus | 2 |
| 0.60-0.699 | 6 | | |
| 0.70 Plus | 6 | | |
| Average | 0.454 | Average | 0.043 |

### Panel B. Sign and Significance of Coefficients

| | Positive, Significant | Positive, Not Signif. | Negative, Not Signif. | Negative, Significant | Average |
|---|---|---|---|---|---|
| Constant | 50 | 1 | 0 | 0 | 0.336 |
| TUR | 36 | 12 | 2 | 1 | 2.066 |
| TUR Lag | 0 | 0 | 10 | 39 | -2.193 |
| D1981 | 4 | 9 | 19 | 19 | -0.027 |
| D1996 | 20 | 16 | 10 | 5 | 0.027 |

### Panel C. Average Recipiency Rates

| WBTU | |
|---|---|
| | Number of States |
| Below 0.20 | 5 |
| 0.20-0.249 | 9 |
| 0.25-0.299 | 11 |
| 0.30-0.349 | 9 |
| 0.35-0.399 | 8 |
| 0.40-0.449 | 4 |
| 0.45 Plus | 5 |
| Average | 0.314 |

*Source:* WBTU ratios developed from data published by the U.S. Department of Labor.

## 2.5 Extended UI Benefits

Besides regular UI benefits, unemployed workers in some states and/or time periods are also eligible for benefits that extend beyond 26 weeks. There is a permanent federal-state extended benefits program (EB) that may pay up to an additional 13 weeks of benefits (or even 20 weeks in certain situations) if a state EB trigger is "On." Additionally, the payment of temporary federal benefits (TFB) occurs in certain periods because of federal UI legislation enacted during recessions. The TFB programs are temporary with definite "sunset" dates. Both EB and TFB programs were activated in 2008 and both expanded considerably in 2009, a result of both legislation and higher unemployment rates. During all earlier recessions, EB has been financed 50-50 by the state and the federal government, while TFB has been fully federally financed. The American Recovery and Reinvestment Act (ARRA) of February 2009, however, included a provision to have the federal partner finance all EB payments for claimants who start to collect EB before ARRA expires.

The EB and TFB programs have been relatively important in many past recessions (recall Table 1.1). During 1992 and 1993 the TFB program (termed Emergency Unemployment Compensation or EUC, the same name as the current TFB program) paid amounts equal to fully half of regular UI benefits. Between 1971 and 1982, EB made substantial payments during recessionary years. While EB was not important during the recessions of 1991 and 2001,[15] the number of states paying EB in 2009 increased from three during the first week of January to 36 to 38 between August and November. One-time financial incentives under ARRA (full federal financing), changes to temporary TUR triggers, plus increases in unemployment to higher levels than in the 1991 and 2001 recessions explain the increase in EB payments by the states during 2009 and 2010. EB during 2009 totaled $6.1 billion, exceeding $1.0 billion for the first time since 1983.

The current EUC program has been the subject of seven federal legislative enactments (July 2008, November 2008, February 2009 and November 2009, December 2009, and

[15] Only nine states activated EB during and after the 1991 recession; just six activated EB during and after the 2001 recession.

March 2010, and April 2010). For the first 11 months of 2009, provisions under the federal stimulus legislation paid EUC for either 20 or 33 weeks depending upon each state's TUR. Eligibility for 20 weeks applied if the three-month TUR was at least 6.0 percent, and for 33 weeks if the TUR was at least 8.0 percent. States eligible for 33 weeks have increased from 20 during the first week of January 2009 to 47 during October 2009. Because of the November 2009 legislation, all states could pay at least 34 weeks of EUC during the final weeks of 2009. As of May 2010, there are four separate tiers of EUC with maximum potential EUC duration of 53 weeks in over 30 states.

Because EB was not active in most states during the 1991 and 2001 recessions, recent information on the relative importance of EB benefits was lacking for most states early in 2009. As noted, however, in late 2009 about three states in four were paying EB. The EB and EUC provisions of current federal UI legislation will run through early November 2010. If the economic recovery proceeds slowly and the recession extends well into 2010 and later, further EB and/or EUC extensions are possible (even likely). Thus, the performance of the regular UI program under alternative future scenarios can be estimated with much greater confidence than the performance of EB and EUC. Discussion of the simulations of the EB and EUC programs in Chapter 4 are careful in describing the underlying assumptions regarding when they are "On."

## 2.6 Regular UI Replacement Rates

The replacement rates to be used in the simulation analysis are from the *Unemployment Insurance Financial Handbook*, i.e., the ratio of the average weekly benefit for full weeks of unemployment to the average weekly wage of taxable plus reimbursable employers. Since 1967, this ratio has varied between 0.329 and 0.377 at the national level.

In contrast to the recipiency rate, the multiple regressions are quite successful in explaining the replacement rate. Table 2.3 summarizes state-level regressions that span the years 1967 to 2007. (The individual state regressions appear in Table A.3 of Appendix A.) Among the 51 state-level regressions in Table 2.3, 38 have adjusted $R^2$s of

0.70 or higher, while just four explain less than half the time series variation in the replacement rate. Also indicative of generally good explanatory power, the regressions usually have small standard errors. More than half (27) are smaller than 0.012, while just 11 exceed 0.016. The average standard error of 0.0126 is less than one-third the average for the recipiency rate regressions summarized in Table 2.2 above.

For individual states, several factors make significant contributions to explaining replacement rate variation. Nearly all regressions include three explanatory variables: 1) the ratio of the maximum weekly benefit to the average weekly wage (MxBenAWW), 2) the TUR, and 3) the TUR lagged. Note that all 51 MxBenAWW variables enter with a positive and significant coefficient. This variable was the most important contributor to explained variation in 45 of 51 regressions. When the maximum weekly benefit increases relative to average wages, the replacement rate increases. The current unemployment rate (TUR) exhibits a uniformly positive coefficient in Table 2.3, which is significant in 37 states. In contrast, the lagged TUR enters negatively with a significant coefficient in 31 of 43 states. This variable was not used in eight states because of collinearity with the current TUR. When both were entered in these states, neither was significant and there was no improvement in the overall fit, i.e., the adjusted $R^2$.

Three other influences on the replacement rate entered significantly in a number of states. The statutory replacement rate changed in 15 states during the 1967-2007 period. All 15 slopes had the expected positive signs, of which all but one were significant. Most states operated with a single statutory replacement rate during these years.

Most states determine a claimant's weekly benefit using high quarter earnings from the base period. Over the 1967-2007 period, however, several states changed their WBA calculation from using the single high quarter of earnings in the base period to using average earnings from the two highest quarters. In nearly all instances, this change reduced the weekly benefit and the associated replacement rate. Note in Panel B that seven of the eight coefficients for the two-quarter calculation (D 2Qtr) are negative and six are significant. On average, the move to a two-quarter calculation reduced

replacement rates by 0.02. A second change that reduced replacement rates was the change to an average weekly wage calculation from a high quarter calculation (or vice versa). The associated dummy variable (D AnnWage) was set at 1.0 in years when the annual wage calculation was used and 0.0 when the high quarter calculation was used. In eight of 10 states, this dummy coefficient had the expected negative sign, of which five were significant. The two exceptions were New York and Wisconsin. Both states changed to a high quarter calculation, but the replacement rate in both was lower in the post-change period. No good explanation for this result has been found. Discussions with professional staff in the two states did not help in finding a solution.

## Table 2.3. Summary of Replacement Rate Regressions, 1967 to 2007

### Panel A. Summary Statistics for 51 Programs

| Adjusted $R^2$ | | Standard Error | |
|---|---|---|---|
| <0.50 | 4 | 0.006-0.0099 | 14 |
| 0.50-0.599 | 3 | 0.010-0.0119 | 13 |
| 0.60-0.699 | 6 | 0.012-0.0139 | 9 |
| 0.70-0.799 | 12 | 0.014-0.0159 | 4 |
| 0.80-0.899 | 17 | 0.016-0.0179 | 5 |
| 0.90 Plus | 9 | 0.018 Plus | 6 |
| Average | 0.772 | Average | 0.0126 |

### Panel B. Sign and Significance of Coefficients

| | Positive, Significant | Positive, Not Signif. | Negative, Not Signif. | Negative, Significant | Number | Average |
|---|---|---|---|---|---|---|
| Constant | 34 | 4 | 8 | 5 | 51 | 0.080 |
| MxBenAWW | 51 | 0 | 0 | 0 | 51 | 0.439 |
| TUR | 37 | 14 | 0 | 0 | 51 | 0.623 |
| TUR Lag | 0 | 0 | 12 | 31 | 43 | -0.488 |
| RRate Stat | 14 | 1 | 0 | 0 | 15 | 0.486 |
| D 2Qtr | 0 | 1 | 1 | 6 | 8 | -0.020 |
| D AnnWage | 2 | 0 | 3 | 5 | 10 | -0.019 |

### Panel C. Average Replacement Rates and Maximum Benefit to AWW Ratios

| Repl. Rate | 1967-07 | 1998-07 | MxBenAWW | 1967-07 | 1967-97 | 1998-07 |
|---|---|---|---|---|---|---|
| Below 0.33 | 9 | 13 | Below 0.35 | 2 | 2 | 3 |
| 0.33-0.349 | 8 | 4 | 0.35-0.399 | 6 | 5 | 6 |
| 0.35-0.369 | 13 | 8 | 0.40-0.449 | 12 | 9 | 11 |
| 0.37-0.389 | 6 | 9 | 0.45-0.499 | 13 | 18 | 9 |
| 0.39-0.409 | 8 | 8 | 0.50-0.549 | 8 | 10 | 7 |
| 0.41-0.429 | 4 | 4 | 0.55-0.599 | 9 | 6 | 7 |
| 0.43 Plus | 3 | 5 | 0.60 Plus | 1 | 1 | 8 |
| Average | 0.366 | 0.364 | Average | 0.474 | 0.469 | 0.488 |

*Source:* Handbook replacement rates published by U.S. Department of Labor. Other variables derived by the author from data published by the Office of Workforce Security and BLS.

The bottom panel in Table 2.3 summarizes the distribution of replacement rates and the ratio of the maximum weekly benefit to the average weekly wage, with attention to the last 10 years (1998-2007) as well as the full 1967-2007 period. Note that the average replacement rate was essentially the same in the last decade as for the full period. The MxBenAWW ratio did increase somewhat in the most recent period, but the increase in the 51-state average was only 4.1 percent compared to the 1967-1997 period. The regressions of Table 2.3 and the back-up detail of Appendix Table A.3 suggest that the determinants of replacement rates are known and that no important trends were present during the 41-year sample period examined here.

The summary provided in Panel C of Table 2.3 also points to a shortcut that can be used in the simulation analysis. Since the replacement rates exhibit comparatively small variation, the simulations can legitimately use average state-level replacement rates as an alternative to the regression equations displayed in Table A.3. The simulation results to be summarized in Chapter 4 take this simpler approach, using as state-level replacement rates a 10-year average.

## 2.7 Summary

This chapter examined behavioral relationships that are central to understanding the performance of UI programs in individual states. Multiple regressions were used to characterize time series variation in average UI tax rates and in recipiency rates and replacement rates in the regular UI program. (The state-level regression results are displayed in Appendix A.) The chapter also described a cross-section analysis of differences in UI tax rates across 19 major industries in each state. All these relationships have been entered into the Economy.com state-level simulation models. Chapter 3 describes the Economy.com state models that underlie the simulation results to be presented and discussed in Chapter 4.

# CHAPTER 3.
# MODELING THE MACROECONOMIC EFFECTS OF UNEMPLOYMENT INSURANCE

Our analysis of UI as an automatic stabilizer was conducted using the macroeconomic models developed by Economy.com, a branch of Moody's Investor Services Incorporated. This chapter describes the structure of those models and discusses the strategy followed in the simulation analysis.

## 3.1 The Economy.com Model

Economy.com has developed econometric models suitable for analysis at the national, state, and MSA levels of geographic detail. Our simulations used state models for all 50 states plus the District of Columbia (hereafter 51 states). This geographic detail matches the UI program's structure, with benefit and financing provisions set by the states and differing noticeably from state to state.

Economy.com models use quarterly seasonally adjusted data with quarterly flows measured at annual rates. They carry historic values back at least 20 years and can make forecasts for as many as 30 future years. In our analysis, many simulations were extended to 2020, or 12 years beyond 2008, the most recent year with fully available annual data. This capacity to make lengthy future projections is important because the UI tax rate relationships have four-year lags on benefit payments. Thus, recession-related increases in benefits of 2009, 2010, and later years will affect UI taxes through 2014 and beyond. The models easily incorporate these lagged effects.

## 3.2 Model Structure

The state models characterize each state economy in six areas: 1) demographics, 2) labor market-real gross product, 3) personal income and average earnings, 4) credit and banking, 5) real estate and housing and 6) consumer demand. Several state-specific relationships are included in each of these areas (or modules), as described in a paper by

Cochrane (2006). The following paragraphs give a brief summary of structural features and key relationships.

Each state model has a complete demographic sector that updates state population estimates with projections of migration, births, and deaths. The total population is divided into age cohorts, and population change includes certain age-specific relationships. Net migration is determined by recent rates of job creation and the change in state unemployment relative to the national average. Separate relationships determine in-migration and out-migration. If aggregate state economic performance is below average, both these population flows respond and slow the pace of statewide population growth. International and domestic population flows are incorporated into the state models.

Paralleling the model's population dynamics are changes in the number of households. Households are disaggregated by age of head and changes are linked to state population growth. Labor market conditions also influence the total number of households. Higher unemployment reduces the rate of new household formation.

Central to each state model is the determination of real output (Gross State Product or GSP). Estimates of GSP are available from the Commerce Department's Bureau of Economic Analysis (BEA) by detailed NAICS[16] industries. State-level GSP for each industrial sector is linked to national GDP in that industry, with adjustments made according to each industry's cost of doing business. This cost variable is discussed below and in Appendix B. State-level GSP for industries in the service sector is driven primarily by local demand conditions, where the size of the state's population and the level of personal disposable income are two key determining factors. Establishment employment is linked to real output through derived demand relationships.

Personal disposable income has wages and salaries as its largest component, but it includes all the other components from the national income accounts as well. Specifically, personal disposable income includes dividends, interest, rents, proprietors'

[16] NAICS – North American Industrial Classification System

income, and Government transfer payments to persons less personal taxes. For the present analysis, transfer payments explicitly recognize each of the three tiers of UI benefit payments as well as the aggregate of all other transfer payments. While this report emphasizes the stabilizing effects of UI benefits, it is important to remember that UI benefits are a small component of total transfers; all other transfers have represented about 98 percent of total transfer payments in recent years.

Real output is also affected by the cost of doing business (CDB) in each state-industry sector. The Economy.com state models recognize three areas of costs that contribute to the overall cost profile for each state-industry sector: Labor costs, energy costs, and tax burden.[17] Labor costs are measured as total wages and salaries (payroll) from the National Income and Product Accounts (NIPA). To recognize labor productivity growth, NIPA payroll is deflated by real GSP. Energy costs are estimated as an average of commercial and industrial electricity prices measured in cents per kilowatt-hour (each normalized by their respective national average) and the weights provided by national expenditures for the two types of energy. The calculation of tax burden incorporates personal, property, and corporate taxes. Taxes also include employer payroll-based contributions for UI and workers' compensation. This comprehensive measure of business plus personal taxes is expressed as a ratio to personal income in the state. Each state-level tax burden ratio is then measured relative to the national ratio.

The aggregate CDB cost measure is then derived as a weighted average of its three constituent components. The national weights are 0.75 for labor costs, 0.15 for energy costs, and 0.10 for tax burden. The weights vary by industry and state. States with an above-average CDB will experience a drag on real GSP growth over the long run, particularly in the industrial sectors, as location decisions respond to cost differentials.

The employer taxes that support the UI program enter the Economy.com models through the CDB cost variable. States with above-average UI taxes and an associated high CDB

[17] See Appendix B for a fuller description of how the cost of doing business is measured. Essentially, it is a weighted average of costs by major cost categories.

will experience some loss of real output due to costs. States with high unemployment rates and/or high UI benefit payments per unemployed worker will be subject to this negative effect on real output.

Real demand and output in each detailed industry and industry productivity are the main determinants of employment in each industry. The models have separate regression relationships that link employment to real output through a derived demand for labor relationship. Through this mechanism, the financing of the UI program has negative output and employment consequences for a state.

UI benefit payments, in contrast, have a positive effect on real output and employment. These transfer payments increase household disposable income and consumption. Increases in UI benefits have an immediate effect upon disposable income and consumption expenditures. Unlike higher UI taxes, which operate with a long (four-year) lag, increases in benefit payments (from all three tiers of UI benefits) immediately raise household income. These transfer payments are then almost entirely spent on consumption items in the same year.

Thus, the two channels whereby UI affects the rest of the economy are through increases in consumption from UI benefits and increases in UI taxes (which reduce real output in affected industries by raising employer costs).

### 3.3 The Simulation Strategy

To examine the effects of UI on the macro economy, several different determinants (or treatments) were included in our analysis. Four separate elements of the UI program can influence the time path of real GDP, total employment, and total unemployment. These four are: (1) regular UI benefits, (2) temporary (or emergency) federal benefits (EUC in 2008, 2009, 2010, and perhaps later), (3) Federal-State Extended Benefits (EB), and (4) UI taxes. For the present report, the EUC and EB programs are modeled as a single extended benefit program. Even with the modifications of the EB triggers made under the

fiscal stimulus package of February 2009, the bulk of all extended benefits in 2009 were EUC benefits. The EB component of their combined total for 2009 was only about 10 percent.

Thus, the analysis examines the effects of three separate components of the UI program: regular UI benefits, extended benefits (EUC plus EB) and UI taxes. It should be noted that the UI taxes included in the analysis are the state taxes that support payment of regular UI benefits. The federal taxes that support program administration are not modeled. This approach also assumes that the full costs of EUC and EB payments are supported by the federal partner and add to the federal budget deficit. The effects of EUC and EB on the deficit are measurable in 2009, adding some $40 billion to the deficit. Their effects in financial markets are the same as other categories of deficit-increasing expenditures. No explicit treatment of the feedback effects of the deficit on macro performance is included in this analysis.

From the perspective of the business cycle, the UI program is important in stabilizing the time paths of macro variables like real GDP and total employment. To gauge UI's stabilizing impact we simulate a steady growth counterfactual and examine downward deviations from the counterfactual. The counterfactual projects macro variables under an assumption of reasonably steady growth during and after the periods affected by the recession, which officially began in the fourth calendar quarter of 2007. While the current recession may officially end in 2010, it is clear that unemployment will remain high and real output will remain considerably below potential real output for several future years. Associated with high unemployment will be elevated levels of UI benefit payments and UI taxes.

The growth counterfactual to be used is a growth projection from the national Economy.com model used in the fourth calendar quarter of 2007. This foresees annual real GDP growth in later periods of between 2.7 and 4.7 percent, with growth in most years above 3.0 percent. During the years between 2008 and 2020, the unemployment rate is projected to range between 4.2 and 5.1 percent (lower in the later years) and

average 4.5 percent. This path approximated full employment growth as projected by the 2007Q4 Economy.com model.

The steady growth path is then compared to a time path that approximates a deep recession. Rather than developing an artificial recessionary time path, we used the historic time path of the economy (2007Q4 through 2009Q2) for comparison with the steady growth path. For quarters starting in 2009Q3, the macro time path follows what Economy.com projects as the most likely future time path for the economy.[18]

Our model-based analysis derives estimates holding constant many other factors in the economy. The research strategy is to focus on the three aspects of the UI program (regular UI benefits, extended benefits and EUC, and UI taxes) in both the steady growth environment and in the recessionary environment. To do this, we simulate the effects of each factor in such a way that its separate contribution to macro performance can be isolated. Thus, the effects of regular UI benefits are simulated first under the assumption of no EB or EUC program, and benefit payouts are simulated with and without UI taxes. The extended benefit programs are then added to regular UI to yield estimates of their marginal effect in addition to that of regular UI. Because UI taxes operate with long lags, these are then added to the simulations to produce results with all aspects of the UI program activated.

The method of holding constant the effects of variables not included in a particular simulation is to keep that variable constant in real terms throughout all future periods. Where it is appropriate in Chapter 4, we discuss further the details of how variables are treated in specific simulations.

[18] To avoid using confusing terminology, this time path will be termed the "future time path". When Economy.com provides forecasts for its clients, it projects five different future time paths, three of which are more pessimistic than the time path it deems most likely. The most likely time path is judged to have a 50 percent probability of occurring. For its clients, this most likely time path is termed the "baseline time path", but we will not use this terminology in the present report.

# CHAPTER 4.
# SIMULATION RESULTS

This chapter summarizes the results of simulations of the U.S. economy with and without UI during a severe recession as experienced in recent years. Within the deep recession simulations, four sets of results are summarized.

- **Path 1** traces the time paths of macro variables when regular UI benefits and associated taxes respond to changes in unemployment.
- **Path 2** adds benefit payments from two extended benefit programs: Emergency Unemployment Compensation (EUC) and Federal-State Extended Benefits (EB).
- **Path 3** traces the time path of macro variables with just regular UI benefits responding to unemployment (UI taxes not responding).
- **Path 4** traces the time path when both regular UI benefits and regular UI taxes are held constant in real terms at their pre-recession level.

By comparing Path 2 with Path 1, one can assess the additional stabilizing effects of extended benefits. By comparing Path 1 with Path 3, one can estimate the extent to which UI taxes lessen the stabilizing effect of regular UI benefits. By comparing Path 4 and Path 3, one can assess the response of regular UI benefits to the recession and how much the time paths of real GDP and employment differ when regular UI benefits respond.

The four recession time paths are simulated for 51 "state" programs (i.e., including the District of Columbia).[19] The simulations extend through 2020, but primary emphasis is placed on results that extend through 2010Q2. By the end of 2010, real output and employment have started to increase while the unemployment rate has also stabilized and started to decline. Given the amount of state-level and time period detail generated for each variable, the chapter necessarily summarizes the results at a high level of aggregation. Again, the model uses quarterly data for GDP, UI benefits and UI taxes but all measured at annual rates.

[19] Economy.com does not support complete models for Puerto Rico and the Virgin Islands, two other jurisdictions within the state UI program.

After examining the stabilizing role of the regular UI program, the model then adds the extended benefit programs to estimate the added stabilizing effects that they provide. While separate detail for EUC and EB is generated in these "extended benefit" simulations, the text emphasizes just the combined effects of EUC and EB. Readers should understand, however, that the vast majority of extended benefits are EUC benefits. In historic data currently available (through the early months of 2010), the highest quarterly payout of EB was the $2.8 billion paid during the third quarter of 2009 while EUC benefits totaled $11.4 billion during the same quarter. Between 2008Q3 and 2009Q4 cumulative EUC benefits totaled $51.0 billion while cumulative EB benefits totaled $6.9 billion, or about 12 percent of their combined total.

While the recession simulations are of principal interest, the steady growth simulations provide one way to gauge the impact of a recession on real output and employment. The steady growth simulations are described first.

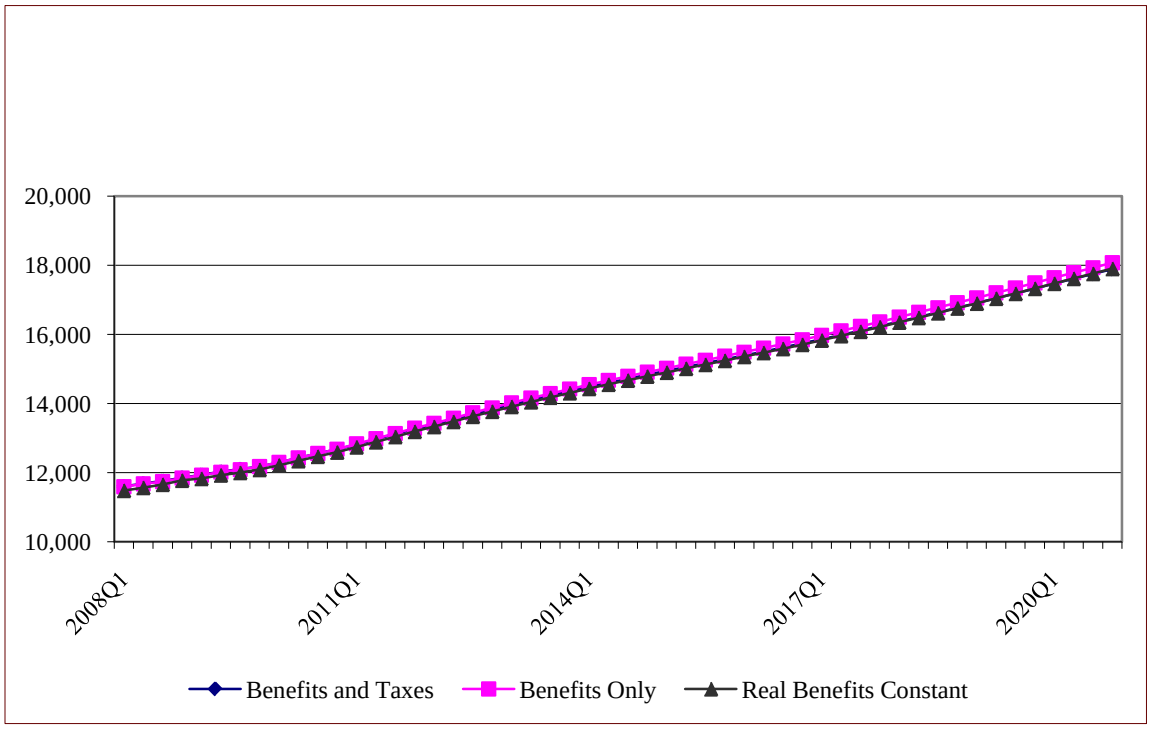
### 4.1 The Steady Growth (No-recession) Simulations

As noted, the performance of the UI program should be measured against a counterfactual simulation where the economy experiences steady growth. This simulation has three variants: 1) growth with regular UI benefits and taxes functioning, 2) growth with regular UI benefits responding but UI taxes constant, and 3) growth with regular UI benefits and taxes both constant in real terms. Each of these three simulated paths has a counterpart in later simulations where the recession started in 2007Q4 and follows a recessionary path into later periods. The recession path closely approximates the economy's actual path through the second quarter of 2009 and then follows the most likely path (as judged by Economy.com) for later quarters through 2020.

The three time paths of the baseline scenario are depicted in Chart 4.1. Note that their proximity is practically identical. The lines are so similar that the graph does not display three distinct series. In a situation where unemployment varies within a narrow range, the

quantitative effect of the benefits and taxes of the regular UI program are very small. The chart shows that with just benefits but no UI taxes, real output is on the highest path as would be expected, but the differences are tiny. Real UI benefits average 0.23 percent of real GDP between 2007Q4 and 2020Q4.

**Chart 4.1 Steady Growth, Real GDP Time Paths, 2008 to 2020**




*Source:* Simulations with the Economy.com model. Data in billions of 2000 dollars.

While the aggregate real GDP growth paths are very similar, clear differences in the size of benefit payouts are observed in state-level data. In comparisons to be repeated later in the chapter, the ratios of real benefits to real output across the states revealed large contrasts. For the 10 states with the highest recipiency rates, real regular UI benefits averaged 0.38 percent of real GDP compared to 0.12 percent for the 10 with the lowest recipiency rates. These contrasts are sizeable even in a steady growth scenario. When the source of the contrast is examined, it is found to be differences in recipiency rates (the ratio of UI beneficiaries to unemployment). The unemployed in high-recipiency states are more than twice as likely to receive regular UI benefits when compared to the unemployed in low-recipiency states. The simple averages of the recipiency rates for the

two groups of states in 2007 were 0.470 versus 0.193. In contrast, there is very little difference in the average replacement rates (weekly benefits divided by weekly wages). During 2007, the average replacement rate across the 10 high-recipiency states was 0.348 while it was 0.338 across the 10 low-recipiency states.[20]

The preceding comparison of states with highest recipiency versus those with lowest recipiency provides a convenient way to summarize state-level detail without explicitly displaying 51 state statistics for a particular variable such as real GDP. Recall from Chart 2.2 of Chapter 2 that multiyear patterns of recipiency rates are quite stable for individual states. Focusing upon states at the extremes of the recipiency rate distribution provides a convenient way to highlight contrasts among the state programs. This device for summarizing contrasts across the states will be employed later in the chapter.

## 4.2 Recession Simulations

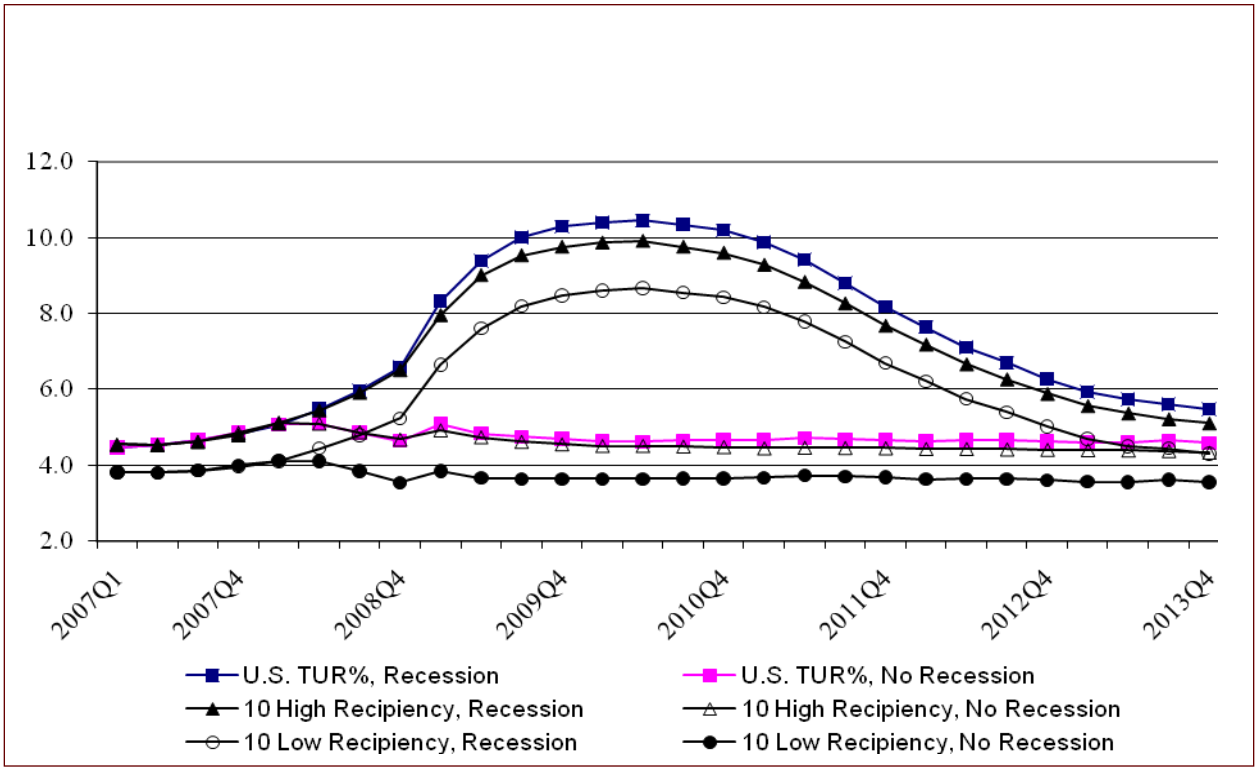
In 2008-2009, the U.S. economy experienced the most serious recession of the post-World War II years. Many observers are describing this period as the "great recession". The national unemployment rate averaged 10.0 percent during October-December 2009 and 16 state-level unemployment rates exceeded 10.0 percent during the same quarter. The annual average U.S. unemployment rate (TUR) for 2009 was roughly twice its level in 2007 (i.e., 9.3 percent compared to 4.6 percent).

While recession-related increases in unemployment have occurred in all states, the most severe increases in unemployment and associated reductions in employment have occurred in the states from two of the nine U.S. Census Bureau divisions, the East North Central and Pacific divisions. Monthly unemployment rates during 2009 have averaged at least a full percentage point and often two percentage points above the national average. The national average unemployment rates for the two divisions were respectively 10.7 percent and 11.1 percent. Higher unemployment has most severely affected youths, minorities, men, and those with low educational attainment.

[20] High recipiency states: Alaska, Connecticut, Idaho, Massachusetts, New Jersey, Pennsylvania, Rhode Island, Vermont, Washington D.C., and Wisconsin. Low recipiency states: Arizona, Colorado, Florida, Mississippi, New Hampshire, Oklahoma, South Dakota, Texas, Utah, and Virginia.

Chart 4.2 displays six time series (three pairs) of unemployment rates (TURs) from the Economy.com state model. These quarterly data cover the seven years 2007 to 2013 and all series are from simulations performed for this research project. The national series are actual historic data from 2007Q1 to 2009Q2, while later periods are model-based projections. The chart displays averages for the 10 states with highest recipiency and the 10 with lowest recipiency. The time profiles of the three steady-growth (or no recession) series and the three recession series are very similar. In the recession series, the peak unemployment rate is reached in 2010Q2. This quarter also has the highest unemployment rate for 39 of the 51 state-level projections.[21]

**Chart 4.2. Unemployment Rates in the Recession and No Recession Scenarios, 2007Q1 to 2013Q4**




*Source*: Simulations with the Economy.com state model. Unemployment as a percent of the labor force.

[21] Of the 12 states where the highest TUR occurs in another quarter, that quarter is 2009Q4 for three, 2010Q1 for four, and 2010Q3 for four. The other highest TUR occurs in Texas in 2011Q2.

Note in Chart 4.2 that both 10-state average TURs are below the national average, particularly in the low-recipiency states. It should also be noted that the TURs in the recession simulations remain above those in the no recession simulations not just through 2013 but also for all years through 2020 (not shown).

The sizes of the real output and employment losses are noteworthy. In 2010Q2, the quarter of peak unemployment, real GDP in the recession simulation is 7.5 percent lower than in the no-recession simulation. Total employment during 2010Q2 in this simulation falls 9.6 million (6.7 percent) below employment in the no recession simulation and the TUR is more than double its no-recession counterpart (10.38 versus 4.62 percent). These large declines in real GDP and employment help to point out the need for having a robust UI program to offset the recession's negative effects on families and individuals.

While the decrease in real output during 2008-2011 is to be expected, the recession also lowers real GDP in all later periods of the 2010-2020 decade. This impact on the growth path arises in part from reduced business fixed investment during the recession, which reduces the size of the capital stock. In the Economy.com model, the recession has long-run effects on real GDP and employment as well as short-run effects.

It may be instructive to describe the size of the reductions in real GDP caused by the recession. In 2008Q2, the downward deviation from the steady growth path projected in 2007Q4 is 0.9 percent, but it then rapidly increases to 3.5 percent at the end of 2008, 6.5 percent at the end of 2009, and 8.0 percent at the end of 2010. The downward deviation then decreases, but only to 7.8 percent at the end of 2011 and 6.7 percent at the end of 2012. After 2012, the convergence of the recession time path towards the no recession time path ceases. The effect of the recession on the growth path, in other words, is very large. The deviation in real GDP between the no-recession and the recession growth paths during the three recession-impacted years 2009-2011 averages $905.5 billion. This represents about 7.0 percent of no-recession real GDP.

The contrasting growth paths are strongly influenced by four changes made in the Economy.com model between the 2007Q4 version and the 2009Q2 version. In light of economic developments during late 2008, the changes identified below were made to the forecasting model that had been used at the end 2007. In later discussions, the "no-recession model" used at the end of 2007 will be termed the "2007Q4 version", and the "recession model" used in mid-2009 will be termed the "2009Q2 version". Key differences between the two models are the following.

1) The future growth rate of the labor force was reduced.[22]
2) The full employment unemployment rate was revised upward from 4.2 percent of the labor force to 5.5 percent.[23]
3) Household savings rate was revised upward to 7.5 percent of household disposable income, an increase from 6.5 percent.
4) The recession reduced business fixed investment, hence the size of the total stock of machinery and equipment.

All four factors combine to produce lower growth paths for real GDP and employment and a higher unemployment rate during the 2010-2020 decade. As a result, the post-recession growth path of the 2009Q2 model remains substantially below the no-recession steady growth path of the 2007Q4 model.

## 4.3 Regular UI Benefits

The recession causes a large response in UI benefit payments. Regular UI benefits increase noticeably in 2008Q1 and grow strongly over the next six quarters. Nominal benefits (measured at an annual rate) increase from $39 billion in 2008Q1 to $96 billion in 2009Q3 and 2009Q4. Thereafter regular UI benefits decrease as the economy recovers and unemployment moves downward. Total nominal benefits in 2010Q4 decrease to $76 billion and then to $56 and $45 billion at the end of the following two years. Measured in real terms (deflated by the GDP deflator based on the year 2000) real benefits in 2012Q4 are $35.1 billion, roughly the same as during 2008Q2. Because the unemployment rate

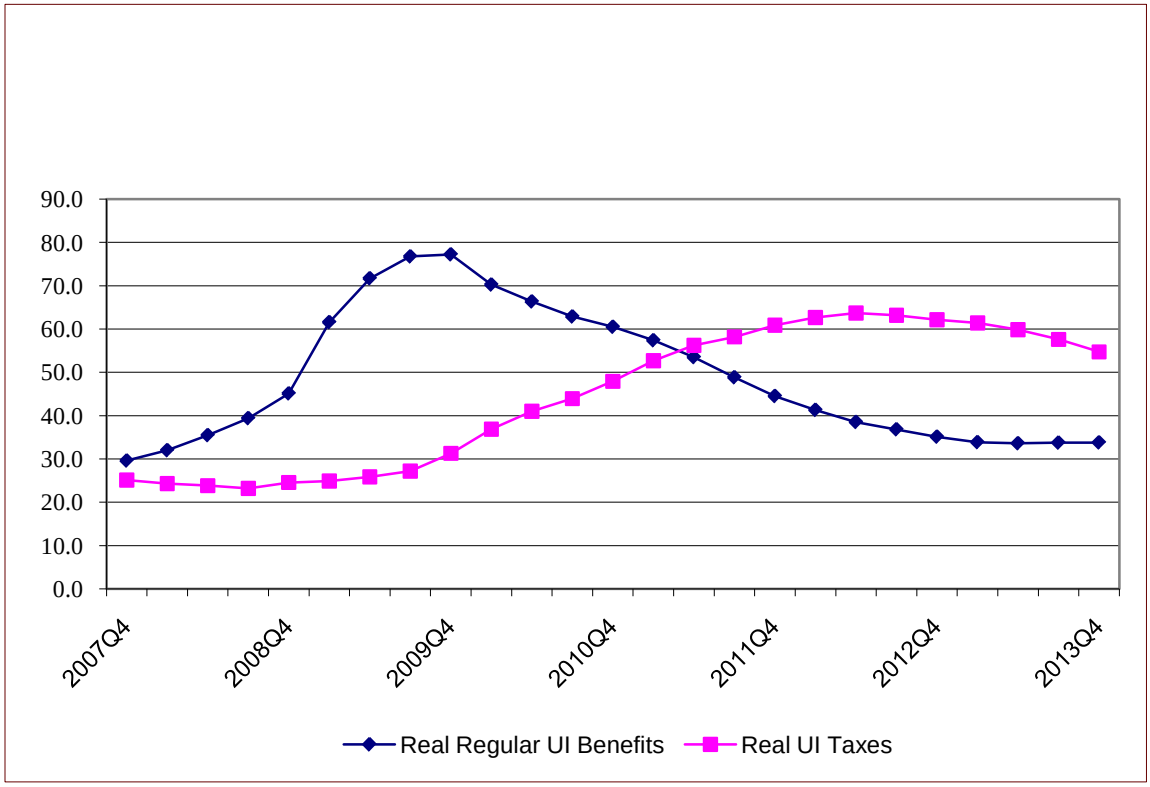
[22] Labor force growth in the 2010-2020 decade was reduced substantially, from 1.3 percent per year to 0.7 percent. The analysis of changing labor force participation patterns is summarized in Marisa Di Natale and Sophia Koropeckyj, "Forecasting U.S. Labor Force Participation," *Moody's Regional Financial Review*, (November 2007), pp 20-27.

[23] The change reflects an assumed increased rate of worker dislocation from jobs and reduced geographic mobility due to the decline in the value of homes and an associated reluctance to move.

never returns to its pre-recession level, real regular UI benefit payments never fall below $33 billion.

Chart 4.3 displays the quarterly time paths of real regular UI benefits and UI taxes (nominal values deflated by the GDP deflator) from the start of the recession (2007Q4) to the period when unemployment stabilizes at 5.4 percent (2013Q4). Note how real benefits increase sharply during the first three calendar quarters of 2009 and then descend gradually after 2009Q4. By the end of 2013, real regular UI benefits have returned to their level of early 2008. Chart 4.3 also clearly displays the response of UI taxes. Aggregate real UI taxes start to exceed $30 billion in 2009Q4, reach a peak above $60 billion in 2012Q2, and then start decreasing. This time pattern reflects the long (4-year) lags in the tax rate equations discussed in Chapter 2.

**Chart 4.3. Real Regular UI Benefits and UI taxes, 2007Q4 to 2013Q4**




*Source*: Simulations with the Economy.com state model. Data in billions of 2000 dollars.

The recession simulation with regular UI benefits responding to unemployment shows a strong response in all states. Comparing the 10 states with the highest with the 10 with the lowest recipiency rates, the percentage response of benefits is larger in states with low recipiency. Between 2007Q3 (the pre-recession quarter) and 2010Q2 (the period of highest unemployment) real benefits grew by 136 percent nationally (from $28.1 to $66.3 billion at an annual rate). Over the same period, the respective growth percentages for the high-recipiency and the low-recipiency states were 113 and 232 percent.

Contributing to the increase in regular UI benefit payouts in 2008 and 2009 is a measurable increase in the recipiency rate as unemployment increases. Nationally the recipiency rate increases from 0.32 in 2007Q3 to 0.39 in 2009Q3 before starting to decline. By 2010Q2, the recipiency rate has declined to 0.32, its pre-recession level. For the 10 high-recipiency states the increase in the recipiency rate between 2007Q3 and 2009Q3 is much smaller (from 0.47 to 0.50), and the subsequent decrease to 2010Q2 is larger (from 0.50 to 0.42). For the 10 low-recipiency rate states, the average recipiency rate in 2007Q3 is 0.19, growing to 0.28 by 2009Q3, and then decreasing to 0.24 in 2010Q2. On average, the negative feedback from lagged unemployment onto recipiency in the current year is stronger in high-recipiency states when compared to the low-recipiency states. As a result, the recipiency rate decreases more in the later periods of a recession in high-recipiency states when compared to low-recipiency states.

Following the onset of a recession and the associated increase in benefit payouts, a negative feedback occurs in regular UI benefit payouts due to benefit exhaustions. Since maximum potential benefit duration is 26 weeks in all but two states,[24] this negative feedback starts to affect recipiency even before the highest unemployment rate is reached. The simulations provide strong evidence of this negative feedback.[25] Nationally the highest volume of real regular UI benefit payouts occurs during 2009Q4, as it does for both the 10 high-recipiency and the 10 low-recipiency states. By 2010Q2, real regular UI payouts nationwide had decreased by 14 percent from their peak in 2009Q4 (or by

[24] In Massachusetts and Montana, the maximum durations are 30 and 28 weeks respectively.
[25] This negative feedback is present in nearly every state. See Panel B in Table 2.2 of Chapter 2 and Table A2 in Appendix A which displays the recipiency rate regression equations for each state.

$10.9 billion at an annual rate). The comparable decreases in the 10 high-recipiency and the 10 low-recipiency states were 13 and 8 percent, respectively.

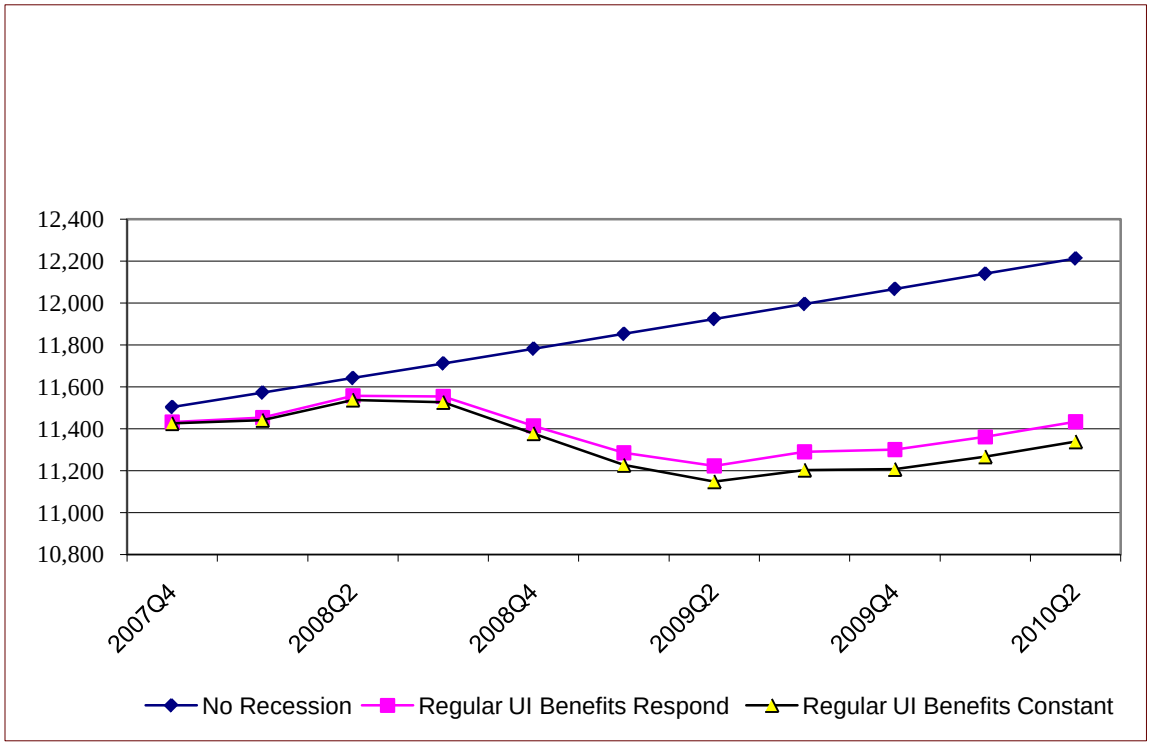
The presence of regular UI benefit payments measurably reduces the severity of the economic downturn. To estimate the size of this effect, we compare two time paths of real GDP:

1) A recession where regular UI benefits respond to the decrease in real GDP and the increase in unemployment.
2) A recession where regular UI benefits are held constant in real terms.

Note that the second time path allows UI benefits to increase, but only in line with changes in the GDP price deflator. Also, rather than remove all regular UI benefits and cause a large negative effect on aggregate demand, output, and employment, this procedure allows the component of demand coming from the volume of pre-recession UI benefit payments to be unchanged during the recession.

Chart 4.4 displays the three time paths for the period 2007Q4 to 2010Q2. The failure of real output to return to the no recession time path projected by the Economy.com model of 2007Q4 was discussed previously. This raises a question of how to project the level of real GDP in a no-recession environment. The growth parameters in the 2007Q4 model were more optimistic than in the recession model of 2009Q2. The simple expedient that underlies Chart 4.4 is to assume a quarterly growth rate of 0.6 percent (2.4 percent annual growth) and project this growth for every quarter starting in 2007Q4. This top line gives the reader a guide to the size of the decline in output. Because the no-recession time path is not a model-based projection, the shortfall of actual GDP from the no-recession GDP should be viewed as illustrative of the recession-related decline in real output. The downward deviation is large, averaging about $800 billion in 2009 and 2010. An indication of the seriousness of the recession is that real GDP does not return to its level of 2007Q4 until the middle of 2010.

**Chart 4.4. Three Time Paths of Real GDP, 2007Q4 to 2010Q2**




*Source:* Recession time paths from the Economy.com model. The no-recession time path derived at the Urban Institute assuming 0.6 percent growth per calendar quarter. Data in billions of 2000 dollars.

Chart 4.4 shows that regular UI benefits have a stabilizing effect, with real GDP consistently higher when real UI benefits respond rather than remaining constant. Between 2008Q3 and 2010Q2, for example, real GDP averages $71 billion higher when real benefits respond compared to constant real benefits.

Table 4.1 summarizes the time paths of real GDP and real regular UI benefits from 2007 to mid-2010. Columns [1]-[3] display quarterly data on the three time paths of real GDP shown in Chart 4.4. Column [4] shows the deviation between the stable growth scenario and the time path where real regular UI benefits do not respond to the recession. This deviation averages $800 billion during 2009 and 2010.

## Table 4.1. Time Paths of Real GDP and Real Regular UI Benefits, 2007Q1 to 2010Q2

| | Real GDP, Stable Growth [1] | Real GDP, Recession, Regular UI Responds [2] | Real GDP, Recession, Regular UI Constant [3] | Stable Growth Less Const. UI [1]-[3] [4] | Real GDP, Responsive UI less Const. UI [2]-[3] [5] | Real Regular Benefits [6] | Change in Benefits From 2007Q3 [7] | Real GDP Deviation/ Real Ben. Deviation [5]/[7] [8] | Share of Deviation Reduced by Regular UI [5]/[4] [9] |
|---|---|---|---|---|---|---|---|---|---|
| 2007Q1 | 11,424 | 11,424 | 11,424 | 0 | 0 | 27.0 | - | | |
| 2007Q2 | 11,370 | 11,370 | 11,370 | 0 | 0 | 27.5 | - | | |
| 2007Q3 | 11,434 | 11,434 | 11,434 | 0 | 0 | 28.1 | - | | |
| 2007Q4 | 11,503 | 11,432 | 11,425 | 78 | 7 | 29.6 | 1.5 | 4.5 | 0.09 |
| 2008Q1 | 11,572 | 11,453 | 11,441 | 131 | 12 | 32.0 | 3.9 | 3.2 | 0.09 |
| 2008Q2 | 11,641 | 11,557 | 11,537 | 104 | 20 | 35.5 | 7.4 | 2.6 | 0.19 |
| 2008Q3 | 11,711 | 11,553 | 11,526 | 185 | 27 | 39.4 | 11.3 | 2.4 | 0.15 |
| 2008Q4 | 11,782 | 11,414 | 11,377 | 404 | 37 | 45.1 | 17.1 | 2.2 | 0.09 |
| 2009Q1 | 11,852 | 11,285 | 11,226 | 626 | 59 | 61.6 | 33.5 | 1.7 | 0.09 |
| 2009Q2 | 11,923 | 11,222 | 11,148 | 775 | 74 | 71.7 | 43.6 | 1.7 | 0.10 |
| 2009Q3 | 11,995 | 11,289 | 11,203 | 792 | 86 | 76.7 | 48.7 | 1.8 | 0.11 |
| 2009Q4 | 12,067 | 11,300 | 11,207 | 860 | 93 | 77.2 | 49.2 | 1.9 | 0.11 |
| 2010Q1 | 12,139 | 11,361 | 11,267 | 873 | 94 | 70.2 | 42.2 | 2.2 | 0.11 |
| 2010Q2 | 12,212 | 11,434 | 11,338 | 874 | 95 | 66.3 | 38.3 | 2.5 | 0.11 |
| | | | | | | | | | |
| 2008Q3 - 2010Q2 Av. | 11,960 | 11,357 | 11,287 | 674 | 71 | 63.5 | 35.5 | 2.0 | 0.11 |

*Source:* Simulations with the Economy.com model. Data measured in billions of 2000 dollars. Column [1] derived at the Urban Institute.

Two comments about the deviation in column [4] can be offered. First, note how the deviation grows between 2008Q3 and 2009Q2. While the NBER placed the cyclical peak in 2007Q4, the downward trajectory in real GDP gains momentum later, during the last half of 2008. Second, the caveat about the derivation of stable growth path needs to be repeated. This was projected at the Urban Institute and not derived from the Economy.com model. The projection assumes the economy after 2007Q3 grows at a rate of 0.6 percent each quarter. Readers should view the deviations in column [4] as illustrative.

Column [5] shows the real GDP deviation when real regular UI benefits respond to the recession compared to constant real UI benefits. This deviation grows throughout the quarters of 2008 and 2009, reaches $93 billion in 2009Q4, and averages more than $90 billion during late 2009 and 2010.

Columns [6] and [7] in Table 4.1 focus on real regular UI benefits. The pre-recession level (2007Q3) of $28.1 billion grows to $77.2 billion (nearly tripling) by 2009Q4. Real regular benefits then decline to $66.3 billion by 2010Q2. Column [7] shows the increases from the pre-recession level of $28.1 billion. This deviation reaches $49.2 billion in 2009Q4. The deviation still exceeds $30 billion in mid-2010.

Column [8] shows the ratio of the real GDP deviation attributable to UI benefits (column [2] less column [3] or column [5]) to the deviation in real UI benefits (column [7]). This can be interpreted as the multiplier effect of UI benefits. For most periods, this ratio ranges between 1.7 and 2.5. It shows the real GDP increment associated with each added real dollar of regular UI benefits.

Note that these “multiplier” estimates are very large in the earliest periods, e.g., 4.5 in 2007Q4, but then decline to the more plausible 1.7 to 2.5 range starting in 2008Q3. Note also that these estimates are based upon two simulated time paths from the 2009Q2 version of the Economy.com model. Readers are reminded that the results displayed in Table 4.1 are built up from state-level detail.

The bottom row of Table 4.1 summarizes results for the eight calendar quarters from 2008Q3 to 2010Q2. The average downward deviation of real GDP averages $674 billion while the increment to real GDP associated with increased UI benefits averages $71 billion. The UI multiplier effect on real GDP averages 2.0 and the share of the downward deviation in real GDP filled by responsive UI benefits averages 0.11.

One exploration into the linkage between UI benefits and aggregate demand is to trace the evolution of real disposable income of households (RYD). This series was traced for the two simulations summarized in columns [2] and [3] of Table 4.1. When real UI benefits respond to the recession, RYD is also noticeably higher compared to RYD when real benefits are constant. The time paths of the deviations in RYD from these two simulations strongly resemble the real GDP deviations shown in column [5] of Table 4.1. The RYD deviations grow from $7 billion in 2007Q4 to $128 billion in 2009Q4, averaging $122 billion during 2009Q3-2010Q2. For the same period real regular UI benefits were higher by an average of $44 billion. The increase in real UI benefits accounted for more than one-third of the increment in RYD.

To summarize, when real regular UI benefits respond to the recession they raise the level of real GDP measurably above the level when real benefits are constant. During the eight quarters of 2008Q3-2010Q2, real UI benefits cause an increment to real GDP that averaged $71 billion and reduced by about 11 percent the downward deviation in real GDP that would have occurred had real UI benefits not responded. The multiplier effect of increased real benefits on real GDP averaged 2.0 during these eight quarters.

Since recipiency rates vary widely across states, it is relevant to examine the differing state-level effects of UI on real GDP. Table 4.2 summarizes and contrasts selected estimates from the 10 high-recipiency and 10 low-recipiency states. This state-level analysis with 2009Q2 Economy.com model uses selected details from individual states that underlie the national aggregates summarized in Table 4.1. The analysis emphasizes the effects of real regular UI benefits on real GDP and does not attempt to project real GDP under a no-recession scenario.

Table 4.2 summarizes these results with details in Panel A for the high-recipiency group and Panel B for the low-recipiency group. Four features of Table 4.2 are noteworthy. First, states in the low-recipiency group are on average larger. Their combined real GDP is 52 percent larger.[26] Second, both groups reach their real output trough in 2009Q2. Third, the level of real UI benefits shows a greater contrast in 2007 than in 2010. The negative feedback from the lagged TUR (due to exhaustions and lower monetary eligibility) is larger on average in the high-recipiency states. Thus, aggregate real benefits in the low recipiency group are less than half of real benefits in the high-recipiency group in late 2007, but the proportion increases to 0.70 by early 2010. The increase in real benefits after 2007Q3 averages $7.26 billion and $5.91 billion for the two groups respectively. Fourth, the multipliers for regular UI benefits are similar across the two groups of states and average 1.9 and 2.0, respectively. These multipliers are similar to the national multipliers estimated earlier in Table 4.1. The principal conclusion of this state-level analysis is that the cyclical performance of regular UI benefit payouts exhibits a smaller contrast than the contrast in average recipiency rates discussed in Chapter 2.

[26] Their employment is 59 percent larger.

**Table 4.2. Real GDP and Real UI Benefits in High and Low Recipiency States, 2007Q3 to 2010Q2**

| | Real GDP, Regular Responds [1] | Real GDP, Regular UI Constant [2] | Real GDP, Responsive UI - Constant UI [1]-[2] [3] | Real Regular UI Benefits [4] | Change in Benefits from 2007Q3 [5] | Real GDP Deviation/ Real Ben. Deviation[3]/[5] [6] |
|---|---|---|---|---|---|---|
| **Panel A. 10 High-Recipiency States** | | | | | | |
| 2007Q3 | 1,714.0 | 1,714.0 | 0.0 | 6.89 | - | - |
| 2007Q4 | 1,712.3 | 1,710.9 | 1.4 | 7.23 | 0.34 | 4.3 |
| 2008Q1 | 1,719.2 | 1,716.4 | 2.7 | 7.80 | 0.91 | 3.0 |
| 2008Q2 | 1,736.4 | 1,732.4 | 4.0 | 8.44 | 1.55 | 2.6 |
| 2008Q3 | 1,735.5 | 1,730.0 | 5.5 | 9.28 | 2.39 | 2.3 |
| 2008Q4 | 1,716.3 | 1,708.8 | 7.5 | 10.55 | 3.66 | 2.1 |
| 2009Q1 | 1,700.4 | 1,689.0 | 11.4 | 13.54 | 6.65 | 1.7 |
| 2009Q2 | 1,694.5 | 1,679.9 | 14.7 | 15.85 | 8.96 | 1.6 |
| 2009Q3 | 1,703.1 | 1,686.2 | 16.9 | 16.78 | 9.89 | 1.7 |
| 2009Q4 | 1,702.6 | 1,684.5 | 18.2 | 16.81 | 9.92 | 1.8 |
| 2010Q1 | 1,706.0 | 1,687.6 | 18.4 | 15.68 | 8.79 | 2.1 |
| 2010Q2 | 1,714.1 | 1,695.5 | 18.6 | 14.72 | 7.83 | 2.4 |
| **Average** | | | | | | |
| 08Q3-10Q2 | 1,709 | 1,695 | 13.9 | 14.15 | 7.26 | 1.9 |
| **Panel B. 10 Low-Recipiency States** | | | | | | |
| 2007Q3 | 2,596.8 | 2,596.8 | 0.0 | 3.19 | - | - |
| 2007Q4 | 2,596.3 | 2,595.0 | 1.3 | 3.48 | 0.28 | 4.7 |
| 2008Q1 | 2,605.9 | 2,603.7 | 2.2 | 3.85 | 0.66 | 3.4 |
| 2008Q2 | 2,627.9 | 2,624.6 | 3.3 | 4.36 | 1.17 | 2.8 |
| 2008Q3 | 2,631.1 | 2,626.6 | 4.5 | 4.96 | 1.76 | 2.6 |
| 2008Q4 | 2,600.3 | 2,594.4 | 6.0 | 5.77 | 2.57 | 2.3 |
| 2009Q1 | 2,588.1 | 2,578.6 | 9.5 | 8.31 | 5.12 | 1.9 |
| 2009Q2 | 2,578.5 | 2,566.5 | 12.0 | 9.88 | 6.68 | 1.8 |
| 2009Q3 | 2,599.2 | 2,585.0 | 14.2 | 11.00 | 7.81 | 1.8 |
| 2009Q4 | 2,608.7 | 2,592.8 | 15.9 | 11.48 | 8.29 | 1.9 |
| 2010Q1 | 2,632.2 | 2,615.8 | 16.4 | 10.87 | 7.67 | 2.1 |
| 2010Q2 | 2,656.0 | 2,639.0 | 17.1 | 10.54 | 7.35 | 2.3 |
| **Average** | | | | | | |
| 08Q3-10Q2 | 2,612 | 2,600 | 11.9 | 9.10 | 5.91 | 2.0 |

*Source:* Simulations with the Economy.com model. Data measured in billions of 2000 dollars.

## 4.4 Extended UI Benefits

In December 2009, Emergency Unemployment Compensation or EUC beneficiaries exceeded 4.0 million persons per week (more than 80 percent of the number receiving regular UI benefits). By April 2010 EUC beneficiaries averaged 5.2 million and exceeded the 4.6 million recipients of regular UI.

In April 2010, the Federal-State Extended Benefits (EB) program was providing compensation in 38 states with weekly recipients averaging more than 0.2 million. This number was only about one-third the number of EB recipients in October 2009. Roughly half the states in 2009 enacted temporary triggers to activate EB based on the total unemployment rate (TUR) from the household labor force survey. These temporary triggers are slated to expire with the expiration of the stimulus package (American Recovery and Reinvestment Act) at which time the number of active EB programs in the states will likely decrease to fewer than 10.

Our simulations combine EUC and EB into a single extended benefits estimate. At the time the simulations were specified, quarterly data existed from 2008Q3 through 2009Q3. For each state-quarter observation, EUC plus EB weeks compensated was expressed as a proportion of regular UI weeks. Since weekly benefits for these programs are based on regular UI weekly benefits, we assumed the increase in payments due to extended benefits matches the proportional increase in weeks compensated from the two extended benefit programs.

Other important assumptions for the combined extended benefits program were that the proportions of weeks compensated for both EUC and EB in 2009Q3 were assumed to hold during 2009Q4. Then a phase-down period was assumed during the first half of 2010. The combined extended benefit proportion in each state during 2010Q1 was assumed to be two-thirds of its proportional size during 2009Q3, and one-third during 2010Q2. For the later quarters of 2010, the combined extended benefits proportion was assumed to be zero. While this ignores the 11 states with permanent TUR triggers and

associated payments, these 11 states are generally small with modest aggregate importance.[27] The simulations also do not include the further extensions of EUC and EB eligibility in 2009 and 2010 that were enacted between November 2009 and April 2010. By assuming a phase-down in early 2010, the simulated payouts of both EUC and EB understate actual payouts in 2010.

In examining the combined effects of EUC and EB, it should be noted that neither program has exhibited a truly automatic response to higher unemployment as has the regular UI program. Federal legislation in 2008, 2009, and 2010 created and then extended the EUC program and greatly expanded the scope of EB. In contrast, the increases in regular UI benefit payments have occurred automatically without any need for legislation. While we acknowledge this distinction, all three aspects of UI have been providing cash benefits to large numbers with unemployment. The simulations that include EUC and EB benefits assume these benefits have the same kinds of effects on household income and spending as regular UI benefits. For the two extended benefit programs, the added payouts are assumed to occur between 2008Q3 and 2010Q2.

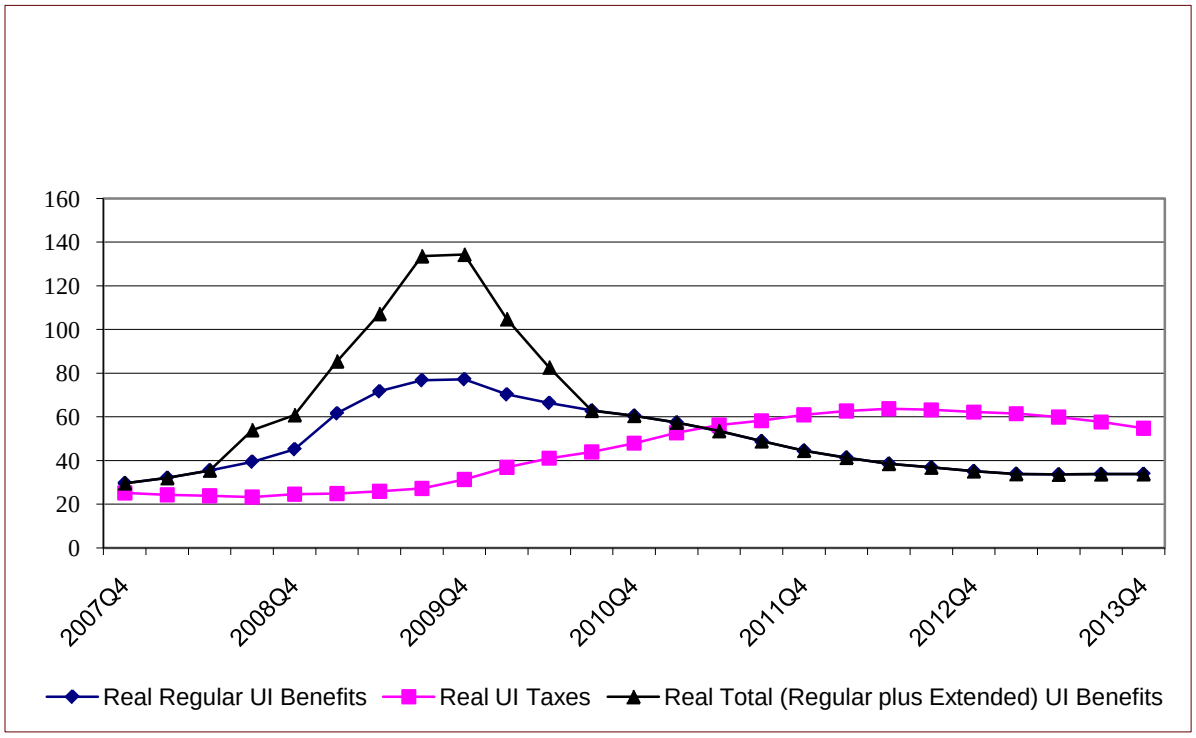
Extended benefits from EUC and EB combined are substantial. During the third and fourth quarters of 2009 they were assumed to add some 74 to 75 percent to regular UI benefit payments and some 49 to 50 percent during 2009Q2 and 2010Q1. Under the statutes operative before November 2009, these benefits were scheduled to phase-out during the first half of 2010.

Chart 4.5 adds combined extended benefits to the display shown previously in Chart 4.3. As in Chart 4.3, all variables are measured in billions of 2000 dollars. The chart vividly illustrates how responsive the combination of regular plus extended benefits was during 2009Q3 and 2009Q4 when their total approached $135 billion. The total increase in real benefits for these two periods vis-a-vis 2007Q3 exceeds $100 billion. Note that taxes in Chart 4.5 refer only to the state taxes that support regular UI benefits. In effect, the

[27] The eleven are Alaska, Connecticut, Kansas, New Hampshire, New Jersey, New Mexico, North Carolina, Oregon, Rhode Island, Vermont, and Washington. In 2008 they represented 13.6 percent of UI employment.

simulations assume EUC and EB benefits are funded as a part of the overall federal budget deficit.

**Chart 4.5. Real UI Benefits and Taxes, 2007Q4 to 2013Q4 ($billions)**




*Source:* Simulation results with the Economy.com model. Data in billions of 2000 dollars.

To estimate the effects of extended benefits, the time paths of two simulations are compared, one with just real regular UI benefits and one with total (regular plus extended) UI benefits.[28] Table 4.3 summarizes the findings with columns [1], [2] and [3] showing real GDP and column [4] showing real combined extended benefits. Finally column [5] again displays a multiplier, the response of real GDP to the payment of real extended benefits.

Four features of Table 4.3 are noteworthy. First, extended benefits have measurable effects on real GDP. The largest effects occur during 2009Q3 and 2009Q4, but the total increase in real GDP averages more than $55 billion between 2008Q3 and 2010Q2. Second, in the eight quarters when these benefits are paid (column [4]), they grow rapidly

[28] Both simulations included UI taxes that respond to changes in regular UI benefits.

and then decrease rapidly. Note that the decrease in 2010 is partly a result of assumptions about a phase-down made in late 2009 before the recent extensions of EUC and EB. Real benefits during 2010Q1, for example, totaled $65 billion (in 2000 dollars measured at annual rates) not $33.8 billion. Thus, real extended benefits are substantially understated during 2010Q1 and 2010Q2.

**Table 4.3. Real GDP and Real Extended Benefits, 2008Q1 to 2010Q2**

| | Real GDP, With Extended Benefits [1] | Real GDP, No Extended Benefits [2] | Real GDP, Effect of Extended Benefits = [1]-[2] [3] | Real Extended Benefits [4] | Real GDP Deviation/Real Ext. Benefits = [3]/[4] [5] |
|---|---|---|---|---|---|
| 2008Q1 | 11,454 | 11,454 | 0.0 | 0.0 | 0.0 |
| 2008Q2 | 11,558 | 11,558 | 0.0 | 0.0 | 0.0 |
| 2008Q3 | 11,577 | 11,555 | 21.8 | 14.5 | 1.5 |
| 2008Q4 | 11,442 | 11,416 | 26.4 | 15.7 | 1.7 |
| 2009Q1 | 11,325 | 11,287 | 38.8 | 23.7 | 1.6 |
| 2009Q2 | 11,277 | 11,222 | 54.9 | 35.1 | 1.6 |
| 2009Q3 | 11,368 | 11,287 | 81.7 | 56.3 | 1.5 |
| 2009Q4 | 11,381 | 11,291 | 90.1 | 56.3 | 1.6 |
| 2010Q1 | 11,424 | 11,346 | 77.9 | 33.8 | 2.3 |
| 2010Q2 | 11,484 | 11,418 | 66.2 | 15.7 | 4.2 |
| **Average** | | | | | |
| 08Q3-10Q2 | 11,410 | 11,353 | 57.2 | 31.4 | 2.0 |

*Source:* Simulation results with the Economy.com model. Data in billions of 2000 dollars.

Having a payment apparatus already in place (the administrative facilities of the state UI programs) permits a rapid build-up and rapid decrease in extended UI benefits. Third, the model suggests the multiplier for real extended benefits is somewhat smaller than for regular UI benefits, but the difference is modest. The average in Table 4.1 was estimated to be 2.0 and in Table 4.3 it is also 2.0. While the smallest "multiplier" in column [8] of Table 4.1 is 1.7, the smallest multiplier in column [5] of Table 4.3 is 1.5.

Extended benefits provide an important addition to total benefit payments in all states during the 2009Q2-2010Q1 period. Total simulated EUC plus EB payouts represented 61 percent of regular UI payments during these four quarters. For the 10 high-recipiency and

the 10 low-recipiency states the corresponding increases were 59 and 67 percent, respectively. Measurable additions to disposable income, especially during these four quarters, were present in all states.

To summarize, the payment of extended benefits has helped to sustain real GDP during the "great recession" and estimates from the model suggest a per-dollar effect on real GDP is about the same as the effect of regular UI benefits. The positive effect of extended benefits during 2008Q3-2010Q2 raised real GDP by an average $57 billion per quarter while regular program benefits raised real GDP by $71 billion over the same period. Regular and extended benefits both operated to cushion the falloff in real GDP.

## 4.5 The Effects of UI Taxes

The regular UI programs in the states are financed with employer payroll taxes. Over long periods these taxes roughly match regular UI benefit payments. Between 1990 and 2008 regular UI benefits and UI taxes averaged about 0.75 percent of the payroll of taxable employers. While UI benefits directly increase household disposable income, UI taxes add to costs for covered employers.[29] In the Economy.com model UI taxes add to the cost of doing business and reduce real output and employment.

The approach for estimating the effects of UI payroll taxes is to compare two simulated run streams. The first simulates real GDP and other macro variables when UI benefits and taxes respond to an increase in recession-related regular UI benefit payments. The second simulates variables when benefits respond to the recession but UI taxes remain constant in real terms. In the first of this pair of simulations, UI taxes respond with a lag as summarized previously in Charts 4.3 and 4.5, and described in Chapter 2. In the second, UI taxes only grow as the GDP deflator increases.

[29] The effect of UI payroll taxes on employer labor costs involves an issue of tax incidence. To the extent that employers can shift the burden backward onto money wages, the actual incidence (or tax burden) falls on covered employees. Regardless of the incidence of the tax, UI financing imposes costs and offsets some or all of the positive effects of UI benefit payments.

Table 4.4 summarizes details on real GDP and real UI taxes for the 4 years 2007 to 2010. Columns [1] and [2] respectively display model estimates of real GDP with real UI taxes responsive to the recession and real taxes constant. Column [3] shows the difference, an estimate of the effect on real GDP when UI taxes respond. Note in 2007 and 2008 the effect of UI taxes is positive indicating that real GDP was slightly higher when real taxes declined (rather than being held constant). Taxes decreased slightly in 2007 and 2008 in response to earlier financing developments. Recall that the tax rate functions in the model have current year taxes determined by a 4-year lag on benefits. Columns [4] and [5] next display two tax series, respectively taxes responsive to higher benefit payouts and constant real taxes and their difference in column [6]. Note the relatively long tail on the tax response. A measurable tax response is first observed in 2009Q4, and the effect on real GDP first exceeds $10 billion in 2010Q1. The aggregate time profile of the tax response was displayed previously in Charts 4.3 and 4.5. Note also in Table 4.4 that the average tax multiplier (-1.4 in column [7]) is smaller in absolute value than the average multipliers for regular UI (2.0) and extended benefits (2.0).

The long, 4-year lag on the tax response means that the short run effect of the UI program during a recession operates almost totally through increases in benefit payouts. Thus the offsetting contractionary effects of taxes typically occur after the economy has started to rebound. In the simulations summarized here, real UI taxes exceed $40 billion in all quarters from 2010Q2 through 2015Q1. They reach a peak in 2012Q2, nearly three full years after the peak in benefit payouts of 2009Q3 and 2009Q4.

**Table 4.4. The Effect of UI Taxes on Real GDP, 2007Q1 to 2010Q2**

| | Real GDP Reg Ben. & Taxes Respond [1] | Real GDP, Reg Ben. but Tax Constant | Real GDP Effect of Higher UI Taxes=[1]-[2][3] | Real UI Taxes Respond [4] | Real UI Taxes Constant [5] | Change in Real Regular UI Taxes=[4]-[5][6] | Real GDP Deviation/Real Tax Deviation=[3]/[6][7] |
|---|---|---|---|---|---|---|---|
| 2007Q1 | 11,424 | 11,424 | 0 | 25.8 | 25.8 | 0.0 | - |
| 2007Q2 | 11,370 | 11,370 | 0 | 26.0 | 26.0 | 0.0 | - |
| 2007Q3 | 11,434 | 11,434 | 0 | 26.2 | 26.2 | 0.0 | - |
| 2007Q4 | 11,432 | 11,432 | 0 | 25.1 | 26.0 | -0.84 | -0.5 |
| 2008Q1 | 11,454 | 11,453 | 1 | 24.3 | 26.0 | -1.68 | -0.5 |
| 2008Q2 | 11,558 | 11,557 | 1 | 23.8 | 26.2 | -2.32 | -0.6 |
| 2008Q3 | 11,555 | 11,553 | 2 | 23.2 | 26.0 | -2.77 | -0.6 |
| 2008Q4 | 11,416 | 11,414 | 2 | 24.6 | 25.8 | -1.22 | -1.3 |
| 2009Q1 | 11,287 | 11,285 | 2 | 24.9 | 25.7 | -0.80 | -2.1 |
| 2009Q2 | 11,222 | 11,222 | 0 | 25.9 | 25.9 | -0.01 | - |
| 2009Q3 | 11,287 | 11,289 | -3 | 27.2 | 26.1 | 1.10 | -2.5 |
| 2009Q4 | 11,291 | 11,300 | -9 | 31.3 | 26.2 | 5.10 | -1.8 |
| 2010Q1 | 11,346 | 11,361 | -15 | 36.9 | 26.4 | 10.49 | -1.4 |
| 2010Q2 | 11,418 | 11,434 | -15 | 41.0 | 26.6 | 14.46 | -1.1 |
| 2008Q3 - | | | | | | | |
| 2010Q2Av. | 11,353 | 11,357 | -5 | 29.4 | 26.1 | 3.29 | -1.4 |

*Source:* Simulations with the Economy.com model. Data in billions of 2000 dollars.

## 4.6 The Net Effect of the UI Program

The net effect of UI on real GDP and other macro variables is the sum of three components: The effect of regular UI benefits, the effect of extended benefits, and the effect of UI taxes. This chapter used the Economy.com model to explore each of these three components.

Table 4.5 summarizes the findings. Column [1] shows a projected time series of real GDP with constant benefits and taxes that extends to 2010Q2. Columns [2], [3] and [4] then show estimated effects of regular UI benefits, extended benefits (EUC plus EB) and UI taxes respectively. Note that the effects of the financing of EUC and EB are not considered in this analysis. Column [5] adds the three effects to yield a total estimated effect of UI. The bottom line in Table 4.5 shows averages during 2008Q3-2010Q2.

The UI tax and benefit provisions added to the Economy.com model respond to the recession as anticipated. Large increases in both regular UI benefits and extended benefits were simulated. Charts 4.3 and 4.5 show a strong lagged response of UI taxes following the "great recession". Maximum real tax revenue is achieved in 2012Q2, three years after the trough of the recession. The UI relationships included in the model accurately track the actual patterns of UI benefits and taxes.

The behavioral relations in the model are state-level relations. The state-level findings related to UI benefits and taxes are plausible and yielded one surprise. Recipiency rates in the regular UI program vary widely across states. Comparisons of the 10 with highest recipiency with the 10 with lowest recipiency showed that the former group had a recipiency rate more than twice that of the low recipiency group. The respective recipiency rate averages in 2007 were 0.47 and 0.19, more than a 2 to 1 ratio. The differences in recipiency rates did not translate into comparable differences in stabilizing effects. This high-low differential was closer to 1.5 to 1, whereas the recipiency rate differential was more than 2.0 to 1. The explanation appears to be the stronger negative feedback of lagged unemployment in the high-recipiency states. This finding should be pursued with additional analysis.

**Table 4.5. Net Effect of UI Program on Real GDP, 2007Q1 to 2010Q2**

| | Real GDP, UI Benefits & UI Taxes Constant [1] | Real GDP, Effect of Regular UI Benefits [2] | Real GDP, Effect of Extended UI Benefits [3] | Real GDP, Effect of UI Taxes [4] | Net Effect of UI Program = [2]+[3]+[4] [5] |
|---|---|---|---|---|---|
| 2007Q1 | 11,424 | 0 | 0 | 0 | 0 |
| 2007Q2 | 11,370 | 0 | 0 | 0 | 0 |
| 2007Q3 | 11,434 | 0 | 0 | 0 | 0 |
| 2007Q4 | 11,425 | 7 | 0 | 0 | 7 |
| 2008Q1 | 11,441 | 12 | 0 | 1 | 13 |
| 2008Q2 | 11,537 | 20 | 0 | 1 | 21 |
| 2008Q3 | 11,526 | 27 | 22 | 2 | 51 |
| 2008Q4 | 11,377 | 37 | 26 | 2 | 65 |
| 2009Q1 | 11,226 | 59 | 39 | 2 | 99 |
| 2009Q2 | 11,148 | 74 | 55 | 0 | 129 |
| 2009Q3 | 11,203 | 86 | 82 | -3 | 165 |
| 2009Q4 | 11,207 | 93 | 90 | -9 | 174 |
| 2010Q1 | 11,267 | 94 | 78 | -15 | 157 |
| 2010Q2 | 11,338 | 95 | 66 | -15 | 146 |
| 2008Q3 - | | | | | |
| 2010Q2 Avg. | 11,287 | 71 | 57 | -5 | 123 |

*Source:* Simulations with the Economy.com model. Data in billions of 2000 dollars.

Three features of Table 4.5 seem especially noteworthy. First, in this recession, extended UI benefits play an important role in stabilizing real GDP. Their effect on real GDP during 2008Q3-2010Q2 was $57 billion compared to an average of $71 billion for the regular UI benefits. Second, all three aspects of the UI program affect real GDP. Given the lags in the financing of regular UI benefits, however, the negative effects of UI taxes commence only in late 2009 and peak only in 2012. After the onset of a recession, regular UI financing does not immediately offset the positive effects of UI benefits. Third, the combined effects of regular UI and extended benefits are substantial. During 2008Q3 - 2010Q2 their combined stimulative effects average $123 billion or more than one percent of real GDP.[30]

[30] The estimates derived from the Economy.com model refer to the marginal effect of increased UI benefits. Recall that $28.1 billion of real regular UI benefits do not enter the estimates summarized in Table 4.5.

## 4.7 The Stabilizing Effect of Unemployment Insurance

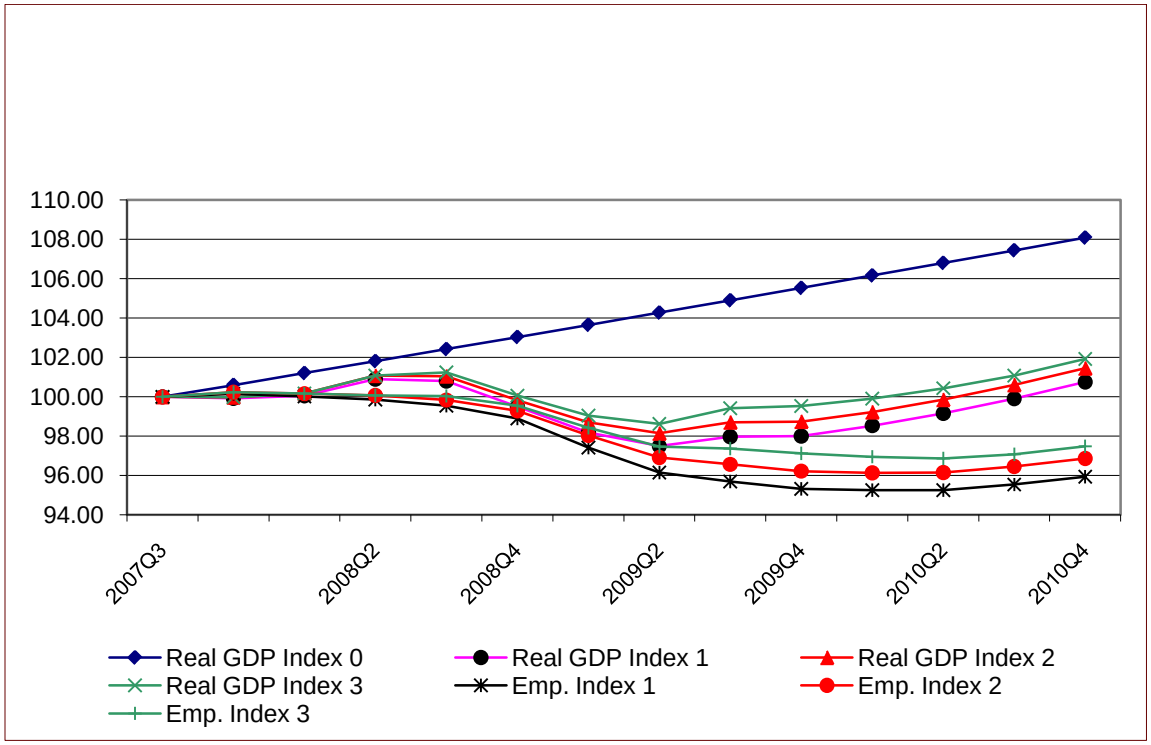
The simulations with the Economy.com model show a clear stabilizing effect of UI benefits. The following paragraphs address some basic questions about the program's performance as an automatic stabilizer. It presents two sets of estimates of the stabilizing effect of UI. Both can be used to describe the stabilizing effect. But, first there is a prior question of what indicator should be used to assess the program's stabilizing impact.

Previous research supported by the U.S. Department of Labor (Chimerine, et. al. (1999) and Dunson, et.al. (1991)) focused on employment as well as real GDP. A review of these two aggregates during the present downturn shows that they have not followed identical time paths. Chart 4.6 traces real GDP and total employment from 2007Q3 to 2010Q4. All series are indexed at 100.0 in 2007Q3. The no-recession projection (made at the Urban Institute) discussed earlier in Table 4.1 is shown as real GDP Index 0. The next three GDP series are respectively: Real GDP with real taxes and benefits held constant (Index 1), real GDP with regular benefits and UI taxes responding (Index 2), and real GDP with real regular benefits, extended benefits (EUC plus EB) and taxes responding (Index 3). Chart 4.6 also depicts three employment indices with the same references to UI, e.g., Index 3 has regular benefits, extended benefits and UI taxes all responding. Since the tax response is delayed into late 2009, the deviations of the Index 2 and Index 3 series from the Index 1 series is almost totally the effect of UI benefits.

Chart 4.6 provides a convenient summary of the scale of the recession in the deviation between the three cyclical GDP series and the steady growth series. Under steady growth of 0.6 percent per quarter, the real GDP Index 0 series reaches 108 by 2010Q4, or 6.0 full index points above the highest of the 3 cyclical real GDP series.[31]

[31] The analogues index for 2010Q4 is 111 under the more optimistic 2007Q4 Economy.com model.

**Chart 4.6. Alternative Indices of Real GDP and Employment, 2007Q3 to 2010Q4**




*Source:* Based data on simulations with the Economy.com model. All series equal 100.0 in 2007Q3.

A second obvious feature in Chart 4.6 is the sharp contrast in the time profiles of the three recessionary real GDP projections versus the three employment projections. Real GDP increases modestly after 2007Q3 and does not turn down until 2008Q4. All three real output series reach a trough in 2009Q2 and then start to recover. By 2010Q4, all three cyclical real GDP indices exceed 100. Real output has returned to its pre-recession level. In contrast, employment starts to decrease in late 2008 but does not reach its trough until the first and second quarters of 2010. The contrasting patterns of real output and employment probably are specific to the "great recession" of 2008-2009. Other recessions would likely have real output and employment patterns that are more closely parallel. Because real GDP and employment have quite different time profiles, measures of the stabilizing effect of UI could yield different results in an analysis that emphasizes both measures. This analysis focuses on the time path of real GDP.

A third feature of Chart 4.6 is the clear effects of UI on real output and employment. The regular UI program has a positive effect and extended benefits have a measurable additional effect.[32] How should these effects be described?

To measure the stabilizing effect of the UI program, at least two measures could be considered.

> **Measure 1.** Calculate the total deviation (shortfall) of actual GDP from steady growth GDP. Note in Chart 4.6 that such measures can be calculated for each calendar quarter after the onset of the recession as well as the average over a longer period, e.g., 2008Q3-2010Q2. The effects of UI estimated from such measures are proportions of the gap between steady growth path and no-UI-program path that is closed by UI.
>
> **Measure 2.** Calculate a peak-to-trough change in real GDP for two periods and calculate the effects of UI on real output for the same two periods. The effects on GDP due to UI will be some proportion of the change in real GDP between the two periods.

Panel A of Table 4.6 displays a series of estimated gap-closing proportions based on the results from Tables 4.1 and 4.5. The steady growth path is the same path that appears in column [1] of Table 4.1, steady growth of 0.6 percent per quarter. Panel A uses this steady growth series to estimate the downward deviation from potential when real UI benefits and taxes are held constant (column [4] in Table 4.1). The gap-closing proportions for the full UI program are shown in column [9]. These range between 0.094 and 0.273 (the quarter EUC started), and averaged 0.183 for the 2008Q3-2009Q2 period. Note that both regular UI benefits and extended benefits contribute important elements in closing the gap while UI taxes are unimportant.

[32] While the text of the report emphasizes the effects of the UI program on real GDP, simulated effects on employment can also be noted. In 2009Q2, the trough quarter, real regular UI benefits raised total employment by 1.050 million while extended benefits caused an additional employment increase of 0.748 million and UI taxes had a negligible effect (a reduction of 0.002 million). During the eight quarters from 2008Q3 to 2010Q2, the estimated average effects on employment were real regular UI benefits (+0.891 million), real extended benefits (+0.714 million), and real UI taxes (-0.015 million).

The peak-to-trough calculations in Panel B show larger proportional gap-closing effects of UI. This exercise obviously depends upon the choice of the peak and the trough. It was previously noted that all real GDP series reached their trough in 2009Q2. The peak selected was 2008Q2 because real GDP was higher than in the NBER-established peak of 2007Q4. In the Panel B comparison, the UI program is estimated to close 0.277 of the gap with regular benefits and extended benefits making equal contributions.

In general, a peak-to-trough comparison of the type displayed in Panel B would be expected to yield larger estimates of the gap-closing effects of the UI program. The reason for this is that the peak-to-trough calculation would presumably use actual GDP for two historic periods as peak and trough. This selection would omit the growth in potential GDP between the peak period and the trough period. The omitted growth factor would be larger as the time interval between the peak and the trough is longer. Note in Table 4.6 that the decline in real GDP (column [1]) is estimated at $391, while in Panel A the deviation from steady growth increased from $104 billion in 2008Q2 to $775 billion in 2009Q2, an increase of $671 billion. The understatement of the loss of real GDP ($391 billion in Panel B versus $671 billion) would generally lead to an overstatement of the proportional stabilization provided by the UI program.

Linking the preceding to earlier literature, two final comments can be offered. First, the concern expressed by Dunson, et al. about the declining importance of UI as a stabilizer does not extend to the "great recession" of 2008-2009. Early intervention with expansive EUC and EB caused these extended benefits to add a large element to the stabilization effect of UI. Second, as signaled by the real GDP and the employment projections of Chart 4.6, the labor market of 2010 continues to have very high unemployment. The annual TUR for 2010 may well exceed the 9.3 percent TUR of 2009. In this environment, there will be continuing pressures to provide extended benefits to exhaustees. It is likely that extended benefits will continue to rival in importance regular UI benefits as a stabilizing element of the UI program.

Extended benefit payments (EUC plus EB) in 2009 totaled $49 billion and represented 0.35 percent of GDP. Across the span of 53 separate years that extend back to 1958, there was an extended benefits program active in at least part of 28 separate years. For these 28 years the extended benefits-to-GDP percentage was highest in 2009. Extended benefit programs in 1975 and 1976 had next-highest percentages at 0.28 percent of real GDP in both years (recall Table 1.1). The EUC and EB programs have continued to receive extensions in 2010, and, at least through April 2010, have continued to serve more than 5 million claimants per week. Consequently, a large gap-filling effect of the UI program can be anticipated for 2010 with both regular UI and extended benefits being important.

## Table 4.6. Summary: Estimated Stabilizing Effect of Unemployment Insurance on Real GDP

| | Deviation from Steady Growth [1] | Effect on Real GDP of | | | | Proportion of Gap Closed by | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Regular UI Benefits [2] | Extended Benefits [3] | UI Taxes [4] | Total UI Program [2+3+4] [5] | Regular UI Benefits [2]/[1] [6] | Extended Benefits [3]/[1] [7] | UI Taxes [4]/[1] [8] | Total UI Program [5]/[1] [9] |
| **Panel A. Estimated Effects on Real GDP by Calendar Quarter** | | | | | | | | | |
| 2007Q4 | 78 | 6.92 | - | 0.42 | 7.34 | 0.089 | - | 0.005 | 0.094 |
| 2008Q1 | 131 | 12.44 | - | 0.91 | 13.35 | 0.095 | - | 0.007 | 0.102 |
| 2008Q2 | 104 | 19.53 | - | 1.34 | 20.87 | 0.187 | - | 0.013 | 0.200 |
| 2008Q3 | 185 | 27.19 | 21.82 | 1.66 | 50.67 | 0.147 | 0.118 | 0.009 | 0.273 |
| 2008Q4 | 404 | 36.74 | 26.40 | 1.54 | 64.68 | 0.091 | 0.065 | 0.004 | 0.160 |
| 2009Q1 | 626 | 58.56 | 38.80 | 1.69 | 99.05 | 0.094 | 0.062 | 0.003 | 0.158 |
| 2009Q2 | 775 | 74.29 | 54.89 | -0.01 | 129.17 | 0.096 | 0.071 | 0.000 | 0.167 |
| 2009Q3 | 792 | 86.15 | 81.68 | -2.70 | 165.13 | 0.109 | 0.103 | -0.003 | 0.209 |
| 2009Q4 | 860 | 93.46 | 90.11 | -9.23 | 174.34 | 0.109 | 0.105 | -0.011 | 0.203 |
| 2010Q1 | 873 | 93.86 | 77.90 | -14.56 | 157.20 | 0.108 | 0.089 | -0.017 | 0.180 |
| 2010Q2 | 874 | 95.36 | 66.21 | -15.44 | 146.13 | 0.109 | 0.076 | -0.018 | 0.167 |
| 2008Q3 - | | | | | | | | | |
| 2010Q2 Av. | 674 | 70.70 | 57.23 | -4.63 | 123.30 | 0.105 | 0.085 | -0.007 | 0.183 |
| **Panel B. Estimated Effects on Real GDP – Peak-to-Trough** | | | | | | | | | |
| Peak 08Q2 | 11,537 | 19.53 | - | 1.34 | 20.87 | | | | |
| Trough 09Q2 | 11,146 | 74.29 | 54.89 | -0.01 | 129.17 | | | | |
| Change | -391 | 54.76 | 54.89 | -1.35 | 108.3 | 0.140 | 0.140 | -0.003 | 0.277 |

*Source:* Based on simulations with the Economy.com model. Real GDP in billions of 2000 dollars.

## 4.8 Summary

This chapter has described the results of simulations with the Economy.com model. Several conclusions can be drawn from the analysis. First, state-level detail regarding regular UI benefits, extended benefits and UI taxes was successfully added to the Economy.com model. State as well as national estimates of UI benefits and taxes were developed and the resulting summary statistics were plausible. Benefits respond strongly to increased unemployment and UI taxes respond strongly (but with a long lag) to increases in regular UI benefit payouts. National summaries and summaries from 10 high-recipiency and 10 low-recipiency states showed that state-level UI variables were successfully added to the Economy.com forecasting model.

The simulations that explored the effects of the UI program on the macro economy yielded plausible results. The regular UI program provided measurable gap-filling stabilization to the economy during 2008-2010. Real regular UI benefits reduced the decline in real GDP during 2008Q3-2010Q2 by 0.105. Extended benefits had a slightly smaller effect with a gap-filling proportion of 0.085 for the same period. Due to lags in experience rating, the tax responses were considerably delayed. Chart 4.3 provided a good visual summary of the lagged tax response. Through the second quarter of 2010, the offsetting effects of UI taxes were small, but they will assume increasing importance in years after 2010.

The results of the simulations presented in this paper suggest the following:

1) The size of the stabilizing effect of UI during 2007-2010 was larger than found in previous research. This is partly due to the unusually large scale of extended benefits payouts in the “great recession”.
2) The feasibility of conducting analysis at the state level is supported by the findings. Somewhat surprisingly the stabilizing effects of UI in 10 low-recipiency states was estimated to be about 70 percent of the stabilizing

effects in 10 high-recipiency states. The surprising finding is that a relative stabilizing effect of 70 percent occurred even though the underlying recipiency rate in low-recipiency states was less than half of that in high-recipiency states, e.g., respective pre-recession recipiency rates of 0.19 versus 0.47. Stronger negative feedback from lagged unemployment is present in the high-recipiency states so that recipiency increases less and decreases faster as states go through the recession when compared to the low-recipiency states.

3) The per-dollar effects of UI taxes have been presumed to be smaller than the effects of UI benefits. The simulations of this project supported this presumption with the average tax multiplier estimated to be -1.4 compared to 2.0 for regular UI benefits, and 2.0 for extended benefits.

# CHAPTER 5.
# CONCLUSION

A primary objective of the state unemployment insurance (UI) program is to provide automatic or built-in stability to the macro economy. The present project has used the Economy.com model to examine the performance of UI as an automatic stabilizer. The analysis was conducted for individual states with national estimates derived by summing the results from 51 separate state economies and UI programs.

The analysis developed state-level detail to describe UI benefit payments and taxes. Benefit payments were estimated based on regression equations that described the recipiency rates and replacement rates for the regular UI program in each state. Taxes were estimated using state-level regression equations to explain average tax rates as a percent of total UI-covered payroll. Proportional adjustments were then applied to the average statewide tax rate to estimate tax rates for 19 detailed industries. Chapter 2 and Appendix A provided details of the state-level benefit and tax relationships.

These relationships were imbedded into the Economy.com model. Details of the model were given in Chapter 3 and Appendix B. The enhanced model was then used to simulate macroeconomic performance and the stabilizing role of the state UI program during the "great recession" of 2008-2009. Simulations were undertaken that yielded state and national detail. While the simulations extended to 2020Q4, primary attention focused on economic performance during 2007-2010. Chapter 4 summarized the results of the simulations.

The simulations yielded two sets of conclusions. First, the behavioral relations describing UI benefits and taxes yielded sensible findings about the response of benefits and taxes to the recession. National summaries showed a large response of regular UI benefits, extended benefits, and UI taxes. The tax response occurred with a long (4-year) lag with

effects that extended over several years following the cyclical peak in benefit payments of 2009-2010. In fact, maximum tax revenues occurred in 2012Q2.

Second, the state-level detail built into the simulation model allowed one to study the contrast in the response of benefit payments in high-recipiency states relative to low-recipiency states. Vivid contrasts in the scale of UI benefit payments relative to real GDP were documented in Chapters 2 and 4. Primarily due to differences in state-level recipiency rates, UI benefits constitute a much larger share of real GDP in some states than in others. The state-level contrasts extend over regions with high recipiency concentrated in New England and Middle Atlantic States (6 of the 10 with the highest recipiency rates) and low recipiency concentrated in states in the South and Rocky Mountains (8 of the 10 with the lowest recipiency rates). This analysis documented these contrasts and embedded them into the Economy.com model

The average multiplier effects of real UI variables on real GDP were plausible and higher for regular (2.0) and extended benefits (2.0) than for real UI taxes (-1.4). Given the long lags in the tax response, measurable negative effects of increased UI taxes will extend from 2010 into several later years.

The analysis of the stabilizing performance of the UI program yielded generally plausible results. The stabilizing effect of the regular UI program was estimated to close about one-tenth of the real GDP shortfall caused by the recession. Extended benefits also played an important stabilizing role. Because of lags that reflect experience rating, the response of UI taxes was delayed with little increase in UI taxes occurring in 2009 and 2010. For the three separate components of UI, the proportional gap-closing effects of the program during 2008Q3-2010Q2 were as follows: Increased regular UI benefits = 0.105, extended benefits = 0.085, and increased UI taxes = -0.007. On average, the UI program closed 0.183 of the gap in real GDP caused by the recession. For this particular recession, the UI program has provided stronger stabilization of real output than in many past recessions.

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# APPENDIX A.
# STATE-LEVEL REGRESSIONS

This appendix summarizes state-level regressions that examined important UI-related behavioral relationships. All three sets of regressions to be described here were fitted using annual time series data for individual states. Table A.1 displays regressions that explain the average UI tax rate (as a percent of total payroll of taxable employers) for the period 1960 to 2007. Table A.2 displays regressions to explain the recipiency rate in the regular UI program (the weekly number of regular UI beneficiaries (WB) as a ratio to total unemployment (TU) from BLS-LAUS data) for the years 1967 to 2007. Table A.3 displays regressions to explain the "Handbook" replacement rate (average weekly benefits divided by the average weekly wage of all covered employees) for the 1967-2007 period. In each table, the absolute value of the *t* ratio appears to the right of each coefficient.

**Table A.1. Regressions of UI Effective Tax Rates by State on Lagged Benefit Ratios, 1960 to 2007**

| State | Type of Exp. Rating-a | Const. | t Ratio | B Ratio Lag 1 | t Ratio | B Ratio Lag 2 | t Ratio | B Ratio Lag 3 | t Ratio | B Ratio Lag 4 | t Ratio | Adj. R2 | Std. Error | Durbin Watson | Mean Tax Rate% | Mean Ben. Ratio% | Sum Benefit Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALABAMA | BR-3 | -0.302 | 3.8 | 0.438 | 4.2 | 0.243 | 2.2 | 0.364 | 3.5 | 0.260 | 2.9 | 0.826 | 0.176 | 0.76 | 0.803 | 0.802 | 1.304 |
| ALASKA | PD | 0.570 | 2.0 | 0.210 | 1.4 | 0.144 | 0.7 | 0.155 | 0.8 | 0.282 | 2.0 | 0.418 | 0.384 | 0.33 | 2.194 | 1.943 | 0.789 |
| ARIZONA | RR | -0.024 | 0.5 | 0.103 | 1.9 | 0.349 | 5.5 | 0.241 | 3.8 | 0.293 | 5.5 | 0.840 | 0.104 | 0.74 | 0.620 | 0.621 | 0.987 |
| ARKANSAS | RR | 0.125 | 1.4 | 0.213 | 3.7 | 0.276 | 4.5 | 0.173 | 2.8 | 0.148 | 2.6 | 0.698 | 0.121 | 0.63 | 0.990 | 1.045 | 0.810 |
| CALIFORNIA | RR | -0.187 | 2.9 | 0.293 | 4.7 | 0.493 | 7.0 | 0.145 | 2.1 | 0.176 | 3.1 | 0.910 | 0.126 | 0.80 | 1.126 | 1.162 | 1.107 |
| COLORADO | RR | -0.020 | 0.3 | 0.327 | 3.1 | 0.406 | 3.1 | 0.192 | 1.5 | 0.042 | 0.4 | 0.722 | 0.136 | 0.93 | 0.566 | 0.592 | 0.966 |
| CONNECTICUT | BR-3 | 0.365 | 6.3 | 0.114 | 2.2 | 0.168 | 2.9 | 0.088 | 1.6 | 0.142 | 3.2 | 0.716 | 0.146 | 0.75 | 0.948 | 1.086 | 0.512 |
| DELAWARE | BWR | 0.187 | 1.5 | 0.147 | 1.1 | 0.236 | 1.5 | 0.188 | 1.2 | 0.172 | 1.4 | 0.401 | 0.249 | 0.27 | 0.859 | 0.877 | 0.743 |
| DIST OF COL | RR | 0.053 | 1.3 | 0.050 | 0.5 | 0.330 | 2.1 | 0.208 | 1.4 | 0.230 | 2.3 | 0.862 | 0.109 | 0.73 | 0.688 | 0.763 | 0.817 |
| FLORIDA | BR-3 | -0.149 | 2.7 | 0.452 | 5.4 | 0.314 | 3.1 | 0.406 | 4.0 | 0.120 | 1.5 | 0.818 | 0.118 | 0.36 | 0.547 | 0.526 | 1.291 |
| GEORGIA | RR | 0.242 | 6.5 | 0.088 | 1.8 | 0.206 | 3.8 | 0.171 | 3.2 | 0.134 | 2.9 | 0.860 | 0.087 | 0.46 | 0.580 | 0.579 | 0.598 |
| HAWAII | RR | -0.039 | 0.3 | 0.351 | 2.5 | 0.316 | 1.5 | 0.110 | 0.5 | 0.261 | 1.9 | 0.664 | 0.232 | 0.85 | 1.154 | 1.143 | 1.038 |
| IDAHO | RR | -0.190 | 1.4 | 0.300 | 2.6 | 0.291 | 2.1 | 0.208 | 1.5 | 0.296 | 2.6 | 0.695 | 0.231 | 0.43 | 1.222 | 1.242 | 1.094 |
| ILLINIOS | BR-3 | -0.039 | 0.6 | 0.144 | 1.9 | 0.385 | 4.4 | 0.255 | 3.0 | 0.182 | 2.7 | 0.847 | 0.157 | 0.56 | 0.930 | 0.987 | 0.966 |
| INDIANA | RR | 0.175 | 4.1 | 0.221 | 3.7 | 0.204 | 3.6 | 0.178 | 3.2 | 0.046 | 0.9 | 0.694 | 0.112 | 0.59 | 0.576 | 0.606 | 0.649 |
| IOWA | BR-3 | -0.227 | 3.4 | 0.393 | 4.3 | 0.281 | 2.5 | 0.241 | 0.3 | 0.300 | 3.3 | 0.860 | 0.172 | 0.56 | 0.815 | 0.870 | 1.215 |
| KANSAS | RR | 0.298 | 3.4 | 0.198 | 2.3 | 0.161 | 1.7 | 0.224 | 2.3 | 0.055 | 0.7 | 0.748 | 0.147 | 0.46 | 0.765 | 0.791 | 0.638 |
| KENTUCKY | RR | 0.178 | 3.0 | 0.284 | 4.6 | 0.236 | 3.8 | 0.139 | 2.2 | 0.095 | 1.8 | 0.826 | 0.140 | 0.47 | 0.982 | 1.019 | 0.754 |
| LOUISIANA | RR | 0.172 | 2.6 | 0.221 | 2.8 | 0.193 | 1.8 | 0.094 | 0.9 | 0.167 | 2.0 | 0.742 | 0.194 | 0.83 | 0.856 | 0.983 | 0.675 |
| MAINE | RR | 0.255 | 2.5 | 0.242 | 2.8 | 0.164 | 1.8 | 0.156 | 1.8 | 0.178 | 2.4 | 0.667 | 0.203 | 0.61 | 1.192 | 1.207 | 0.741 |
| MARYLAND | BR-3 | -0.277 | 3.0 | 0.133 | 1.1 | 0.490 | 3.8 | 0.394 | 3.2 | 0.249 | 2.6 | 0.815 | 0.209 | 0.71 | 0.872 | 0.844 | 1.267 |
| MASSACHUSETTS | RR | 0.139 | 1.6 | 0.188 | 2.7 | 0.274 | 3.2 | 0.118 | 1.4 | 0.265 | 4.1 | 0.790 | 0.156 | 0.74 | 1.231 | 1.265 | 0.845 |
| MICHIGAN | BR-RR | 0.331 | 4.1 | 0.066 | 1.3 | 0.201 | 4.2 | 0.200 | 4.3 | 0.232 | 5.4 | 0.772 | 0.187 | 0.92 | 1.244 | 1.254 | 0.699 |
| MINNESOTA | BR-4 | 0.215 | 2.6 | 0.082 | 0.9 | 0.217 | 2.2 | 0.179 | 1.9 | 0.210 | 2.6 | 0.592 | 0.152 | 0.32 | 0.860 | 0.911 | 0.689 |
| MISSISSIPPI | BR-3 | 0.045 | 0.5 | 0.199 | 1.5 | 0.391 | 2.5 | 0.383 | 2.5 | -0.062 | 0.5 | 0.631 | 0.242 | 0.44 | 0.815 | 0.802 | 0.912 |
| MISSOURI | RR | -0.155 | 2.6 | 0.266 | 4.2 | 0.270 | 3.9 | 0.328 | 4.8 | 0.235 | 3.9 | 0.824 | 0.097 | 1.46 | 0.686 | 0.759 | 1.098 |
| MONTANA | RR | 0.499 | 4.8 | 0.368 | 2.3 | -0.016 | 0.1 | 0.258 | 1.6 | -0.131 | 1.2 | 0.467 | 0.227 | 0.38 | 1.060 | 1.118 | 0.479 |
| NEBRASKA | RR | 0.006 | 0.2 | 0.585 | 8.4 | 0.153 | 1.8 | 0.132 | 1.6 | 0.057 | 0.8 | 0.833 | 0.084 | 1.23 | 0.552 | 0.578 | 0.927 |
| NEVADA | RR | 0.018 | 0.2 | 0.259 | 2.4 | 0.219 | 1.9 | 0.229 | 2.1 | 0.260 | 2.9 | 0.706 | 0.205 | 0.80 | 1.146 | 1.101 | 0.967 |
| NEW HAMPSHIRE | RR | 0.018 | 0.5 | 0.336 | 6.9 | 0.162 | 3.0 | 0.207 | 3.9 | 0.174 | 3.9 | 0.872 | 0.112 | 0.74 | 0.584 | 0.602 | 0.879 |
| NEW JERSEY | RR | 0.241 | 2.1 | 0.182 | 1.8 | 0.111 | 0.9 | 0.154 | 1.3 | 0.295 | 3.2 | 0.652 | 0.199 | 0.82 | 1.307 | 1.390 | 0.742 |
| NEW MEXICO | RR | 0.260 | 2.7 | 0.174 | 1.6 | 0.200 | 1.5 | 0.085 | 0.6 | 0.169 | 1.6 | 0.378 | 0.150 | 0.25 | 0.792 | 0.841 | 0.628 |
| NEW YORK | RR | -0.095 | 1.4 | 0.277 | 3.6 | 0.242 | 2.8 | 0.224 | 2.8 | 0.257 | 4.0 | 0.869 | 0.121 | 0.85 | 1.010 | 1.054 | 0.999 |

**Table A.1. Regressions of UI Effective Tax Rates by State on Lagged Benefit Ratios, 1960 to 2007 (cont)**

| State | Type of Exp. Rating-a | Const. | t Ratio | B Ratio Lag 1 | t Ratio | B Ratio Lag 2 | t Ratio | B Ratio Lag 3 | t Ratio | B Ratio Lag 4 | t Ratio | | Adj. R2 | Std. Error | Durbin Watson | Mean Tax Rate% | Mean Ben. Ratio% | Sum Benefit Coeff. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NORTH CAROLINA | RR | 0.034 | 0.5 | 0.125 | 1.9 | 0.264 | 3.9 | 0.264 | 3.9 | 0.229 | 3.8 | | 0.748 | 0.149 | 0.61 | 0.701 | 0.715 | 0.883 |
| NORTH DAKOTA | RR | 0.050 | 0.6 | 0.679 | 5.7 | 0.114 | 0.7 | 0.133 | 0.8 | 0.030 | 0.2 | | 0.839 | 0.173 | 0.91 | 1.163 | 1.138 | 0.956 |
| OHIO | RR | 0.171 | 3.2 | 0.059 | 1.1 | 0.206 | 4.0 | 0.187 | 3.7 | 0.253 | 5.6 | | 0.810 | 0.147 | 0.88 | 0.842 | 0.913 | 0.705 |
| OKLAHOMA | BWR | -0.117 | 2.0 | 0.384 | 4.6 | 0.371 | 3.9 | 0.345 | 3.6 | 0.034 | 0.4 | | 0.822 | 0.123 | 0.62 | 0.645 | 0.644 | 1.134 |
| OREGON | BR-3 | 0.189 | 1.0 | 0.239 | 2.1 | 0.258 | 1.9 | 0.150 | 1.1 | 0.245 | 2.3 | | 0.476 | 0.299 | 0.50 | 1.450 | 1.367 | 0.893 |
| PENNSYLVANIA | BR-RR | 0.343 | 3.8 | 0.019 | 0.3 | 0.246 | 3.2 | 0.208 | 2.9 | 0.231 | 3.8 | | 0.782 | 0.194 | 0.80 | 1.403 | 1.444 | 0.704 |
| RHODE ISLAND | RR | 0.558 | 3.1 | 0.132 | 1.4 | 0.205 | 2.0 | 0.081 | 0.8 | 0.216 | 2.4 | | 0.443 | 0.297 | 0.52 | 1.683 | 1.737 | 0.634 |
| SOUTH CAROLINA | RR | 0.281 | 4.2 | 0.157 | 2.9 | 0.126 | 2.2 | 0.139 | 2.4 | 0.164 | 3.0 | | 0.509 | 0.139 | 0.50 | 0.741 | 0.767 | 0.586 |
| SOUTH DAKOTA | RR | -0.083 | 1.8 | 0.397 | 3.6 | 0.234 | 1.6 | 0.162 | 1.1 | 0.214 | 1.9 | | 0.773 | 0.108 | 0.67 | 0.445 | 0.509 | 1.007 |
| TENNESSEE | RR | 0.145 | 2.1 | 0.206 | 2.5 | 0.184 | 2.2 | 0.238 | 2.9 | 0.135 | 1.9 | | 0.665 | 0.158 | 0.45 | 0.780 | 0.781 | 0.763 |
| TEXAS | BR-3 | -0.083 | 1.4 | 0.535 | 4.3 | 0.419 | 2.9 | 0.212 | 1.5 | -0.097 | 0.8 | | 0.732 | 0.133 | 1.44 | 0.482 | 0.513 | 1.069 |
| UTAH | BR-4 | -0.127 | 1.9 | 0.243 | 2.8 | 0.420 | 4.0 | 0.269 | 2.6 | 0.173 | 2.1 | | 0.844 | 0.137 | 0.67 | 0.841 | 0.840 | 1.105 |
| VERMONT | BR-3 | 0.271 | 1.6 | -0.170 | 1.4 | 0.238 | 1.7 | 0.252 | 1.8 | 0.369 | 3.3 | | 0.497 | 0.300 | 0.38 | 1.162 | 1.273 | 0.689 |
| VIRGINIA | BR-4 | -0.144 | 2.6 | 0.419 | 3.9 | 0.398 | 3.4 | 0.265 | 2.3 | 0.238 | 2.4 | | 0.747 | 0.136 | 0.60 | 0.442 | 0.425 | 1.321 |
| WASHINGTON | BR-4 | 0.689 | 3.9 | 0.035 | 0.4 | 0.221 | 1.8 | 0.068 | 0.5 | 0.195 | 2.0 | | 0.323 | 0.269 | 0.31 | 1.485 | 1.481 | 0.519 |
| WEST VIRGINIA | RR | 0.208 | 2.9 | 0.294 | 3.8 | 0.253 | 3.0 | 0.080 | 1.0 | 0.115 | 1.8 | | 0.808 | 0.195 | 1.30 | 1.124 | 1.195 | 0.743 |
| WISCONSIN | RR | -0.022 | 0.2 | -0.002 | 0.0 | 0.271 | 2.6 | 0.237 | 2.3 | 0.438 | 5.0 | | 0.697 | 0.238 | 0.58 | 1.039 | 1.117 | 0.943 |
| WYOMING | BR-3 | 0.196 | 2.8 | 0.354 | 4.2 | 0.117 | 1.0 | 0.332 | 3.0 | -0.018 | 0.2 | | 0.764 | 0.220 | 0.45 | 0.940 | 0.913 | 0.785 |

*Source:* Regressions based on data in columns (15) and (16) of the "UI Financial Handbook," (1995) and subsequent Handbook updates. Absolute value of t ratios appear to the right of each coefficient. Regressions for Georgia and Kansas also included dummy variables for periods of UI tax holidays. a - RR - Reserve Ratio, BR - Benefit Ratio (and years of benefits), BWR - Benefit Wage Ratio , PD - Payroll Decline.

| Table A.2. UI Recipiency Rates, Time Series Regression Results for Individual States, 1967 to 2007 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| State | Constant | t Ratio | TUR | t Ratio | TUR Lag | t Ratio | Dummy 1981 | t Ratio | Dummy 1996 | t Ratio | | Adj. R2 | Std. Error | Durbin Watson | Mean Recip. Rate |
| ALABAMA | 0.273 | 11.9 | 0.980 | 1.8 | -0.680 | 1.2 | -0.060 | 3.4 | 0.074 | 3.6 | | 0.372 | 0.037 | 1.36 | 0.273 |
| ALASKA | 0.953 | 5.0 | -0.482 | 0.2 | -3.397 | 1.5 | -0.042 | 0.8 | -0.080 | 1.2 | | 0.015 | 0.144 | 0.39 | 0.571 |
| ARIZONA | 0.225 | 7.8 | 1.684 | 3.3 | -1.884 | 3.7 | -0.008 | 0.5 | -0.007 | 0.4 | | 0.252 | 0.039 | 1.52 | 0.206 |
| ARKANSAS | 0.283 | 6.2 | 1.984 | 2.5 | -2.321 | 2.7 | 0.021 | 1.1 | 0.060 | 2.4 | | 0.447 | 0.043 | 0.82 | 0.293 |
| CALIFORNIA | 0.453 | 22.2 | 0.935 | 2.7 | -2.132 | 6.3 | -0.003 | 0.4 | -0.011 | 1.2 | | 0.514 | 0.021 | 1.14 | 0.364 |
| COLORADO | 0.098 | 5.4 | 1.484 | 3.4 | -0.405 | 0.9 | 0.043 | 4.0 | 0.004 | 0.3 | | 0.567 | 0.024 | 1.17 | 0.181 |
| CONNECTICUT | 0.602 | 11.4 | 2.180 | 1.9 | -4.203 | 3.8 | -0.089 | 2.9 | 0.111 | 3.5 | | 0.437 | 0.080 | 0.83 | 0.473 |
| DELAWARE | 0.396 | 9.9 | 1.232 | 1.2 | -1.761 | 1.8 | 0.001 | 0.0 | 0.114 | 4.7 | | 0.487 | 0.057 | 1.73 | 0.403 |
| DIST OF COL | 0.348 | 8.0 | 1.856 | 1.7 | -1.274 | 1.2 | -0.011 | 0.4 | -0.036 | 1.4 | | 0.076 | 0.066 | 1.33 | 0.371 |
| FLORIDA | 0.105 | 6.6 | 1.903 | 5.5 | -1.020 | 3.1 | -0.009 | 1.0 | 0.074 | 7.4 | | 0.656 | 0.022 | 1.11 | 0.173 |
| GEORGIA | 0.131 | 3.7 | 4.610 | 5.1 | -2.992 | 3.3 | 0.015 | 0.8 | 0.005 | 0.3 | | 0.378 | 0.045 | 1.70 | 0.228 |
| HAWAII | 0.376 | 12.4 | 3.332 | 3.6 | -3.488 | 3.9 | 0.031 | 1.7 | -0.035 | 2.1 | | 0.326 | 0.043 | 1.29 | 0.377 |
| IDAHO | 0.298 | 6.3 | 1.958 | 1.7 | -2.285 | 1.8 | 0.055 | 2.7 | 0.047 | 1.9 | | 0.414 | 0.046 | 0.90 | 0.328 |
| ILLINIOS | 0.313 | 12.4 | 2.640 | 4.2 | -1.609 | 2.3 | -0.100 | 4.6 | 0.089 | 4.4 | | 0.544 | 0.040 | 1.26 | 0.337 |
| INDIANA | 0.226 | 14.0 | 2.264 | 5.3 | -1.870 | 4.2 | -0.051 | 3.9 | 0.101 | 7.1 | | 0.704 | 0.031 | 1.26 | 0.245 |
| IOWA | 0.339 | 16.3 | 3.118 | 3.0 | -3.367 | 3.0 | -0.037 | 1.7 | 0.082 | 4.0 | | 0.498 | 0.042 | 1.45 | 0.329 |
| KANSAS | 0.273 | 9.3 | 5.327 | 6.1 | -4.217 | 4.7 | -0.004 | 0.2 | -0.051 | 3.7 | | 0.587 | 0.034 | 1.28 | 0.305 |
| KENTUCKY | 0.282 | 7.8 | 2.119 | 2.7 | -1.865 | 2.2 | -0.050 | 1.8 | 0.039 | 1.5 | | 0.236 | 0.048 | 0.97 | 0.277 |
| LOUISIANA | 0.167 | 4.9 | 2.810 | 4.0 | -1.402 | 2.0 | -0.055 | 3.0 | 0.026 | 1.1 | | 0.388 | 0.039 | 1.25 | 0.241 |
| MAINE | 0.469 | 14.6 | 1.477 | 1.9 | -2.442 | 3.3 | -0.045 | 2.7 | -0.041 | 2.2 | | 0.434 | 0.044 | 1.15 | 0.374 |
| MARYLAND | 0.320 | 14.0 | 2.563 | 3.6 | -3.128 | 4.4 | -0.015 | 1.2 | -0.012 | 0.9 | | 0.379 | 0.031 | 1.12 | 0.279 |
| MASSACHUSETTS | 0.720 | 29.4 | 0.471 | 0.9 | -4.412 | 8.4 | -0.073 | 4.9 | 0.037 | 2.2 | | 0.822 | 0.040 | 1.01 | 0.465 |
| MICHIGAN | 0.387 | 24.6 | 2.069 | 7.2 | -2.757 | 9.1 | -0.037 | 3.1 | 0.067 | 5.0 | | 0.832 | 0.028 | 2.08 | 0.333 |
| MINNESOTA | 0.328 | 12.4 | 2.071 | 2.6 | -1.594 | 1.9 | -0.035 | 2.2 | 0.045 | 2.5 | | 0.240 | 0.037 | 1.46 | 0.341 |
| MISSISSIPPI | 0.182 | 7.9 | 2.214 | 4.3 | -1.990 | 3.7 | -0.003 | 0.1 | 0.031 | 1.8 | | 0.338 | 0.034 | 1.44 | 0.206 |
| MISSOURI | 0.428 | 16.5 | 1.806 | 2.6 | -3.321 | 4.5 | -0.049 | 2.6 | -0.004 | 0.2 | | 0.604 | 0.039 | 2.04 | 0.316 |
| MONTANA | 0.330 | 6.7 | -1.180 | 0.9 | -0.651 | 0.5 | -0.015 | 0.8 | 0.036 | 1.4 | | 0.102 | 0.046 | 0.45 | 0.300 |
| NEBRASKA | 0.253 | 11.7 | 1.396 | 1.6 | -0.042 | 0.0 | -0.020 | 1.5 | 0.000 | 0.1 | | 0.082 | 0.035 | 1.23 | 0.285 |
| NEVADA | 0.397 | 11.3 | 2.380 | 3.7 | -2.112 | 3.2 | -0.101 | 7.1 | 0.060 | 3.3 | | 0.611 | 0.038 | 1.18 | 0.364 |
| NEW HAMPSHIRE | 0.315 | 9.4 | 4.133 | 3.6 | -3.648 | 3.2 | -0.128 | 4.7 | -0.005 | 0.2 | | 0.540 | 0.068 | 1.85 | 0.251 |
| NEW JERSEY | 0.707 | 27.8 | 0.025 | 0.0 | -2.909 | 4.9 | -0.110 | 7.7 | 0.040 | 2.5 | | 0.769 | 0.038 | 1.09 | 0.476 |
| NEW MEXICO | 0.296 | 7.9 | 1.012 | 1.3 | -2.145 | 2.6 | -0.010 | 0.7 | -0.005 | 0.3 | | 0.198 | 0.035 | 1.12 | 0.211 |
| NEW YORK | 0.641 | 31.3 | 0.281 | 0.6 | -3.142 | 6.6 | -0.074 | 6.9 | -0.060 | 5.2 | | 0.852 | 0.029 | 1.53 | 0.395 |

**Table A.2. UI Recipiency Rates, Time Series Regression Results for Individual States, 1967 to 2007 (cont)**

| State | Constant | t Ratio | TUR | t Ratio | TUR Lag | t Ratio | Dummy 1981 | t Ratio | Dummy 1996 | t Ratio | Adj. R2 | Std. Error | Durbin Watson | Mean Recip. Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NORTH CAROLINA | 0.194 | 8.1 | 3.435 | 6.4 | -2.120 | 3.9 | -0.015 | 1.1 | 0.056 | 3.7 | 0.550 | 0.037 | 1.18 | 0.268 |
| NORTH DAKOTA | 0.112 | 1.5 | 2.570 | 1.3 | 2.093 | 1.0 | -0.025 | 1.0 | 0.062 | 1.7 | 0.084 | 0.057 | 0.45 | 0.305 |
| OHIO | 0.222 | 10.7 | 2.931 | 6.4 | -2.488 | 5.2 | -0.001 | 0.1 | 0.022 | 1.3 | 0.497 | 0.035 | 1.00 | 0.258 |
| OKLAHOMA | 0.256 | 7.4 | 1.710 | 2.2 | -1.872 | 2.4 | -0.058 | 2.7 | 0.008 | 0.3 | 0.320 | 0.044 | 1.24 | 0.212 |
| OREGON | 0.433 | 15.0 | 1.457 | 2.4 | -2.875 | 4.7 | 0.051 | 3.3 | 0.000 | 0.0 | 0.465 | 0.040 | 1.13 | 0.369 |
| PENNSYLVANIA | 0.416 | 16.2 | 3.191 | 4.8 | -2.686 | 4.0 | -0.058 | 3.4 | 0.107 | 5.8 | 0.591 | 0.040 | 0.75 | 0.441 |
| RHODE ISLAND | 0.792 | 24.6 | -1.784 | 2.8 | -1.672 | 2.7 | -0.086 | 4.3 | -0.076 | 3.5 | 0.689 | 0.054 | 1.46 | 0.512 |
| SOUTH CAROLINA | 0.192 | 5.4 | 3.489 | 4.7 | -2.574 | 3.4 | -0.008 | 0.4 | 0.034 | 1.7 | 0.341 | 0.049 | 1.55 | 0.251 |
| SOUTH DAKOTA | 0.115 | 4.7 | 2.760 | 2.8 | 0.323 | 0.3 | -0.101 | 7.4 | 0.040 | 3.1 | 0.654 | 0.025 | 0.96 | 0.169 |
| TENNESSEE | 0.351 | 13.9 | 2.598 | 3.9 | -3.333 | 4.9 | -0.038 | 1.9 | 0.028 | 1.4 | 0.497 | 0.042 | 1.23 | 0.292 |
| TEXAS | 0.081 | 3.9 | 2.803 | 5.8 | -1.429 | 3.0 | 0.003 | 0.2 | 0.044 | 4.1 | 0.661 | 0.021 | 1.41 | 0.174 |
| UTAH | 0.211 | 6.2 | 1.888 | 2.5 | -0.595 | 0.7 | -0.049 | 3.2 | -0.002 | 0.0 | 0.407 | 0.040 | 0.75 | 0.245 |
| VERMONT | 0.438 | 18.5 | 1.476 | 2.4 | -1.860 | 3.2 | 0.006 | 0.4 | 0.052 | 3.6 | 0.450 | 0.034 | 1.68 | 0.439 |
| VIRGINIA | 0.052 | 2.0 | 4.459 | 5.4 | -2.118 | 2.6 | 0.000 | 0.0 | 0.089 | 5.3 | 0.572 | 0.034 | 1.25 | 0.180 |
| WASHINGTON | 0.437 | 9.0 | 1.959 | 2.2 | -2.856 | 3.3 | 0.009 | 0.4 | 0.003 | 0.1 | 0.170 | 0.060 | 0.58 | 0.381 |
| WEST VIRGINIA | 0.289 | 7.1 | 2.003 | 2.9 | -1.946 | 2.7 | -0.054 | 1.8 | 0.061 | 1.7 | 0.279 | 0.053 | 0.40 | 0.274 |
| WISCONSIN | 0.404 | 16.8 | 1.963 | 2.8 | -2.866 | 3.9 | 0.030 | 1.7 | 0.102 | 5.4 | 0.701 | 0.041 | 1.17 | 0.410 |
| WYOMING | 0.222 | 6.0 | 3.798 | 3.6 | -4.515 | 4.4 | 0.103 | 3.7 | -0.028 | 1.1 | 0.508 | 0.050 | 1.05 | 0.246 |

*Source:* Data on recipiency rates (WBTU) and unemployment rates (TURs) from OWS and BLS . Dummy variables equal 1.0 for the period 1981 to 2007 (Dummy 1981) and 1.0 for the period 1996 to 2007 (Dummy 1996), zero otherwise. Absolute values of t ratios appear to the right of each coefficient.

**Table A.3. Replacement Rate Regressions, 1967 to 2007**

| State | Constant | t Ratio | MaxBen/ AWW | t Ratio | TUR | t Ratio | TUR Lag | t Ratio | RRate Stat. | t Ratio | 2 High Quarter Dummy | t Ratio | Annual Wage Dummy | t Ratio | Adj. R2 | Std. Error | Durbin Watson | Mean Repl. Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALABAMA | 0.132 | 9.7 | 0.485 | 16.5 | 0.274 | 2.7 | -0.277 | 2.9 | | | -0.015 | 5.5 | | | 0.930 | 0.007 | 1.24 | 0.307 |
| ALASKA | 0.103 | 6.8 | 0.428 | 16.5 | 0.226 | 2 | | | | | | | | | 0.884 | 0.011 | 1.10 | 0.254 |
| ARIZONA | 0.026 | 1 | 0.724 | 9 | 0.734 | 3.6 | -0.292 | 1.4 | | | | | | | 0.772 | 0.016 | 0.50 | 0.312 |
| ARKANSAS | 0.240 | 12.2 | 0.294 | 11.1 | 0.127 | 0.7 | -0.367 | 1.8 | | | -0.017 | 3 | | | 0.796 | 0.010 | 1.91 | 0.389 |
| CALIFORNIA | -0.068 | 1.5 | 0.381 | 3.3 | 0.499 | 1.47 | -0.109 | 0.3 | 0.407 | 2.9 | | | | | 0.721 | 0.022 | 0.19 | 0.292 |
| COLORADO | 0.194 | 5.5 | 0.460 | 6.1 | 0.281 | 1.3 | -0.518 | 2.5 | | | -0.029 | 7.5 | | | 0.781 | 0.012 | 1.25 | 0.403 |
| CONNECTICUT | 0.146 | 5.4 | 0.525 | 7.7 | 0.049 | 0.3 | -0.449 | 2.7 | | | -0.072 | 15.2 | | | 0.910 | 0.012 | 0.75 | 0.345 |
| DELAWARE | 0.099 | 2.6 | 0.522 | 5.9 | 1.096 | 2.5 | -0.977 | 2.1 | | | | | | | 0.483 | 0.025 | 0.97 | 0.337 |
| DIST OF COL | -0.032 | 0.5 | 0.469 | 11.7 | 0.093 | 0.3 | -0.581 | 2.3 | 0.341 | 2.5 | | | | | 0.940 | 0.016 | 1.02 | 0.337 |
| FLORIDA | 0.170 | 9.9 | 0.406 | 9.98 | 0.867 | 3.3 | -0.776 | 3 | | | | | -0.019 | 2.8 | 0.771 | 0.016 | 1.89 | 0.344 |
| GEORGIA | 0.120 | 5.4 | 0.535 | 9.6 | 0.458 | 2.5 | -0.448 | 2.5 | | | | | | | 0.703 | 0.009 | 0.88 | 0.332 |
| HAWAII | -0.129 | 2.3 | 0.939 | 11.1 | 0.469 | 1.2 | -0.467 | 1.2 | | | | | | | 0.760 | 0.018 | 1.17 | 0.467 |
| IDAHO | 0.290 | 14.5 | 0.208 | 5.7 | 0.707 | 3.8 | -0.605 | 3 | | | | | | | 0.471 | 0.008 | 1.08 | 0.407 |
| ILLINIOS | -0.452 | 4.2 | 0.407 | 8.7 | 0.970 | 5.3 | -0.450 | 2.3 | 1.246 | 6.3 | | | | | 0.845 | 0.011 | 0.94 | 0.356 |
| INDIANA | 0.131 | 14.9 | 0.508 | 29.9 | 0.521 | 3.8 | -0.200 | 1.5 | | | | | | | 0.961 | 0.010 | 0.65 | 0.321 |
| IOWA | 0.101 | 4.9 | 0.641 | 15.1 | 1.216 | 6 | -0.738 | 3.7 | | | | | | | 0.892 | 0.008 | 1.10 | 0.438 |
| KANSAS | 0.149 | 7.4 | 0.502 | 11.1 | 1.147 | 5 | -0.900 | 3.7 | | | | | | | 0.847 | 0.009 | 1.12 | 0.424 |
| KENTUCKY | -0.003 | 0.1 | 0.531 | 9.8 | 0.617 | 4.5 | -0.462 | 2.9 | 0.238 | 3.3 | | | -0.057 | 9.3 | 0.909 | 0.009 | 1.57 | 0.368 |
| LOUISIANA | -0.269 | 4.1 | 0.629 | 11.3 | 0.394 | 1.3 | -0.874 | 3.3 | 0.727 | 5.7 | | | -0.043 | 5.8 | 0.874 | 0.019 | 0.68 | 0.348 |
| MAINE | -0.044 | 0.7 | 0.365 | 3.3 | 0.125 | 1 | | | 0.440 | 4.2 | -0.012 | 2.1 | | | 0.554 | 0.010 | 0.52 | 0.389 |
| MARYLAND | 0.097 | 5.1 | 0.569 | 13.3 | 1.078 | 4.7 | -0.856 | 3.7 | | | | | | | 0.838 | 0.010 | 0.99 | 0.356 |
| MASSACHUSETTS | 0.286 | 7.5 | 0.174 | 2.3 | 0.572 | 3 | -0.473 | 2.5 | | | | | | | 0.232 | 0.014 | 0.67 | 0.381 |
| MICHIGAN | -0.098 | 1 | 0.336 | 11.1 | 0.775 | 5.4 | -0.291 | 1.8 | 0.538 | 3.2 | | | -0.040 | 3 | 0.813 | 0.013 | 1.90 | 0.362 |
| MINNESOTA | 0.161 | 11.9 | 0.447 | 17.2 | 0.259 | 1.9 | | | | | | | | | 0.897 | 0.011 | 0.41 | 0.413 |
| MISSISSIPPI | 0.181 | 11 | 0.361 | 8.6 | 0.130 | 1 | -0.148 | 1.1 | | | | | | | 0.648 | 0.009 | 1.97 | 0.324 |
| MISSOURI | 0.063 | 1.9 | 0.560 | 7.7 | 0.558 | 2.8 | -0.615 | 2.8 | 0.092 | 1.9 | | | | | 0.717 | 0.011 | 1.54 | 0.321 |
| MONTANA | 0.113 | 4.8 | 0.416 | 7.6 | 1.245 | 5.3 | | | | | | | -0.019 | 1.6 | 0.799 | 0.017 | 1.40 | 0.391 |
| NEBRASKA | -0.268 | 4.2 | 0.681 | 11.6 | 0.529 | 2.8 | -0.159 | 0.8 | 0.615 | 5 | | | 0.000 | 0 | 0.872 | 0.007 | 1.51 | 0.365 |
| NEVADA | 0.213 | 9.4 | 0.270 | 5.6 | 0.778 | 3.2 | -0.234 | 1 | | | | | | | 0.542 | 0.014 | 1.43 | 0.365 |
| NEW HAMPSHIRE | 0.094 | 4.7 | 0.574 | 13.9 | 0.179 | 0.8 | -0.505 | 2.2 | | | | | | | 0.835 | 0.014 | 0.97 | 0.341 |
| NEW JERSEY | 0.080 | 1.3 | 0.247 | 4.3 | 0.365 | 1.8 | -0.550 | 2.9 | 0.282 | 4.1 | | | | | 0.397 | 0.013 | 0.66 | 0.364 |

**Table A.3. Replacement Rate Regressions, 1967 to 2007 (cont.)**

| State | Constant | t Ratio | MaxBen/ AWW | t Ratio | TUR | t Ratio | TUR Lag | t Ratio | RRate Stat. | t Ratio | 2 High Quarter Dummy | t Ratio | Annual Wage Dummy | t Ratio | | Adj. R2 | Std. Error | Durbin Watson | Mean Repl. Rate |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NEW MEXICO | -0.233 | 1.8 | 0.359 | 10.9 | 0.554 | 3.2 | -0.364 | 2.1 | 0.810 | 3.2 | | | | | | 0.789 | 0.008 | 1.24 | 0.353 |
| NEW YORK | 0.150 | 6.3 | 0.378 | 6.4 | 0.451 | 2 | -0.748 | 3.4 | | | | | 0.028 | 5.1 | | 0.677 | 0.013 | 0.61 | 0.307 |
| NORTH CAROLINA | 0.169 | 4 | 0.360 | 5.5 | 0.352 | 2.1 | -0.350 | 2.1 | | | -0.002 | 0.5 | -0.017 | 1.4 | | 0.890 | 0.011 | 1.46 | 0.368 |
| NORTH DAKOTA | 0.205 | 7.4 | 0.315 | 6.8 | 1.238 | 4.1 | | | | | | | | | | 0.625 | 0.017 | 0.60 | 0.431 |
| OHIO | 0.177 | 7.1 | 0.347 | 6.1 | 0.862 | 6.1 | | | | | | | | | | 0.662 | 0.019 | 0.99 | 0.376 |
| OKLAHOMA | -0.107 | 1.9 | 0.522 | 13.9 | 0.445 | 1.9 | -0.343 | 1.5 | 0.414 | 3.5 | | | | | | 0.926 | 0.013 | 1.46 | 0.372 |
| OREGON | 0.177 | 13.8 | 0.333 | 16.2 | 0.637 | 3.9 | -0.450 | 2.8 | | | | | | | | 0.869 | 0.011 | 0.94 | 0.369 |
| PENNSYLVANIA | 0.234 | 13 | 0.217 | 6.5 | 1.109 | 5 | -0.386 | 1.7 | | | | | | | | 0.762 | 0.014 | 1.04 | 0.406 |
| RHODE ISLAND | 0.244 | 4 | 0.315 | 3.2 | 0.436 | 2 | -0.518 | 2.3 | | | | | -0.003 | 0.3 | | 0.571 | 0.019 | 0.73 | 0.420 |
| SOUTH CAROLINA | 0.199 | 18.6 | 0.340 | 15.5 | 0.287 | 2.8 | -0.355 | 3.5 | | | | | | | | 0.879 | 0.007 | 1.45 | 0.354 |
| SOUTH DAKOTA | -0.041 | 1.6 | 0.470 | 9.6 | 1.281 | 5.1 | | | 0.329 | 8.1 | | | | | | 0.914 | 0.009 | 1.35 | 0.399 |
| TENNESSEE | 0.055 | 1.9 | 0.334 | 5.8 | 0.432 | 3 | -0.397 | 2.7 | 0.258 | 5.7 | | | | | | 0.787 | 0.009 | 0.87 | 0.315 |
| TEXAS | 0.092 | 8.7 | 0.535 | 14.7 | 1.222 | 6.4 | -0.779 | 3.6 | | | | | | | | 0.944 | 0.009 | 1.05 | 0.347 |
| UTAH | 0.104 | 3.1 | 0.510 | 9.4 | 0.561 | 3.3 | | | | | | | | | | 0.688 | 0.015 | 0.86 | 0.416 |
| VERMONT | 0.207 | 13.2 | 0.389 | 11.8 | 0.621 | 3.9 | -0.638 | 4.1 | | | -0.015 | 4.9 | | | | 0.822 | 0.009 | 1.05 | 0.393 |
| VIRGINIA | 0.088 | 4 | 0.592 | 9.6 | 0.531 | 1.5 | -0.446 | 1.4 | | | | | | | | 0.820 | 0.013 | 1.37 | 0.352 |
| WASHINGTON | 0.182 | 5.4 | 0.295 | 5.9 | 1.102 | 4.2 | -0.570 | 2.1 | | | 0.007 | 0.7 | -0.033 | 2.1 | | 0.843 | 0.017 | 1.64 | 0.376 |
| WEST VIRGINIA | -0.019 | 6 | 0.439 | 16.2 | 0.627 | 3.8 | -0.463 | 2.7 | 0.551 | 7.3 | | | | | | 0.950 | 0.013 | 1.32 | 0.354 |
| WISCONSIN | 0.254 | 8.9 | 0.209 | 3.8 | 1.055 | 4.7 | -0.557 | 2.5 | | | | | 0.017 | 3.8 | | 0.671 | 0.013 | 1.06 | 0.405 |
| WYOMING | 0.117 | 6.1 | 0.538 | 11.6 | 0.656 | 3.1 | -0.279 | 1.3 | | | | | | | | 0.870 | 0.011 | 0.92 | 0.397 |

*Source:* Replacement rates, maximum benefits, average weekly wages and methods of calculating weekly benefits from the Office of Workforce Security. Data on TURs from BLS-LAUS program.
Absolute value of t ratios appear to the right of each coefficient.

# APPENDIX B.
# COST OF DOING BUSINESS INDEX

The cost of doing business index estimates how business costs differ across states, within states, and across industries. The index is a weighted sum of three component business cost indices that measure the costs of labor, energy, and taxes relative to the U.S. national average.

$CDB_{is} = w\_ulc_{is} * ULC_{is} / ULC_{iUS} + w\_e_{is} * Energy_{is}/Energy_{iUS} + w\_t * Tax_{is}/Tax_{iUS}$

where i = industry, s = state, US = U.S., w_ulc = unit labor cost weight, ULC = unit labor cost, w_e = energy weight, Energy = average electricity price, w_t = tax burden weight, Tax = effective business tax rate

An index value of 100 implies that the cost of doing business in industry *i* in state *s* is exactly equal to the cost of doing business nationally.

The three components will not be used uniformly by each industry and in each state; the weighting structure varies to account for these differences in cost structure. Moody's Economy.com uses IMPLAN Professional's input-output accounts for 2007 to calculate the proper weights for each component within in each industry and state.

The labor cost index measures unit labor costs in each industry within each state relative to the U.S. For most industries, particularly in the service sector, labor costs comprise the largest share of business costs. The variations across industries are wide, however. For example, in New York, labor costs range from a low of 20 percent of the total Cost of Doing Business in the natural resources and mining industry compared to a high of 98 percent in state government.

The energy cost index measures electricity prices (in cents per kilowatt-hour) for either commercial or industrial electricity relative to the same for the nation. The price data come from the Energy Information Administration. Manufacturing industries use industrial electricity and most service sector industries use commercial electricity. Here again, there is a wide range across industries within states. In New York, energy costs account for only 2 percent of total business

costs in state government, and 67 percent in chemicals, energy, plastics and rubber manufacturing.

An index of the state and local business tax burden is included to estimate the costs associate with a state's taxes. A state's effective tax rate is measured as the total tax burden as a percent of total personal income within an area, indexed to the national effective tax rate. Tax burden is estimated using government revenues from taxes levied on personal property, corporate taxes, and charges, less severance taxes. Corporate license taxes, education, hospital, and intergovernmental transfers are included as well as business contributions to unemployment and workers' compensation programs. Therefore, if a state generates more revenue through the aforementioned taxes relative to incomes compared to the national average, its tax index will exceed 100.