Replacement Rates and UC Benefit Generosity

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Table of Contents

Introduction

The cost of unemployment compensation (UC) support payments can be examined within an actuarial framework that recognizes three factors: 1) the economy's underlying unemployment rate, 2) the recipiency rate (the share of the unemployed who receive benefits) and 3) the replacement rate (the ratio of periodic (weekly or monthly) benefit payments to average earnings for the same time period. The present paper operates within this actuarial framework but focuses primarily upon replacement rates.

Part 1 derives the framework for examining UC benefit costs. Parts 2 and 3 then undertake two empirical investigations of replacement rates. Part 2 fits time series regressions to determine the effects of unemployment and UC statutory provisions on replacement rates in 20 OECD member countries. Replacement rates are found to be strongly connected to the maximum UC benefit payment. Part 3 examines the association between the replacement rates derived from aggregate program data and replacement rates published by the OECD. Because the two sets of replacement rates are derived using different methodologies, they are not necessarily closely linked. This is found to be the case in regressions fitted to time series and cross section data.

1. The Actuarial Cost Framework

Most UC programs in OECD countries are financed by payroll taxes levied on covered payrolls, with contributions owed by both employers and employees. A combined (employer-employee) payroll tax rate of τ is levied on total payroll in covered employment. The tax is presumed to cover the long-run average cost of benefit payments and associated administrative expenses.

The payroll base for a UC program can be specified as follows.

(1) $P = ECov \times AWW \times 52$[1]

where
P = Annual covered payroll
ECov = Covered employment

[1] The accounting time unit used here is the week but months could also be used in an analogous derivation.

AWW = average weekly wages in covered employment and
52 is a multiplier that converts weekly payroll into annual payroll.

Contributions are not received from all workers. The unemployed are not active contributors along with groups explicitly excluded from program coverage. Coverage exclusions typically apply to the self-employed and may encompass an entire industry such as agriculture, an entire class of workers such as family workers and/or firms that fall below a minimum size threshold. Coverage details depend upon statutory provisions that vary from one country to the next. For present purposes, we note that covered employment is smaller than the total labor force and can be expressed as follows:

(2) $ECov = LF - U - ENC$

where
LF = The labor force
U = Unemployment
ENC = Non-covered employment which usually encompasses the self-employed as well as groups explicitly excluded from coverage.

Covered employment in expression (2) is lower as the unemployment rate is higher and as the excluded groups form a larger share of the labor force. This can be expressed as follows:

(3) $ECov = LF \times (1 - u) \times (1 - enc)$

where
u = the unemployment rate or (U/LF) and
enc = the noncovered employment share (ENC/(LF – U))

Collecting terms yields the following expression for covered payroll.

(4) $P = LF \times (1 - u) \times (1 - enc) \times AWW \times 52$

Expression (4) is general a characterization that recognizes the size of the labor force, the unemployment rate, the non-covered employment share and average weekly wages as explicit determinants of covered payroll.

Annual benefit payments can be expressed as 52 times the product of the weekly number of beneficiaries and the weekly benefit amount.

(5) $B = NBen \times WBA \times 52$

where
B = Annual benefit payments
NBen = Weekly beneficiaries

WBA = Weekly benefit amount, and
52 converts weekly payments to annual payments.

The volume of weekly beneficiaries, in turn, can be expressed as the product of unemployment times the recipiency rate.

(6) NBen = LF × u × rcprt

where
rcprt = the weekly number who receive benefits as a ratio to unemployment

The weekly benefit amount in (5) is the product of the replacement rate times the average weekly wage, or

(7) WBA = rr × AWW

where
rr = the replacement rate (= WBA/AWW)

Collecting terms from (6) and (7) and substituting into (5) yields the following expression for annual benefit payments.

(8) B = LF × u × rcprt × rr × AWW × 52

Annual benefit payments depend upon five explicit factors that determine weekly beneficiaries and the weekly benefit amount, and the product of the five is multiplied by 52 to convert weekly benefit payments into an annual flow.

The cost rate for providing UC benefits is the ratio of benefit payments to covered payroll. When benefit payments are financed by a payroll tax, the tax will also need to incorporate the costs of program administration (unless administrative costs are funded separately). For the benefit part of program costs, the cost rate can be expressed as the ratio of equation (8) to equation (4). Since annual cost experiences will include short-run random factors, the calculation of the program's cost rate should be based on multi-year averages of experiences rather than experience from any single year. One advantage of having a trust fund associated with a UC program is that the short run "noise" in benefit payments and revenues can be absorbed by short-run fluctuation in the trust fund balance without a need for frequent tax rate adjustments.

Expression (9) summarizes the preceding derivation, showing explicit factors that enter the determination of the benefit cost rate.

(9) B/P = [LF × u × rcprt × rr × AWW × 52]/[LF × (1 – u) × (1 – enc) × AWW × 52]

After the common terms LF, AWW and 52 are cancelled from the numerator and denominator, the resulting expression summarizes the costs of UC benefits.

(10) $B/P = [u \times rcprt \times rr]/[(1 - u) \times (1 - enc)]$

The three factors in the cost of benefit payments (the numerator of (10)) are the unemployment rate, the recipiency rate and the replacement rate. The two factors in the denominator of (10) that negatively affect the size of covered payroll (and raise the cost rate) are the unemployment rate and the share of employment not covered by UC.

When the program is financed by a payroll tax, the tax rate τ needed match long-run averages of revenues and benefit costs is determined by these six factors. Program administrative costs would add somewhat to τ. Because the beneficiary population turns over quite rapidly, administrative costs can be 10 percent or more of total benefit costs.

The three explicit cost factors in the numerator of (10) are widely available and have intuitive appeal. Total benefit payouts depend on the product of: 1) the unemployment rate, 2) the recipiency rate and 3) the replacement rate. When appropriate data are available, the benefit cost rate and/or one or more of the components that enter expression (10) can be examined to make cross section and/or time series comparisons of UC program costs. Different countries and/or the states within the United States can be compared at a given point in time. It is also possible to trace the evolution of UI program costs over a succession of years to identify the factors responsible for changes in costs in any individual country or U.S. state.

Of the three benefit cost factors in the numerator of (10), much more research attention has been given by labor economists and others to understanding the determinants of the unemployment rate than to the other two cost factors. Numerous investigations of unemployment rates in OECD countries have been conducted. Causal factors in determining unemployment rates have included indicators of product market competition, tax wedges, the minimum wage, collective bargaining, UC benefit generosity and employment protection legislation. Recent summary investigations of the determinants of unemployment appear in the OECD *2006 Employment Outlook* and an associated working paper.[2]

[2] See Chapters 3 and 7 in the *2006 Employment Outlook* and Andrea Bassanini and Romain Duval. 2006. "Employment Patterns in OECD Countries: Reassessing the Role of Policies and Institutions," OECD Social Employment and Migration Working Papers, Paris: OECD.

In the short run, the unemployment rate has macroeconomic determinants that cannot be controlled by a country and this causes uncontrollable variation in UC program costs. The business cycle is a major determinant of UC program benefit payouts.

In contrast, the recipiency rate and the replacement rate in expression (10) can be controlled through UC statutory provisions and methods of UC program administration. More generous UC programs are characterized by lengthy potential benefit durations (greater than one year), limited oversight of continuing claims, high statutory replacement rates and high maximum weekly benefits. In the short run, UC costs are partly controllable and partly beyond a country's (or state's) control.

The generosity of benefits from a UC program is conveniently characterized as the product of the recipiency rate times the replacement rate (rcprt and rr in (10)). If every unemployed person were compensated by UC and if average weekly payments equaled the average weekly wage, someone paid the average wage would experience no diminution of income upon becoming unemployed as UC benefits would exactly match (offset) the person's reduction in earnings.[3] For this individual, rcprt and rr would both equal unity. The generosity index in this situation would also equal unity.

Generosity indices can also be derived for entire countries when macroeconomic estimates of rcprt and rr (or their product) can be obtained. For individual countries, many combinations of recipiency rates and replacement rates are possible, hence many possible generosity indices exist. A generosity index is even less demanding of supporting data than the data requirements of expression (10). A simplification of expression (10) that focuses explicitly upon generosity is the following:

(11) $B/P = [u \times g]/[(1 - u) \times (1 - enc)]$ or $= g \times \{(u/[(1 - u) \times (1 - enc)]\}$

where

g = the generosity index, the recipiency rate (rcprt) times the replacement rate (rr).

The generosity index can be computed when one knows total UC benefit payments, total covered payroll, the unemployment rate and the noncovered share of employment, but not the recipiency rate and the replacement rate. If all the terms inside the{ } expression in (11) are known, the generosity of a country's UC program can be estimated without direct knowledge of rcprt and rr.

[3] This statement abstracts from taxes that may be levied differentially upon earnings and UC benefits.

UC programs across the world have widely varying generosity. Using the preceding actuarial framework, it is possible to compare programs. The next two sections focus on UC replacement rates but not on recipiency rates. Thus the empirical work to be presented is restricted to one component of UC program generosity.

2. UC Replacement Rates in 20 OECD Countries

The actuarial framework discussed above has a macroeconomic focus. The replacement rate (the ratio of average weekly benefits to average weekly wages) is derived from economy-wide series, not micro data. Weekly benefits, in turn, are measured as the ratio of annual UC benefits to 52 times the annual average of UC beneficiaries. Given their method of derivation, the estimates of weekly benefits are analogous to unit value indices, e.g., the average payment per person-week of benefits. The time unit is annual, and where possible, the data period is from 1959 to 2004.

The analysis focuses upon 20 long-term member countries of the OECD. There are six English-speaking countries (Australia, Canada, Ireland, New Zealand, the United Kingdom and the United States), four Scandinavian (Denmark, Finland, Norway and Sweden), six from western Europe (Austria, Belgium, France, Germany, the Netherlands and Switzerland) and four from southern Europe (Greece, Italy, Portugal and Spain). Ninteen (all except Portugal) have had a UC program for more than 50 years. The start date for the time series, 1959, was selected mainly because of a long-standing interest in examining the effects of the energy price run-ups of the mid- and late 1970s and associated increases in unemployment on unemployment protection programs and also because of improved data availability around 1959.[4] As will soon be obvious, many of the time series are much shorter due mainly to limitations on data availability.

UC programs often pay two types of benefits: unemployment insurance (UI) benefits and unemployment assistance (UA) benefits. UI benefits in most countries are related to past earnings and are received as a matter of right regardless of family income. UA benefits are either flat or earnings-related but eligibility is dependent upon family

[4] Two data considerations were the availability of certain unemployment data from the United States Bureau of Labor Statistics (BLS) starting in 1959 and the detail on UI statutory provisions in *Social Security Programs Throughout the World* starting in 1958.

income. Across the 20 countries, two (Australia and New Zealand) operate UA-only programs, eight operate UI-only programs (Canada, the United States, Denmark, Norway, Belgium, Switzerland, Greece and Italy) while the remaining 10 operate combined UI-UA programs. The typical pattern of receipt under combined programs is to receive UI first and then UA after exhaustion of the UI entitlement. UA may also be received directly after the onset of unemployment when the person does not satisfy UI eligibility requirements.

UA payments are generally much lower than UI payments.[5] Thus if the two types of benefits were combined, the resulting overall replacement rate series would be influenced by the mix of the two benefits as well as developments affecting either UI or UA singly. To avoid mix effects and to better distinguish separate developments affecting UI and UA benefits, two replacement rate regressions were fitted in countries with mixed UI-UA programs. Across the 20 countries, 30 replacement rate time series are examined: 18 UI series and 12 UA series.

Two statutory factors would be expected to have a major influence on actual replacement rates: the maximum weekly benefit and the statutory replacement rate. Considerable time was devoted to measuring these provisions with most details taken from various issues of *Social Security Programs Throughout the World (SSPTW).* This publication is typically issued every second year, but it appeared at three-year intervals between 1958 and 1967. Some statutory details were also obtained from the Statistical Yearbooks of individual countries. Because *SSPTW* is not annual, decisions had to be made for intermediate years. Generally, the decision was to use an average of the provisions from the two adjacent issues of *SSPTW*. To the extent that *SSPTW* entries have errors, e.g., lags in reporting statutory changes, there are errors in the measures used here.

In many countries, the maximum benefit and the statutory replacement rate vary across individuals depending upon years past work experience, the level of earnings, the presence of dependents, duration in benefit status and other factors. Thus several alternative measures of both statutory provisions could have been utilized. In countries where the maximum decreases after receipt for a specified period, the maximum benefit

[5] Across the ten countries with combined UI-UA systems, the ratio of UA to UI average benefits for common periods ranged from less than half in two (Spain and Sweden) to more than 1.0 in two (Ireland and the United Kingdom) with a ten-country median of 0.62.

is measured as the initial maximum. The same measurement for the statutory replacement rate was followed. Where the replacement rate varied inversely with the level of pre-unemployment earnings, the replacement rate for high-wage workers was used. Dependents' benefits were generally excluded from the statutory measures. The maximum benefit was measured as a ratio to average wages, usually average wages from the non-farm sector. Thus both the maximum weekly benefit and the statutory replacement rate were measured in the same units as the actual replacement rate.[6]

In all countries, the statutory replacement rate changed much less frequently than the ratio of the maximum week benefit to the average weekly wage. Figures 1 and 2 help to illustrate the contrast, displaying data for the six West European countries over the 1959-2004 period. Note in Figure 1 that the ratio of the maximum benefit to average wages was usually 0.60 or lower in Austria and Belgium, close to 1.0 in Germany, and somewhat higher in the Netherlands (until recent years). The ratios were even higher in Switzerland and France with the French ratios consistently above 2.0 for all years after 1977 and above 3.0 since 1993. Decreases as well as increases in these ratios are observed for several countries as wage growth erodes the value of an unchanged benefit maximum. The resulting saw-tooth pattern is most apparent for the Netherlands but also present for Austria, France and Switzerland. Indexation of the maximums has largely eliminated the saw-tooth patterns in more recent years.

Figure 2 presents several examples of countries with just one, two or three statutory replacement rates operative during these 46 years. The increase in France in 1978 is by far the largest single change in the figure. During the last half of the period, decreases in statutory replacement rates were more frequent than increases with two exceptions, Austria and Switzerland. When the entries for a single country are compared in Figures 1 and 2, the maximum benefit to average wage ratio usually exhibits greater time series variation than the statutory replacement rate.

Changes in the maximum benefit and in the statutory replacement rate affect low-wage and high-wage workers differently. *Ceteris paribus* raising the statutory replacement rate mainly affects low-wage workers whose periodic benefits fall below the

[6] Because benefits in the United States are determined at the state level, fixed-weight averages of state data were used to derive the statutory replacement rate and the ratio of the maximum benefit to average wages.

maximum. In contrast, the maximum weekly benefit mainly affects high-wage workers. As this paper is partly exploratory, the specifications simply enter each statutory provision linearly. Their possible interaction effects as well as the effects of changes in the minimum benefit have not been explored.

The regression specifications draw upon earlier analysis of UI replacement rates in several U.S. states. In addition to the maximum benefit and the statutory replacement rate, tests for effects of unemployment were also undertaken. For both the statutory replacement rate and the maximum benefit, a positive slope coefficient was anticipated. The expectation for the current and lagged unemployment rate coefficients was less certain. In analysis of (national and state-level) U.S. data, the current unemployment rate has a positive effect on the replacement rate but the lagged effect is usually negative. This pattern at least partially reflects the short potential duration of U.S. benefits (26 weeks in non-recession years). When unemployment increases, the mix of unemployment changes to include an increased share of job losers who earn higher wages than other unemployed persons. Their higher wages cause average benefits and the replacement rate to increase, at least initially. After they exhaust benefits, the replacement rate tends to decrease.

A different pattern might be expected in countries where potential benefit duration is longer, e.g., positive effects on both current and lagged unemployment. Underlying the signs on the unemployment rate variables are effects of changes in the mix of high-wage and low-wage unemployment when the unemployment rate changes and effects of differing maximum benefit duration provisions. Initially, all country regressions included the unemployment rate for the current year and the previous year. Where the two variables were highly collinear, lagged unemployment was dropped.[7]

Analysis of regression residuals identified several very large residuals for individual years or groups of adjacent years. Where just a single year was unusual, it was removed. When several years of unusual residuals were found, a dummy variable was added to the specification. The dummies acted as intercept shift variables and improved the fits, but had little effect on estimated slope coefficients. The presence of these dummy variables has been flagged in the regression summaries.

[7] In regressions to be displayed below, lagged unemployment was dropped in Norway, Belgium and for the UA program in the Netherlands.

In a few countries, the earliest years had regression residuals that were much larger than the residuals in subsequent years. The standard errors in equations that included these data points were at least 70 percent larger than for equations with later start dates. The years removed were as follows: Australia, 1960 to 1962; New Zealand, 1961 to 1985; United Kingdom UI, 1959 to 1977; and Belgium, 1959 to 1968. For all other regressions that use shortened data periods, the explanation is the absence of data.

Table 1 displays 30 regression results, one for each UI and UA program in the 20 countries. Absolute values of t ratios appear beneath the coefficients. The fits are generally good, with 25 adjusted R^2s of at least 0.50 and 16 of at least 0.70. Standard errors are smaller than 0.04 in 26 regressions with the standard error for Greece (0.090) twice the size of the next largest standard errors (0.044). More than half the regressions have evidence of significant positive serial correlation in the residuals with twelve Durbin-Watson statistics falling below 1.0. No autoregressive correction was applied, and readers should note that several reported t ratios contain upward biases.

Unemployment rates make an uneven contribution to explained variation in Table 1. In 14 regressions, current and lagged unemployment both have insignificant effects. The current unemployment rate has a significant positive coefficient in eight regressions but a significant negative coefficient in five. Fewer (nine) coefficients on the lagged unemployment rate are significant. Across the 30 regressions, no strong pattern emerged as to the size and/or sign of the effect of unemployment on replacement rates.

In contrast, the statutory features of UC programs make highly significant contributions to explained variation. The ratio of the maximum benefit to average wages has a positive and significant coefficient in 24 of the 28 regressions where it enters. The statutory replacement rate enters positively and significantly in five regressions. In several countries, attempts to isolate individual coefficients for these two statutory factors were not successful, usually because the statutory replacement rate exhibited little or no variation. Figure 2 illustrated this limited variation for six Western European countries.[8]

[8] Recall from Chart 2 that the statutory replacement rate in France did change (increase) in the late 1970s. French data that distinguished UI from UA payments were available only from 1982 to 2003. The UA share ranged between 8 and 15 percent of combined UI + UA benefits during these 22 years. An auxiliary regression estimated the UI replacement rate between 1969 and 1981 with the combined (UI + UA) replacement rate as the explanatory variable. When the longer series (1969 to 2003) was then examined, the statutory replacement rate was found to exercise a significant positive effect on the UI replacement rate.

Table 2 summarizes the regression results, emphasizing the sign and t ratios of the coefficients in Table 1. The wide dispersion and modest significance of the unemployment rate coefficients is apparent. Fourteen of 30 are positive for current unemployment while ten of 27 are positive for lagged unemployment. Only three of these 57 coefficients have t ratios with absolute values of 5.0 or larger and just 22 have t ratios with absolute values of at least 2.0, a customary indicator of statistical significance.

The maximum-benefit-to-average-wage ratio is seen to have highly significant effects with 14 t's of at least 5.0 and 24 of 28 of 2.0 or larger. All five statutory replacement rate coefficients are also significant. Both statutory provisions enter in the expected manner with positive coefficients. Given the greater variation in the maximum benefit ratio, its larger contribution to explained variation across these countries is also an expected finding.

To further describe the contribution of the maximum benefit ratio, Figure 3 displays the association between the mean ratio of the maximum benefit to the average wage and its coefficient. The coefficients appear on the figure's vertical axis. Readers should note that both series are taken directly from results shown in Table 1.

One's expectation would be that as the maximum benefit is located further up the wage distribution, fewer recipients would be affected by changes in the maximum benefit and its coefficient would be smaller. Figure 3 shows a clear negative association between the two. Eight regression coefficients exceed 1.0. For these eight the largest maximum-benefit-to-average-wage ratio is only 0.333. The remaining 20 coefficients are all smaller than 1.0

The functional form for this association might not be obvious, but one possibility would be a rectangular hyperbola. The bottom of Figure 3 shows a regression where the coefficient is explained by the reciprocal of the ratio of the maximum benefit to average wages. The regression, fitted without an intercept, explains 41 percent of the variation in the regression coefficients, and the regression slope is highly significant (t ratio of 8.9). While the relationship is noisy, e.g., a standard error of 0.54, the association in Figure 3 is obvious. Raising the maximum in Australia, Ireland and United Kingdom (mean ratios

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The regression is not included in Table 1 because the pre-1982 estimates of the UI replacement rate were derived by the author, not taken from French sources.

below 0.25 for both UI and UA) would have much larger effects on replacement rates than in Switzerland, Portugal-UI or French-UI (all with mean ratios above 1.50).

To summarize, three statements about the determinants of replacement rates seem appropriate. (1) Two statutory features of UC benefits (the ratio of the maximum benefit to the average wage and the statutory replacement rate) exert a significant influence on actual replacement rates in these 20 countries. Of the two statutory features, the maximum benefit has the larger effect with positive and significant coefficients in 24 of 28 regressions where it entered. The lesser significance of the statutory replacement rate is mainly attributable to smaller variance in most countries during the 1959-2004 period. (2) A systematic negative association was found between the level of the maximum-benefit-to-average-wage ratio and the size of its regression coefficient. Higher ratios were strongly associated with smaller coefficients. (3) Tests for effects of unemployment on replacement rates yielded mixed results. While several coefficients were significant (22 of 57 had t ratios of 2.0 or larger), their signs were mixed with similar numbers of positive and negative coefficients. These regressions suggest that no strong conclusions can be drawn as to the effect of the business cycle on replacement rates.

3. A Comparison with OECD Replacement Rates

The replacement rates studied in Section 2 were derived from the ratio of annual UC benefit payments to the average number of recipients and normalized by average weekly (or monthly) wages. These replacement rates are decidedly empirical, responding to changes in UC statutes, the level of unemployment (at least in some countries) and the mix of recipients.

The replacement rate series used most widely in studies of cross-national unemployment rates and other labor market outcomes are those derived by the staff at the OECD. In another paper, Vera Brusentsev and I have characterized the OECD measures as stylized replacement rates.[9] The OECD measures are simple averages for unemployed workers in different individual situations.

[9] See Vera Brusentsev and Wayne Vroman. 2006. "A Study of Unemployment Compensation Replacement Rates," paper delivered at the International Atlantic Economic Association Conference, Philadelphia, PA: October 8, 2006. The paper has a short review of earlier replacement rate papers.

The OECD replacement rates have been constructed for odd numbered years starting in 1961. For each country, they are simple averages of stylized replacement rates for workers classified along three dimensions: (1) the level of weekly wages (two thirds or equal to the country-wide average), (2) family situation (single adult, two adults with one earner and two working adults) and (3) unemployment duration (first twelve months, second and third years of unemployment and fourth and fifth years of unemployment). The possible combinations across these three dimensions yield 18 stylized replacement rates across the three unemployment duration categories and six first year replacement rates. The OECD makes available all 18 series and simple averages based on some or all of the 18 categories. This analysis focuses on the first-year replacement rates and compares them with the empirical replacement rate measures examined in the previous section. All measures used in the present analysis are gross replacement rates with no attempt to control for the effects of payroll taxes and income taxes that affect net benefits and take home wages.

Readers should be cautioned that the OECD measures (RRtO6) and those examined in Section 2 (RRtUC, RRtUI and RRtUA) are quite distinct. The former are derived from a measurement system that places strong emphasis upon duration in benefit status and the possibility of collecting benefits for a period whose length depends upon the statutory duration provisions in each country's UC program. For mixed UI-UA systems where potential UA duration is unlimited, the OECD measures for the longer duration categories could be quite high regardless of how many persons actually have benefit periods that extend beyond the first year. Part of the motivation for making comparisons with OECD first-year replacement rates is that considerations of potential benefit duration have smaller obvious effects on first year replacement rates (RRtO6) than on the all-year replacement rates (RRtO18).

Since this paper is an exploratory empirical analysis, it emphasizes simple comparisons. Initially it focuses on cross section comparisons for the individual years from 1961 to 2003. The maximum number of observations is 20 per year, but just 19 prior to 1975 because Portugal adopted UC only in 1975. In the early years, our replacement rate measures could not be constructed for four other countries (Austria, Denmark, Spain, and Switzerland). Thus the regressions for the early years are based on

fifteen data points. For more recent years, the regressions often have only 19 data points because Italian replacement rates could not be constructed between 1977 and 1991.

The regressions specify our measure (RRtUC) as the explanatory variable and the OECD measure (RRtO6) as the dependent variable. To the extent the two measures are consistent, one would expect the intercept to be insignificantly different from zero and the slope to be 1.0. As the two measures differ by increasing amounts, the expectation is that the intercept would be significantly larger than zero and the slope would be smaller than 1.0. Even if the measures are not capturing similar concepts, there is no expectation that their correlation, hence the slope, would be negative. Higher generosity (relative to average wages) should be observed under both measures.

Table 3 displays the regressions for the 22 years. The fits are generally modest with 15 of 22 adjusted R^2s between 0.200 and 0.499. More than half the variation in RRtO6 was explained in just two years (1993 and 1995). The worst fits obtained in the two earliest years, the only years with negative adjusted R^2s. Nearly all intercepts are insignificant, with the two exceptions of 1961 and 1963.

While the regressions have generally modest explanatory power, all slopes are positive and 18 of 22 differ significantly from zero (under a one sided t test at the 0.05 level).[10] During the years from 1983 to 2003 the slopes are consistently larger than 0.75, indicating a strong association between the two measures. The average of these 11 slopes is 0.880. Confidence intervals at the 95 percent level for these years all span 1.0.

For years prior to 1983, the slopes are generally smaller, and just one reaches 0.75 (1971). Even leaving aside 1961 and 1963, the average slope during 1965-1981 was 0.587 or 0.293 less than the average for 1983-2003. Overall, the results for the first half of the 1961-2003 period were much less satisfactory than results for the last half.[11]

In summary, the cross section relationship between the two measures is positive in all years, but the fits are noticeably better after 1981. However, the relationships are "noisy" with only two adjusted R^2s exceeding 0.50, five below 0.20 and a mean of 0.29.

[10] The necessary t ratio is 1.771 for 15 observations and 1.734 for 20 observations.
[11] A pooled regression for 1961-1981 had an adjusted R^2 of 0.157 and a slope of 0.348. For the 1983-2003 period the adjusted R^2 was 0.381 and the slope was 0.832.

When the residuals were examined, certain country-specific patterns were apparent. Persistently negative residuals were observed for Denmark for all years between 1975 and 2003 and for Greece from 1961 to 1989. Large positive residuals for late years in the data period were observed for Finland, Italy and Switzerland. The explanation for these multi-year contrasts merits additional research.

The findings displayed in Table 3 all utilized our measures of UC replacement rates to explain cross country variation in RRtO6. In the ten countries with mixed UI-UA systems, it could be argued that the OECD measures should be more closely related to UI (not UC) replacement rates. Initial payments in these mixed systems would be mainly UI benefits since UA payments usually occur after UI entitlements have been exhausted. As noted earlier, UI replacement rates are generally much higher than UA replacement rates.

The result of refitting the 22 regressions using UI replacement rates in the ten countries with mixed systems were very similar to those reported in Table 3.[12] The fits were again generally better during 1983-2003 than during 1961-1981 with positive slope coefficients estimated for all 22 years. The distributions of the adjusted R^2s and standard errors were similar to those of Table 3. The simple average of the 22 adjusted R^2s was marginally higher (0.31 compared to 0.29 in Table 3). Because UI replacement rates are generally higher, the slope coefficients were somewhat lower but qualitatively similar to those in Table 3. The earlier results were little changed by the use of UI rather than UC replacement rates to explain OECD first year replacement rates.

A second investigation examined time series relationships between the OECD first-year replacement rate averages and the measures from Section 2. Again, simple regressions were fitted with the OECD measure (RRtO6) as the dependent variable.

Table 4 presents the results with the countries sorted into to four groups. The table has 30 regressions, two for each of the ten countries with mixed UI-UA systems. The first of each pair uses the UC replacement rate while the second uses the UI replacement rate. The country identifier column shows the replacement rate used to explain RRtO6. Where data were missing, the regressions have fewer than 22 data points.[13] Short data periods are due to lack of our measures of (UC and UI) replacement rates.

[12] These are available upon request

[13] For Portugal the OECD data commence in 1975 but our measures only in 1978.

The Table 4 results, in contrast with those of Table 3, show a clear bifurcation in the fits. Of the 20 country-specific regressions that use the UC replacement rate, eleven have adjusted R^2s that fall below 0.20 while nine have adjusted R^2s of 0.50 or higher. Not one falls into the range between 0.20 and 0.499 (compared to 15 in Table 3). A second contrast is the presence of several negative slope coefficients. Of the 20 regressions based on UC replacement rates, nine have negative slopes and four differ significantly from zero (Austria, the Netherlands, Greece and Italy). Of the eleven positive slopes, eight are significant. In general, the results for English speaking and Scandinavian countries are better than for countries from western and southern Europe.

Use of UI replacement rates improves the fits in some countries (Ireland, the United Kingdom, Finland and Sweden) but not in all. The UI-based replacement rates have worse fits in Austria and the Netherlands.

The time series results present some puzzles. The UI system in the United States has had a comparatively stable statutory history. While the slope for the U.S. regression in Table 4 is positive, its t ratio falls below unity. Very large positive residuals were present for 1977, 1981, 1983 and 1985 while the empirical replacement rates for these years indicate little change from adjacent years. Some of the variation in RRTO6 is intended to capture the effects of extended benefits programs (both Federal-State Extended Benefits and Temporary Federal programs). However it seems there are errors in timing. The temporary increases in potential benefit duration spanned the years 1975 to 1977, 1980 to 1983, 1992-1993 and 2002-2003. Removing all data points between 1977 and 1985 still yielded a result where the slope coefficient was not statistically significant. More analysis of GRRtO6 is probably warranted.

Some other puzzles in RRTO6 were also encountered. The replacement rate in Italy increased sharply in 1999 while our expenditure-based measure showed little change. The OECD series for Greece increased sharply in 1991 while the expenditure-based measure was little changed until 2001. A low OECD replacement rate for Denmark persisted for all years between 1961 and 2003 even though our series shows Denmark to have a consistently above-average replacement rate. Again, further investigation is warranted into the reason(s) why the two series for a given country are so different.

Figures 4 and 5 provide a visual representation of the contrasting series. The Australian UA system has had unlimited potential duration throughout these years.[14] Note how GRRtO6 and our empirical series move in parallel until 1997 and then nearly coincide from 1997 to 2003.Variation in both Australian series reflects changes in payment levels (relative to average wages) such as the increases in the 1970s and again in the late 1980s. Note also how GRRtO6 is consistently the lower of two U.S. series in Figure 4 with the exception of 1977, 1981 and 1985 when the two series are identical. Their equality for these years reflects increases in potential duration that would permit receipt of UI benefits for 52 or more weeks. For most years, however, potential duration is only 26 weeks and the OECD series falls below our empirical series. Because the U.S. is unique in frequent changes in potential benefit duration, the OECD series is especially volatile while the empirical series moves between 0.32 and 0.36 in all years.

Figure 5 compares data series for Denmark and Greece.[15] The two OECD series have consistently low levels and just four data points (all for Greece) exceed 0.30. The low estimates of GRRtO6 for Greece reflect short benefit duration but the explanation for Denmark has not been found. Benefits in Denmark can last for several years, and even after a reform in the late 1990s, maximum potential duration is still four years. Both empirical series decrease after the late 1980s while the OECD series for Denmark is quite stable, and for Greece it increases. More comparative analysis would seem to be needed.

Figure 6 gives a summary overview of the OECD and our replacement rates by plotting averages in both for each year between 1961 and 2003. All three series are simple averages that weight each country equally. Recall from Table 3 that several regressions were fitted using fewer than 20 observations due to data limitations. Figure 6 shows means for GRRtO6 and our series based on the countries included for that year (regression countries). Since the OECD measures exist for all countries for all years, a second OECD series is included, the simple average of all 20 countries.[16]

[14] This statement abstracts from changes in work search enforcement and other requirements for continuing eligibility which occurred between 1961 and 2003.
[15] The empirical series for Denmark commences in 1975 due to lack of data. The number of recipients is available only from 1984. I have used a replacement regression along with earlier detail on the maximum benefit to extend the estimates of replacement rates back to 1975. The projection used the regression displayed earlier in Table 1
[16] Recall that estimates of GRRtO6 for Portugal commence only in 1975.

Three features of Figure 6 are noteworthy. (1) The two OECD series are very similar. Their simple correlation is 0.990. Thus for the OECD series, the averages for the countries used in Table 3 are practically identical to the averages for all 20 countries. (2) Both OECD averages increase strongly between 1961 and 2003, increasing from below 0.30 to above 0.45. These series are essentially on plateaus from 1985 to 2003. (3) The averages of our empirical replacement rates do increase in the early years, but only from 0.42-43 to 0.46-.47. After 1993, however, the averages decrease and fall consistently below 0.40 for the final four data points. The average during 1997-2003 (0.391) is about 16 percent lower than the 1981-1987 average (0.391). In the empirical series, the recent trend in the average replacement rate for these 20 countries has been downward.

The contrasting patterns in Figure 6 vividly illustrate that the OECD series and our series are measuring different concepts of wage loss replacement. Ours do not focus on duration other than the effects of lower weekly (monthly) payments as benefit duration increases. In the OECD series, the effect of increasing maximum potential duration to 52 weeks from a lower maximum increases GRRtO6 even with an unchanged payment per week. An explicit duration component enters the computation of GRRtO6. As several countries raised their maximum durations, particularly between the mid-1970s and the mid-1980s, the increases raised the average OECD replacement rates depicted in Figure 6.

4. Concluding Comments

After developing an actuarial framework for examining the costs and generosity of unemployment compensation (UC) programs in Section 1, the paper conducted two empirical investigations of UC replacement rates. Section 2 examined the determinants of aggregate (country-wide) UC replacement rates in 20 OECD member countries using time series regressions. The underlying replacement rates were constructed from annual aggregate data on total UC benefit payments, the average number of UC beneficiaries and average weekly (or monthly) wages. Strong and significant effects of the maximum weekly benefit (as a ratio to average weekly wages) were found across the 20 countries. Significant effects of the statutory replacement rate were also found in five countries.

Less consistently, significant effects of current and lagged unemployment rates were also present. Of 57 unemployment coefficients, 22 were either significantly positive or significantly negative. The principal conclusion of Section 2 is that much of the time series variation in replacement rates can be explained using as explanatory variables the statutory features of UC programs and unemployment rates.

Section 3 then examined the association between the empirical replacement rates of Section 2 and average first-year replacement rates generated by the OECD (GRRtO6). Annual cross section relations for the 20 countries were fitted for the odd numbered years from 1961 to 2003. While a positive association between the two series was found for each year, the associations were not close, especially during the period from 1961 to 1981. Overall, 20 of 22 adjusted R^2s fell below 0.50.

A comparison of the two replacement rate time series in individual countries found that fits were quite good in nine countries (adjusted R^2s above 0.50) but poor in eleven countries (adjusted R^2s below 0.20). Comparisons for individual countries found substantial contrasts between the OECD series and the series examined in Section 2. In United States data, it seemed clear that short run variation in the OECD series was linked to temporary extensions of maximum benefit duration during recessions.

Two suggestions for future research can be made. First, more comparative analysis of the two series seems warranted, especially in countries where the two series differ by wide margins, e.g., the 11 countries where the Table 4 adjusted R^2s fall below 0.20. From the U.S. series in Figure 4, it is clear that changes in potential benefit duration have an important effect on the OECD series. However, other factors may also have a differential influence on the two series.

Second, several studies of the effects of unemployment program generosity on unemployment have been undertaken. It would be useful to know how results reported in the existing literature would (or would not) change if the empirical replacement rates examined in Section 2 replaced the OECD replacement rates that typically have been used in these studies. From Figures 4, 5 and 6 it is clear the two series have different time series patterns. It would be interesting to test for possible differences in their effects on unemployment in these 20 OECD member countries.

Table 1. Regressions Results for 20 OECD Countries May 26, 2007

	Constant	U Rate	U Rate Lag	MxWBA/ AWW-a	RRate Stat	Years	Avg. Repl. Rate	Avg. MaxBen/ AWW	Adj R2	Std. Error	Durbin Watson
English Speaking Countries											
Australia - c	0.012 (0.90)	0.161 (0.66)	-0.520 (2.21)	1.258 (16.81)		63-05 Fin Yrs	0.275	0.238	0.925	0.014	1.06
Canada	0.118 (5.18)	0.139 (0.53)	-0.127 (0.46)	0.323 (9.29)	0.159 (2.62)	59-04	0.398	0.591 [0.558]	0.943	0.015	0.69
Ireland - UI - c	0.167 (2.18)	0.806 (2.18)	-1.112 (3.29)	1.241 (2.62)		78-04	0.281	0.207	0.819	0.021	1.53
Ireland - UA - c	0.270 (6.76)	-0.795 (3.28)	0.427 (2.07)	0.792 (2.55)		80-04	0.297	0.194	0.637	0.012	1.48
New Zealand	-0.041 (0.95)	-0.100 (0.31)	-0.086 (0.25)	1.557 (10.45)		86-05 Fin Yrs	0.343	0.255	0.902	0.012	1.70
UK - UI	-0.136 (3.91)	-0.073 (0.15)	-0.775 (1.68)	2.584 (10.54)		78-03	0.180	0.149	0.842	0.024	1.24
UK - UA - b	-0.111 (5.04)	1.383 (4.57)	-0.411 (1.43)	1.572 (10.23)		78-03	0.209	0.150	0.921	0.015	1.16
United States	0.052 (0.46)	0.749 (5.57)	-0.252 (1.83)	0.102 (2.08)	0.418 (2.22)	59-04	0.343	0.455 [0.515]	0.565	0.008	0.96
Scandinavia											
Denmark	0.183 (4.21)	1.429 (3.23)	-0.928 (2.20)	0.611 (6.02)		84-04	0.558	0.561	0.819	0.021	1.26
Finland - UI - b	-0.057 (1.96)	0.650 (2.02)	-0.313 (1.00)	0.804 (17.34)		72-04	0.416	0.584	0.929	0.028	1.35
Finland - UA	0.160 (4.07)	0.424 (1.57)	-0.618 (2.21)	0.436 (4.17)		72-04	0.278	0.301	0.642	0.024	0.74
Norway	-0.003 (0.05)	2.170 (4.61)		0.455 (4.37)		71-04	0.358	0.638	0.481	0.039	0.90
Sweden - UI - a	0.140 (8.15)	1.258 (2.30)	-0.790 (1.47)	0.638 (28.30)		59-74, 76-04	0.652	0.778	0.957	0.027	0.69
Sweden - UA	-0.089 (2.38)	-0.272 (0.65)	0.883 (2.26)	1.132 (9.40)		75-04	0.3116	0.333	0.857	0.018	1.71

a - Single years excluded: Sweden - UI - 1975, France - 1982, Germany - UI - 1959, Switzerland - 1991, Portugal - UA - 1986, Spain - UA - 1983.

b - Shift dummy for groups of years: UK-UA - 1989-91, Finland - UI - 1981-86, Italy - 1966-70, Neth. - UI - 1987-1989, and Germany - 1979-82.

c - Other explanatory variables included: Australia - shift dummy from 1996, Ireland - UI and UA - linear trends.

Table 1 (continued). Regressions Results for 20 OECD Countries May 26, 2007

	Constant	U Rate	U Rate Lag	MxWBA/ AWW-a	RRate Stat	Years	Avg. Repl. Rate	Avg. MaxBen/ AWW	Adj R2	Std. Error	Durbin Watson
Western Europe											
Austria - UI	0.378 (5.31)	-0.387 (0.39)	-0.932 (0.73)	0.054 (0.70)		83-04	0.356	0.530	-0.006	0.017	0.45
Austria - UA	0.297 (7.91)	-0.251 (0.49)	0.185 (0.28)	-0.005 (0.12)		83-04	0.292	0.508	-0.169	0.008	1.00
Belgium	0.246 (3.76)	-1.077 (6.76)		0.703 (6.04)		69-03	0.552	0.573	0.658	0.034	1.18
France - UI - a	0.726 (25.94)	-0.738 (1.61)	-1.370 (2.98)	0.002 (0.19)		83-03	0.516	2.963	0.747	0.013	1.16
France - UA - a	0.119 (2.27)	-1.365 (2.55)	1.062 (2.07)	0.703 (3.77)		83-03	0.269	0.260	0.557	0.015	0.97
Germany - UI - a,b	0.411 (20.55)	0.436 (0.74)	-0.436 (0.77)	0.081 (3.06)		60-04	0.501	0.985	0.669	0.029	1.07
Germany - UA- b	0.135 (0.94)	0.174 (0.17)	-1.150 (1.15)	0.339 (2.37)		75-04	0.412	1.005	0.613	0.044	0.45
Neth. - UI - b	-1.170 (9.21)	-0.869 (1.05)	0.373 (0.43)	0.309 (6.16)	1.859 (9.66)	59-04	0.549	1.189 [0.736]	0.874	0.044	0.87
Neth. - UA	0.350 (18.98)	1.167 (5.12)				80-01	0.438		0.546	0.029	0.71
Switzerland - a	-0.597 (2.78)	3.456 (1.98)	1.238 (0.56)	0.569 (5.62)		85-90, 92-04	0.563	1.832	0.697	0.036	0.98
Southern Europe											
Greece	0.408 (4.91)	-3.996 (1.98)	1.145 (0.56)	0.298 (2.69)		59-02	0.444	0.724	0.483	0.090	0.91
Italy - b	0.021 (0.67)	-0.219 (0.41)	0.755 (1.52)	1.207 (12.52)		59-76	0.174	0.114	0.940	0.012	2.60
Portugal - UI	-1.975 (3.78)	-1.901 (1.37)	3.070 (1.34)	0.758 (2.25)	1.708 (2.58)	85-98	0.516	1.763 [0.629]	0.830	0.039	1.90
Portugal - UA - a	0.068 (0.38)	-0.208 (0.24)	-0.407 (0.40)	0.672 (1.80)		78-85, 87-98	0.304	0.414	0.233	0.034	1.39
Spain - UI	-0.734 (3.88)	-2.509 (4.05)	2.876 (4.97)		1.891 (7.89)	80-01	0.780	[0.768]	0.746	0.040	1.19
Spain - UA - a	-0.335 (4.71)	-0.170 (0.57)	-0.076 (0.24)	2.876 (12.62)		81-82, 84-01	0.348	0.254	0.930	0.021	1.52

a, b, c - See explanations of data and estimation on previous page.

Table 2. Summary of Regression Coefficients from Table 1.

	t <= -5.0	-4.99 < t <-2.0	-1.99 < t <0.0	0.0 < t <1.99	2.0 < t <4.99	t >= 5.0	Total Number
Constant	2	5	3	5	7	8	30
Unemp. Rate	1	4	11	6	6	2	30
Lagged Un. Rate	0	5	12	6	4	0	27
Max. Benefit to Avg. Wage Ratio	0	0	1	3	10	14	28
Staturory Replace-ment Rate	0	0	0	0	3	2	5

Source: Detailed regressions shown in Table 1.

Table 3. Cross-section Regressions Explaining Average OECD First-Year Replacement Rate, 1961 to 2003
June 2, 2007

Year	Constant	t Ratio	UC Repl. Rate	t Ratio	Adj. R2	Std Error	Mean OECD RRate	Mean Our UC RRate	Number Countries of 20
1961	0.209	(2.9)	0.149	(0.97)	-0.004	0.119	0.273	0.430	15
1963	0.250	(4.8)	0.047	(0.58)	-0.049	0.120	0.274	0.426	15
1965	0.057	(0.8)	0.534	(3.53)	0.450	0.114	0.290	0.436	15
1967	0.026	(0.3)	0.629	(2.83)	0.333	0.122	0.291	0.420	15
1969	0.034	(0.3)	0.626	(2.55)	0.282	0.137	0.313	0.444	15
1971	-0.054	(0.5)	0.852	(3.69)	0.474	0.112	0.306	0.422	15
1973	0.006	(0.0)	0.740	(2.52)	0.277	0.157	0.335	0.446	15
1975	0.086	(0.6)	0.590	(2.15)	0.195	0.184	0.363	0.469	16
1977	0.250	(1.8)	0.369	(1.28)	0.043	0.169	0.420	0.459	15
1979	0.205	(1.7)	0.411	(1.72)	0.116	0.167	0.397	0.467	16
1981	0.174	(1.5)	0.535	(2.31)	0.213	0.163	0.429	0.476	17
1983	0.078	(0.7)	0.788	(3.54)	0.419	0.168	0.443	0.463	17
1985	0.110	(0.8)	0.802	(2.73)	0.265	0.165	0.482	0.465	19
1987	0.124	(0.9)	0.770	(2.70)	0.259	0.171	0.482	0.465	19
1989	0.083	(0.6)	0.855	(3.03)	0.312	0.168	0.477	0.461	19
1991	0.079	(0.7)	0.899	(3.65)	0.407	0.148	0.489	0.456	19
1993	0.005	(0.1)	1.023	(4.66)	0.522	0.142	0.462	0.446	20
1995	0.003	(0.0)	1.095	(4.57)	0.512	0.137	0.457	0.415	20
1997	0.074	(0.7)	0.978	(4.11)	0.455	0.133	0.464	0.398	20
1999	0.168	(1.6)	0.788	(3.02)	0.300	0.149	0.476	0.391	20
2001	0.156	(1.4)	0.829	(3.02)	0.300	0.154	0.477	0.387	20
2003	0.137	(1.3)	0.850	(3.24)	0.345	0.151	0.466	0.387	19

Source: Regressions by author using a measure of the actual average UC replacement rate to explain the average of six OECD first year replacement rates.

Table 4. Time-series Regressions Explaining Average OECD First-Year Replacement Rates, 1961 to 2003
June 3, 2007

Country	Constant	t Ratio	Repl. Rate	t Ratio	Adj. R2	Std Error	Mean OECD RRate	Mean Our RRate	Number of Years
English Speaking Countries									
Australia	0.072	(2.31)	0.542	(4.79)	0.511	0.030	0.217	0.268	22
Canada	0.002	(0.03)	1.257	(6.90)	0.689	0.051	0.506	0.401	22
Ireland - UC RRt	-0.071	(0.54)	1.717	(3.74)	0.541	0.050	0.423	0.288	12
Ireland - UI RRt	0.089	(1.57)	1.233	(6.12)	0.753	0.038	0.430	0.277	13
New Zealand	0.267	(9.04)	0.080	(1.24)	0.025	0.037	0.302	0.443	22
U. K. - UC RRt	0.064	(2.68)	0.885	(9.20)	0.799	0.030	0.275	0.239	22
U. K. - UI RRt	0.122	(8.21)	0.642	(11.06)	0.852	0.025	0.275	0.238	22
United States	0.026	(0.09)	0.699	(0.83)	-0.015	0.043	0.266	0.343	22
Scandinavia									
Denmark	0.288	(7.23)	-0.077	(1.15)	0.023	0.017	0.242	0.594	15
Finland - UC RRt	0.124	(0.88)	0.822	(2.10)	0.140	0.139	0.411	0.349	22
Finland - UI RRt	0.127	(2.63)	0.842	(7.55)	0.789	0.049	0.480	0.420	16
Norway	0.609	(2.33)	-0.540	(0.81)	-0.017	0.232	0.401	0.383	22
Sweden - UC RRt	-0.553	(2.82)	1.985	(6.23)	0.643	0.154	0.654	0.608	22
Sweden - UI RRt	-0.501	(4.04)	1.763	(9.50)	0.810	0.113	0.654	0.655	22

Source: Regressions using author's measurement of actual average replacement rates to explain the average of six OECD first year replacement rates. In countries with two entries, separate regressions were fitted using the UC replacement rate and the UI replacement rate as explanatory variables.

Table 4. (cont.) Time-series Regressions Explaining Average OECD First-Year Replace. Rates, 1961 to 2003
June 3, 2007

Country	Constant	t Ratio	Repl. Rate	t Ratio	Adj. R2	Std Error	Mean OECD RRate	Mean Our RRate	Number of Years
Western Europe									
Austria - UC RRt	0.541	(6.92)	-0.475	(2.15)	0.286	0.026	0.374	0.352	10
Austria - UI RRt	0.651	(2.52)	-0.797	(1.10)	0.021	0.036	0.368	0.356	11
Belgium	0.576	(5.80)	-0.194	(1.15)	0.015	0.069	0.463	0.583	22
France - UC RRt	0.406	(5.15)	0.248	(1.77)	0.092	0.059	0.544	0.555	22
France - UI RRt	0.515	(6.88)	0.156	(1.08)	0.016	0.014	0.595	0.517	11
Germany - UC RR	0.417	(10.31)	-0.054	(0.64)	-0.029	0.022	0.392	0.471	22
Germany - UI RRt	0.470	(10.15)	-0.155	(1.69)	0.082	0.021	0.392	0.503	22
Neth. - UC RRt	0.892	(19.22)	-0.346	(5.88)	0.627	0.074	0.636	0.741	21
Neth. - UI RRt	0.608	(5.10)	0.056	(0.27)	-0.046	0.121	0.639	0.552	22
Switzerland	0.872	(8.79)	-0.316	(1.80)	0.199	0.035	0.695	0.558	10
Southern Europe									
Greece	0.501	(12.07)	-0.590	(6.48)	0.661	0.051	0.242	0.439	22
Italy	1.032	(4.65)	-2.883	(3.81)	0.509	0.150	0.201	0.288	14
Portugal - UC RRt	-0.082	(0.81)	1.603	(6.46)	0.773	0.088	0.553	0.396	13
Portugal - UI RRt	0.551	(20.81)	0.174	(3.32)	0.588	0.015	0.637	0.495	8
Spain - UC RRt	0.467	(8.35)	0.403	(4.10)	0.589	0.043	0.691	0.554	12
Spain - UI RRt	0.395	(2.25)	0.386	(1.73)	0.166	0.034	0.696	0.781	11

Source: Regressions using author's measurement of actual average replacement rates to explain the average of six OECD first year replacement rates. In countries with two entries, separate regressions were fitted using the UC replacement rate and the UI replacement rate as explanatory variables.

Figure 1. Ratio of Max. Benefit to Avg. Wages

Six West European Countries, 1959 to 2004

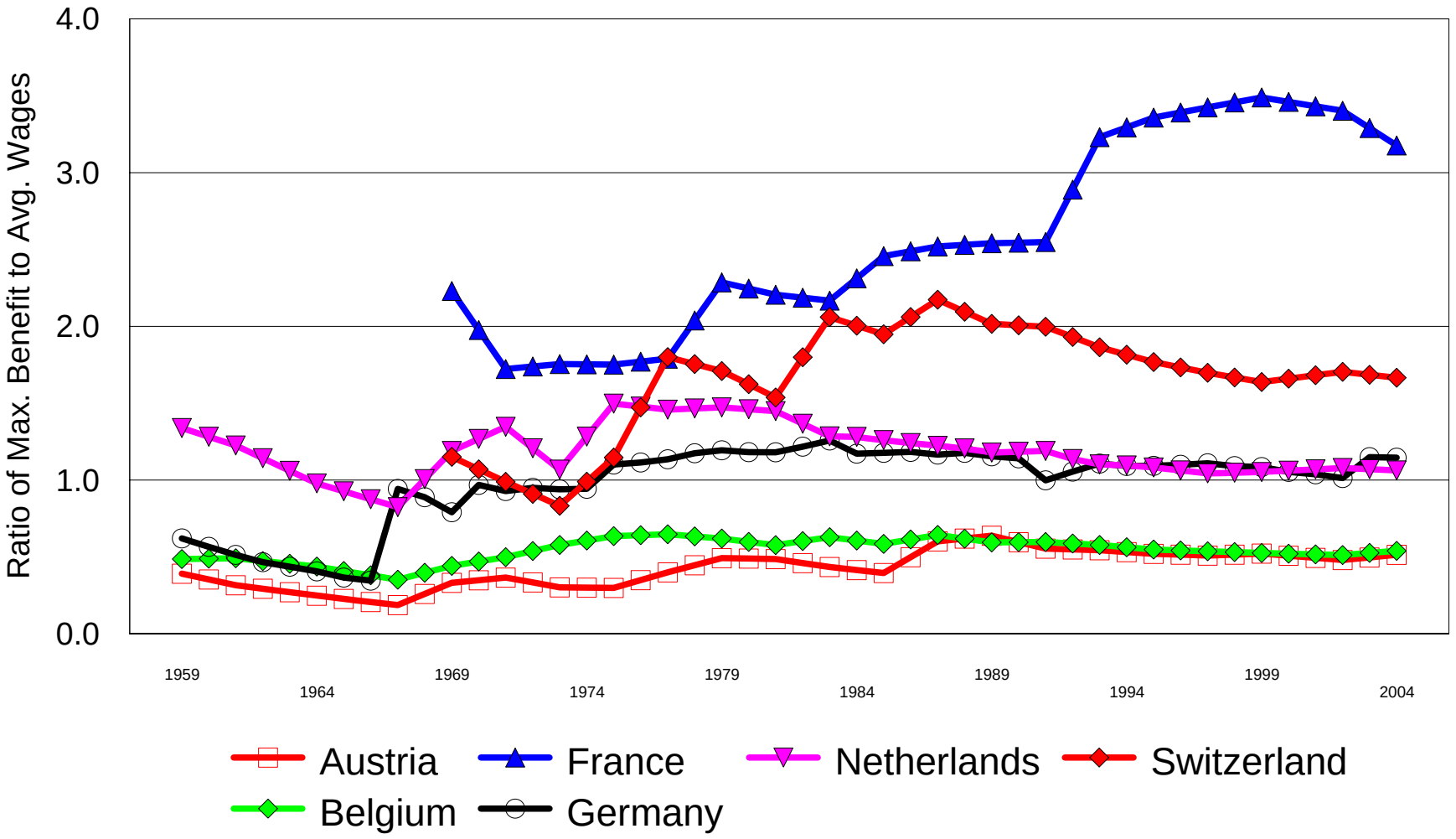


Figure 2. Statutory Replacement Rates

Six West European Countries, 1959 to 2004

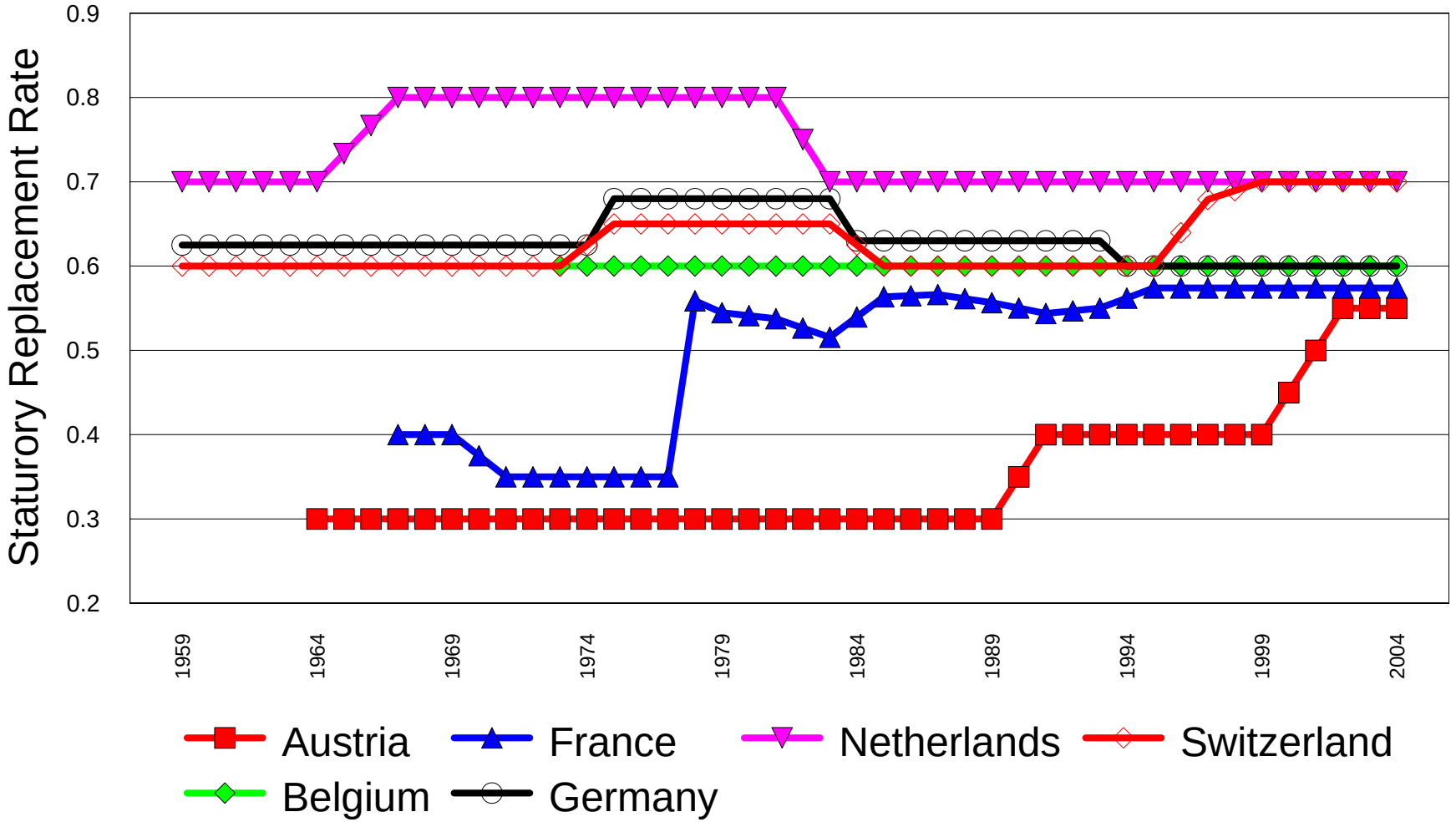
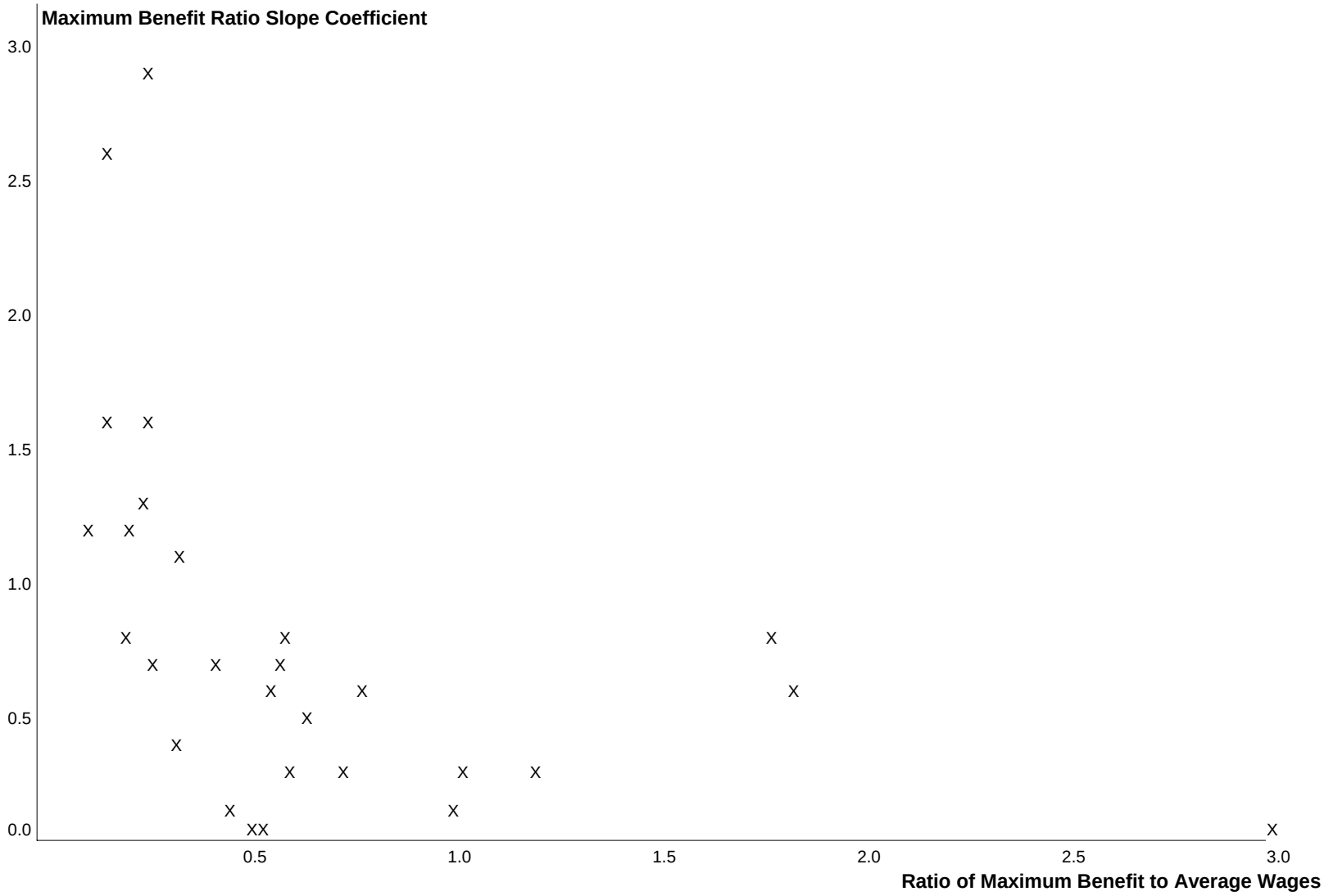


Figure 3. The Association Between the Maximum Benefit Ratio and Its Slope Coefficient



Regression Coefficient = 0.260 *(1.0/ (Max. Benefit/ Avg. Wages)) Adjusted R2 = 0.41
(8.9) Standard Error = 0.54

Figure 4. Replacement Rates in Australia and the U.S.

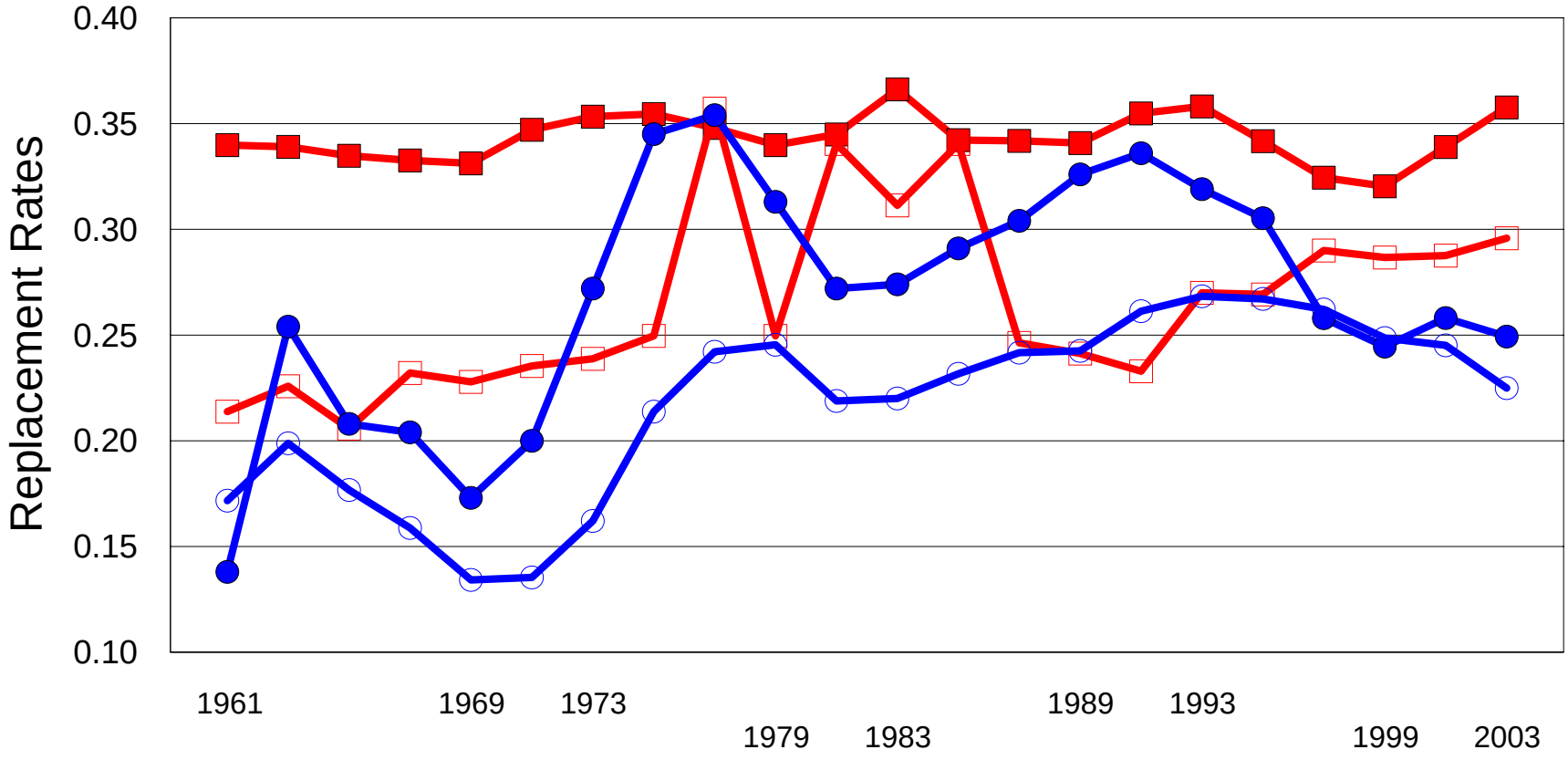


Figure 5. Replacement Rates in Denmark and Greece

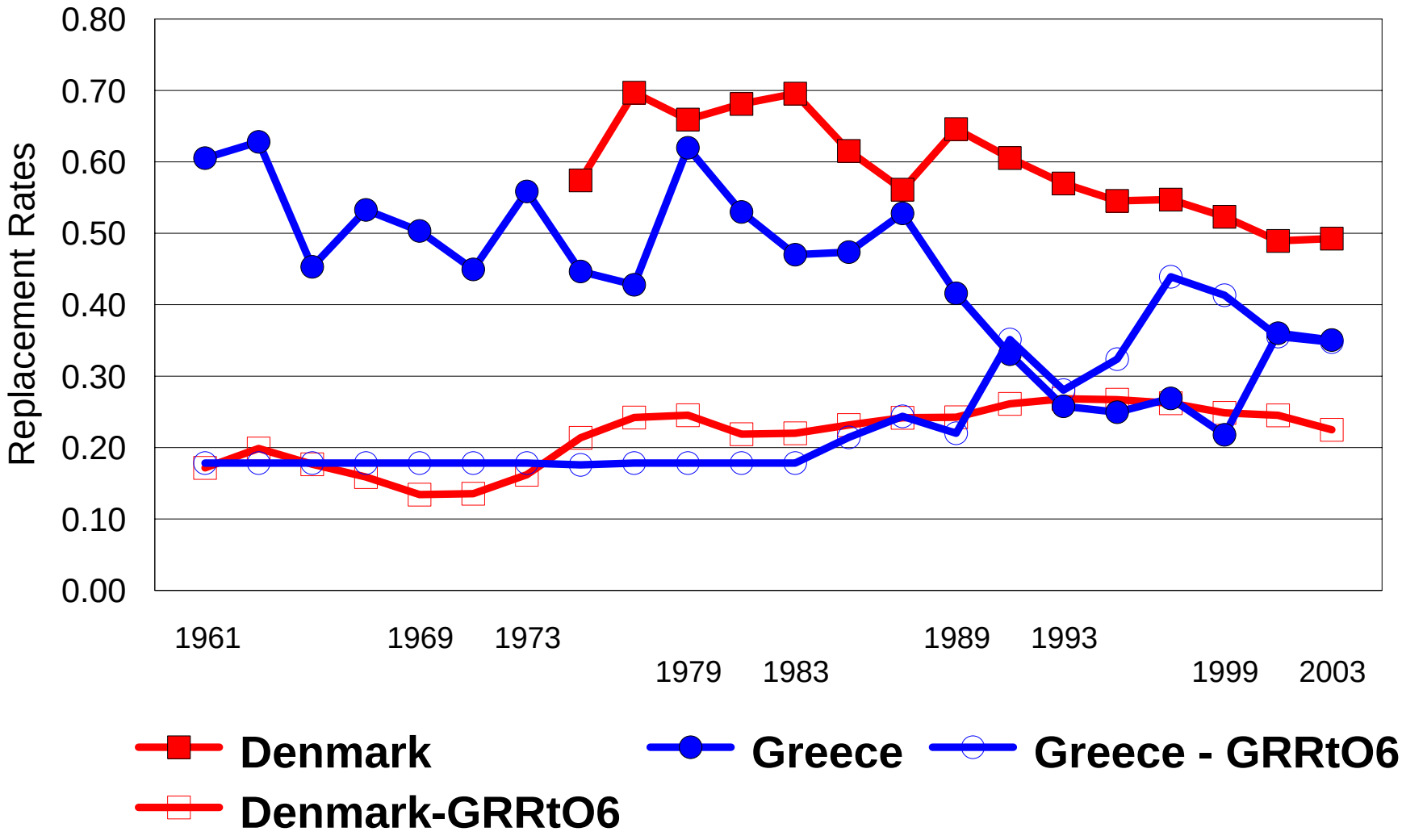


Figure 6. Comparison of Average Replacement Rates