Stratford Douglas is an associate professor of economics at West Virginia University. Howard J. Wall is a senior economist at the Federal Reserve Bank of St. Louis. The authors are grateful for the helpful suggestions of Gylfi Zoega, participants in the Labour Market Imperfections Group of the CEPR, and seminar participants at the Federal Reserve Bank of Cleveland.

The Revealed Cost of Unemployment

Stratford Douglas and Howard J. Wall

Traditionally, the costs of unemployment have been thought of in terms of the output or national income directly foregone. The most notable of these approaches is Okun's Law, which states that a one-percentage point increase in the unemployment rate translates roughly into a three-percent shortfall in output. Approaches such as this are incomplete for normative analysis because they do not provide a measure of the *utility* losses attributed to cyclical unemployment. Our proposed method for measuring these losses is based on the notion that the unemployment rate is a measure of general labor market risk. Because fluctuations in the unemployment rate reflect changes in risk, the cost of cyclical unemployment can be measured by the amount that people are willing to pay to avoid it.

Rosen (1979) and Roback (1982) view general labor market conditions, as represented by the unemployment rate, as a region-specific amenity that is taken into consideration when agents make migration decisions. The standard of living is the utility level that the average agent attains from the income and amenities of a region. If migration is frictionless: Utility-maximizing agents are optimally located at every point in time, the standard of living is uniform across regions, and interregional income differentials indicate the compensating differentials paid for differences in unemployment and other amenities (the "voting with your feet" criterion of Tiebout, 1956). Therefore, the compensating differential for a region's unemployment rate can be obtained by controlling for the differences in the other amenities.[1]

Following Tiebout, a large body of work has been produced in the regional economics and regional science literature dealing with compensating differentials, wages, and migration (see Porell, 1982, for a partial survey). At the same time, following Harris and Todaro (1970) and Hall (1970), macro-labor economists have produced many papers examining the relationships between migration, wages, and unemployment rates (see Ghatak, Levine, and Wheatley Price, 1996, for a survey). The most recent significant addition to this latter literature is Blanchflower and Oswald (1994), who have called into question a basic result of Harris-Todaro type models, which is that high unemployment rates are compensated for with higher wages.

The most glaring difference between the two approaches is that the macro-labor literature generally ignores the fact that potential migrants consider things other than wages and unemployment. Because of this, the literature searches for a link between those two variables as a means of proving or disproving that compensating differentials exist. It is recognized in the regional literature, however, that such a link, although interesting, proves little because wages and unemployment rates both can be compensated for with high levels of amenities. More importantly, given the ongoing debate among regional economists about the appropriateness of the assumption of standard-of-living equivalence, which is common to both literatures, the empirical results of both should be viewed with some trepidation.[2]

Our approach follows Rosen (1979) and Roback (1982) in considering the unemployment rate as a region-specific amenity. It is a departure from their models in that we recognize the possibility that, in the short run, frictions may prevent the optimal allocation of agents across regions. Because of these frictions, differences in unemployment rates and other amenities are not likely to be completely compensated for, meaning that standard-of-living equivalence does not occur at each point in time. To account for this, we follow Greenwood, Hunt, Rickman, and Treyz (1991) in using migration rates to measure the extent to which the system deviates from standard-of-living equivalence.

In our model, the probability of a consumer migrating between his present region and any other region depends on moving costs and the standard-of-living differential he perceives. When he does migrate,

[1] Rosen and Roback do not use their models to estimate the costs of unemployment. They include unemployment rates to control for standard-of-living differences not accounted for by differences in other amenities.

[2] See Evans (1990) and Hunt (1993) for discussions.

it is to the region that would give him the greatest standard-of-living improvement. Because of moving costs, the standard of living differs across regions in the short run, and high levels of unemployment will not be compensated for with higher levels of income. The net cross-migration rate between any two regions indicates the degree to which the standard of living differs between them, and can be used to estimate the income level that would make the standard of living the same across regions.

Using the above-described model, and data for interprovincial migration in Canada for 1971-90, we estimate the relationship between net cross-migration rates (representing differences in standard of living) and differences in per-capita incomes, unemployment rates, and other amenities. See Ledent (1990), Day (1992), and Milne (1993) for discussions of migration in Canada. We then use this estimated relationship to calculate for each region the relative income that would have equated the actual standard of living and the standard of living without cyclical unemployment. This compensating differential is what we call the cost of cyclical unemployment. In our model, preferences towards the tradeoff between unemployment and income are thus revealed by the actual utility-maximizing migration decisions of consumers.

In principle, any level of unemployment imposes a risk cost, regardless of whether the unemployment is cyclical or not. Because of this, our model need not be restricted to estimating the costs of cyclical unemployment, but also can be used to calculate the cost of having a level of unemployment above any benchmark rate. As we demonstrate, this can be done by comparing the actual standard of living with the standard of living that would have occurred had unemployment been at the benchmark rate.

The question we are addressing is similar to that of Lucas (1987), İmrohoroğlu (1989), Clark, Leslie, and Symons (1994), and Dolmas (1998), who wish to measure the costs of the business cycle in terms of what people are willing to pay to avoid business-cycle fluctuations. They use calibrated models of a risk-averse representative agent to calculate the costs of macroeconomic fluctuations around trend growth paths. Welfare costs arise in these models because the agent gets disutility from fluctuations in his consumption. While our question is similar to this, it is not compatible with theirs because their notion of the business cycle, as fluctuations around a trend, is different from our more traditional notion based on cyclical unemployment. Additionally, in our model, individual uncertainty about employment prospects exists even in the absence of aggregate uncertainty.

In this paper, Section I presents the model and Section II describes the data, estimation methods, and regression results. We calculate the revealed costs of cyclical unemployment and the levels of unemployment in Section III, and in Section IV we present our conclusions.

THE MODEL

Assume that an individual's assessment of the standard of living in a region has two components, one that is commonly held, and another that is individual-specific. Specifically, individual k's assessment of the standard of living he would attain at region i is

$$V_i^k = v(\mathbf{A}_i, U_i, Y_i) + \varepsilon_i^k; \tag{1}$$

where the function $v(.)$ is "the" standard of living at region i, U_i is the unemployment rate, Y_i is the per-capita income at i, and $\mathbf{A}_i$ is a vector of amenities, which includes *all* considerations other than income and unemployment. The stochastic term ε_i^k captures the extent to which individual k's assessment of region i differs from the common assessment.

If we actually knew the standard of living for each region, we could simply estimate the importance of each of the arguments in $v(.)$. With this estimate, we could calculate the cost of any level of unemployment in terms of lost standard of living, or, instead, express the cost in terms of the income that would compensate for the level of unemployment. The obvious problem with this is that it is impossible to know any region's standard of living. So, instead, we use the methodology developed by Greenwood, et al. (1991), who use migration data to estimate relative standard of living. Their empirical model is based on their assumption that a region's net migration rate measures the extent to which its standard of living differs from that of the nation:

$$\frac{\sum_{j=1} (M_{ij} - M_{ji})}{N_i} = \bar{v} - v_i;$$

where M_{ij} is the number of people who migrate from region i to region j, N_i is the population of region i, and $\bar{v}$ is the standard of living for the nation as a whole.

The problem with Greenwood, et al.'s methodology is that actual potential migrants compare their current region to each of the potential destinations, rather

than to the national average. Thus, it is the *cross*-migration decisions between two regions that provide the appropriate information about preferences, not the net in-migration rate. Because of this, we use the version of the Greenwood, et al. method developed by Douglas (1997), Douglas and Wall (2000), and Wall (2000). In this version, it is the expected net cross-migration rate between two regions that is an increasing function of the standard-of-living differential. Also, the appropriate cross-migration rate takes account of the number of migration *opportunities* in potential destination regions, as proxied for by the destination region's population. The standard-of-living differential between two regions therefore is measured by a gravity-type net cross-migration rate:

$$\frac{M_{ij} - M_{ji}}{N_i N_j} = v_j - v_i . \tag{2}$$

For purposes of estimation, specify the standard-of-living function as

$$v(\mathbf{A}_i, U_i, Y_i) = \alpha' \ln \mathbf{A}_i + \gamma \, lnY_i + \delta \, lnU_i ; \tag{3}$$

where γ and δ are positive constants. From this, the difference in the standard of living between the two regions is

$$v_j - v_i = \alpha' \left(\ln \mathbf{A}_j - \ln \mathbf{A}_i \right) + \gamma \left(lnY_j - lnY_i \right) + \delta \left(lnU_i - lnU_j \right). \tag{4}$$

Substitute equation 2 into equation 4 and allow for measurement and other error to obtain

$$\frac{M_{ij} - M_{ji}}{N_i N_j} = \lambda_j - \lambda_i + \gamma \, ln\left(\frac{Y_j}{Y_i}\right) + \delta \, ln\left(\frac{U_i}{U_j}\right) + \eta_{ij}; \tag{5}$$

where $\lambda_i \equiv \alpha' \ln \mathbf{A}_i$, the utility value of amenities.

As mentioned above, the basic methodology of using migration rates to estimate standard-of-living differentials follows from Greenwood, et al. (1991), Douglas and Wall (2000), and Wall (2000). Because we wish to separate the effect of labor-market conditions from that of other amenities, we expand the methodology by including the relative unemployment rate as a right-hand-side variable. This follows Rosen (1979) and Roback (1982), who viewed the unemployment rate as a region-specific amenity.

EMPIRICAL RESULTS

Data and Estimation

The best country to apply our model to is Canada. Not only are the migration and other data of very high quality, but, more importantly for our present purposes, reliable estimates of provincial noncyclical rates of unemployment are readily available. Cross-migration data are from the Total Migration Series from Statistics Canada 1971-90, as calculated from census figures and Family Allowance accounts. The migration data go back to 1950, but as reported by Statistics Canada, they are much more reliable after 1970. Real per-capita provincial income is calculated using provincial price indices.

In implementing equation 5, we allow amenity values to change every five years. It is possible to allow amenities to vary more frequently, but doing so would increase the variability of the estimates. Let Z denote the number of periods over which the amenities are fixed, and P the number of provinces. There is one observation per-year per unique pair of provinces, for a total of $ZP(P-1)/2 = 900$ observations, each containing the log of real relative income $\ln(Y_j/Y_i)$, the log of relative unemployment $\ln(U_i/U_j)$, and a set of discrete variables that identify the provinces. The discrete variables are necessary to estimate relative amenities, and consist of one discrete variable for each province for each five-year period. Within its corresponding five-year period, each discrete variable has the value of 1 if the province is province i, -1 if the province is province j, and zero otherwise. We avoid singularity by imposing the restriction that the λs sum to zero for each five-year period, meaning that the amenity estimates are relative to zero.

The regression results are summarized by Table 1. The coefficients on real income and unemployment are positive and statistically different from zero. Note that $\hat{\gamma} > \hat{\delta}$ (i.e., the standard of living is more responsive to a change in relative income than to a change in relative unemployment).

Estimated Amenities

Although our primary focus here is to estimate the costs of unemployment, our model can be used to calculate the relative values of other amenities

Table 1

Regression Results

	λ	SE	*t*
1971-75			
Prince Edward Island	1.61	0.18	9.00
Newfoundland	1.39	0.17	8.27
New Brunswick	0.85	0.12	7.02
Nova Scotia	0.48	0.10	4.65
Alberta	–0.21	0.11	–1.89
British Columbia	–0.36	0.17	–2.13
Quebec	–0.37	0.10	–3.55
Manitoba	–0.84	0.10	–8.86
Saskatchewan	–0.94	0.13	–7.19
Ontario	–1.61	0.20	–8.17
1976-80			
Newfoundland	1.17	0.16	7.40
Prince Edward Island	1.02	0.16	6.39
New Brunswick	0.89	0.13	6.91
Nova Scotia	0.68	0.11	6.22
Alberta	–0.31	0.14	–2.19
Saskatchewan	–0.38	0.13	–3.06
Quebec	–0.46	0.12	–3.78
British Columbia	–0.54	0.16	–3.35
Manitoba	–0.77	0.10	–7.83
Ontario	–1.29	0.16	–8.00
1981-85			
Newfoundland	1.19	0.17	6.93
Prince Edward Island	1.08	0.16	6.70
New Brunswick	0.92	0.12	7.42
Nova Scotia	0.77	0.10	7.53
Quebec	–0.28	0.10	–2.71
Manitoba	–0.45	0.09	–4.74
Saskatchewan	–0.49	0.11	–4.43
British Columbia	–0.61	0.14	–4.26
Ontario	–0.99	0.15	–6.45
Alberta	–1.15	0.15	–7.87
1986-90			
Newfoundland	0.96	0.14	6.70
Prince Edward Island	0.84	0.13	6.62
New Brunswick	0.72	0.11	6.73
Nova Scotia	0.58	0.09	6.50
British Columbia	0.03	0.12	0.23
Quebec	–0.26	0.09	–2.83
Manitoba	–0.42	0.09	–4.55
Saskatchewan	–0.46	0.11	–4.21
Alberta	–0.72	0.12	–6.01
Ontario	–1.26	0.16	–7.91
Real income (γ)	4.07	0.62	6.62
Unemployment (δ)	0.82	0.16	5.28
$R^2 = 0.319$			

across provinces. Refer to Table 1 and note that $\hat{\lambda} > 0$ indicates that the utility value of amenities (exclusive of the unemployment rate) was higher than the national average, and vice versa. The provinces are listed in order of the value of their amenities. See Douglas and Wall (2000) for the use of these results to rank the provinces by total standard of living.

THE REVEALED COST OF UNEMPLOYMENT

Cyclical Unemployment

In this section, we calculate the amount of income that people would be willing to give up in return for having no cyclical unemployment. Define the non-cyclical standard-of-living in province j as the standard of living that would prevail if the unemployment rate is at the noncyclical rate U'_j, and if per-capita income were Y_j. The noncyclical standard of living is then

$$v'_j = \lambda_j + \gamma \ln Y'_j - \delta \ln U'_j. \tag{6}$$

Substituting the estimated parameters $\hat{\gamma}$ and $\hat{\delta}$, the relative income that would be required to equate the noncyclical standard of living and the actual standard of living, $RY^*_j \equiv Y'_j / Y_j$, can be obtained from:

$$\hat{\gamma} \ln RY^*_j + \hat{\delta} \ln\left(\frac{U_j}{U'_j}\right) = 0. \tag{7}$$

If a province's actual unemployment rate is greater than the noncyclical rate, then RY^*_j is less than one. The rate at which Y'_j is less than actual income is the amount of income that people would be willing to give up to have no cyclical unemployment, which is what we call the cost of cyclical unemployment. Thus, the cost of cyclical unemployment is $L_{jt} \equiv 1 - RY^*_{jt}$ for province j in year t. Aggregation of these costs across provinces and over time is straightforward, and is described in the appendix. The next step is to find appropriate measures of U'_j to substitute into equation 7. We use two possible measures to give us the lower and upper bounds of the costs of cyclical unemployment.

Lower limit of the costs of cyclical unemployment. In this subsection we calculate the costs of cyclical unemployment using estimates of provincial

Table 2

Provincial Noncyclical Rates of Unemployment; Burns (1991)

	Alb.	B.C.	Man.	N.B.	Nfl.	N.S.	Ont.	PEI	Que.	Sas.	Canada
1971	5.4	7.3	5.4	6.1	9.4	6.4	4.9	7.1	7.1	3.5	5.9
1972	5.5	7.3	5.2	8.5	9.9	7.0	4.9	8.4	7.0	4.3	6.0
1973	5.0	6.1	4.7	7.9	9.9	7.6	5.1	8.4	7.0	3.6	5.9
1974	4.1	7.0	4.1	9.3	14.3	8.1	5.1	8.6	7.6	2.6	6.1
1975	3.5	8.9	4.5	11.1	14.4	8.6	5.4	8.7	8.2	3.6	6.7
1976	4.2	9.0	5.2	11.1	15.6	8.7	5.7	9.1	8.7	3.8	7.0
1977	4.2	8.4	5.8	11.5	15.6	9.4	5.7	9.3	8.9	4.5	7.1
1978	4.0	7.3	5.2	10.2	14.4	9.3	5.6	8.9	8.7	4.1	6.8
1979	3.5	5.8	4.5	10.7	12.9	9.6	5.4	8.7	8.3	3.9	6.3
1980	3.2	5.6	4.8	11.3	12.5	9.4	5.3	9.2	8.8	3.8	6.3
1981	4.2	8.7	5.9	12.1	15.6	10.4	5.7	10.0	9.7	5.4	7.4
1982	6.9	11.5	7.1	13.5	16.2	11.7	6.6	11.1	10.5	6.4	8.7
1983	8.6	10.0	7.1	14.1	16.3	12.1	6.1	11.6	9.8	6.9	8.4
1984	8.4	11.1	6.8	14.2	18.4	12.2	6.2	11.6	9.8	7.1	8.6
1985	8.5	11.3	7.1	13.6	18.1	12.3	6.1	11.8	9.8	7.5	8.6
1986	8.1	10.5	6.4	12.5	16.9	11.4	5.6	11.0	8.5	6.6	7.8

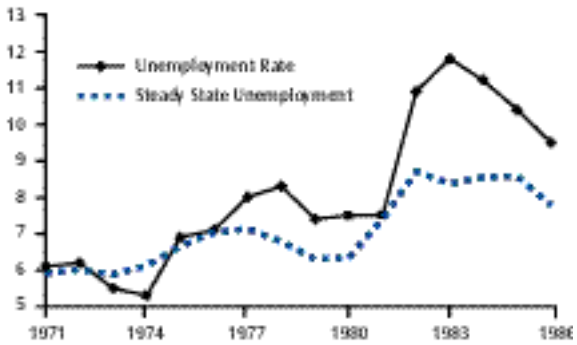
noncyclical unemployment rates for each year from 1971-86, taken from Burns (1991) and reported in Table 2. As described by Burns, his estimates of the noncyclical rates are based on what would be expected in the steady state. The Canadian unemployment experience over this period is summarized by Figure 1. The estimated national steady-state unemployment in Canada ranged between 6 and 7 percent during the 1970s, and rose to around 8 percent during the early 1980s. For all years but 1973 and 1974, cyclical unemployment was positive at the national level. The provincial noncyclical rates, reproduced in Table 3, varied greatly across Canada during this period.

Table 3 presents the cost of cyclical unemployment as a percentage of provincial income for each province for each year (L_{jt}). The bottom row is each province's cost as a percent of income over the entire time period (L_j), and the last column is the aggregate cost for Canada for each year (L_t). The bottom right-hand corner is the total cost of cyclical unemployment for Canada for the period 1971-86 (L).

Cyclical unemployment was most costly for Ontario, 4.7 percent of provincial income over the period. The provinces with the lowest costs of cyclical unemployment were New Brunswick, Newfoundland, Nova Scotia, and Saskatchewan; 0.7 to 1.1 percent of provincial income. This was achieved in

Figure 1

Canadian Unemployment 1971-86



Saskatchewan with low steady-state unemployment and low actual unemployment, whereas the other three had high levels of both, but with little difference between them. For the remaining five provinces the cost of cyclical unemployment was between 2.2 and 3.2 percent of provincial income.

For Canada as a whole, yearly costs of cyclical unemployment were low during the early 1970s, rose to a peak of 7.9 percent of national income in 1983, and fell to 4.2 percent by 1986. For the entire

Table 3

Lower Limits of the Costs of Cyclical Unemployment, as a Percentage of Income
Noncyclical unemployment rates = steady–state rates from Burns (1991)

	Alb.	B.C.	Man.	N.B.	Nfl.	N.S.	Ont.	PEI	Que.	Sas.	Canada
1971	0.8	–0.2	1.1	–0.3	–2.3	1.8	2.0	5.7	0.6	0.5	1.1
1972	0.5	1.5	0.9	–3.6	–1.3	–0.3	0.5	5.7	1.3	0.5	0.7
1973	0.8	1.9	–0.3	–0.2	0.0	–2.7	–3.2	1.8	–0.8	–0.9	–1.4
1974	–3.4	–2.6	–2.1	–4.2	–1.6	–3.7	–2.8	0.4	–2.9	1.8	–2.7
1975	3.8	–0.9	0.3	–2.3	–0.5	–2.0	3.5	1.4	–0.3	–4.9	1.3
1976	–1.2	–1.0	–1.9	0.0	–3.0	1.6	1.7	1.0	–0.1	0.7	0.4
1977	1.3	0.3	0.8	3.0	0.0	2.5	4.1	1.2	3.0	–0.3	2.7
1978	3.3	2.5	4.9	4.2	2.5	2.5	5.2	2.0	4.6	3.6	4.4
1979	2.5	5.9	3.6	0.6	3.4	1.1	3.9	5.1	2.9	1.4	3.5
1980	3.4	3.9	2.6	–0.5	1.3	0.8	5.4	2.9	2.3	3.1	3.7
1981	–1.9	–5.0	0.1	–1.0	–2.5	–0.4	2.9	2.3	1.4	–3.1	0.5
1982	2.2	1.2	3.5	0.7	0.7	2.3	8.1	3.1	5.7	–1.0	5.1
1983	4.4	6.7	5.8	1.0	2.9	1.7	12.0	1.2	7.3	1.1	7.9
1984	5.8	6.0	4.4	1.0	2.0	1.3	8.0	1.9	5.6	2.6	6.2
1985	3.4	4.6	2.9	2.1	2.8	2.1	5.5	2.5	4.0	1.5	4.3
1986	3.9	3.6	3.8	2.7	2.7	2.9	4.3	4.1	5.2	3.0	4.2
Sum	2.4	2.2	2.4	0.7	0.9	1.1	4.7	2.6	3.2	0.8	3.3

period of 1971-86, the costs of cyclical unemployment were 3.3 percent of national income.

Upper limit of the costs of cyclical unemployment. There is a potential problem with using estimates of the noncyclical unemployment that are based on what should occur in the steady state, as we have done above. When there is unemployment hysteresis, an increase in cyclical unemployment can cause the steady-state level of unemployment to rise.[3] If current cyclical unemployment increases future steady-state rates, then the use of steady-state unemployment rates suppresses the effect that past unemployment has on current risk. Because of this, we must eliminate the possible effects that the actual unemployment rates may have had on steady-state rates.

In order to obtain an upper limit on the costs of unemployment over the period, we assume that all changes in the steady-state rates estimated by Burns (1991) are attributed to hysteresis. Thus, to eliminate the effect that the unemployment history may have had on the steady-state unemployment rates, we use the estimates of the steady-state rates for 1971 as the noncyclical unemployment rate for the entire period. These estimates of the costs of cyclical unemployment are presented in Table 4.

Note that the sums of the upper limits of costs of cyclical unemployment are for 1971-86 only, so that they are comparable to the lower limits calculated above. The difference between the upper and lower limits are greatest for the Maritime Provinces, where the increases in the steady-state unemployment rates were quite large. Only for Alberta, Manitoba, and Ontario are the upper limits not more than twice the lower limits. For Canada as a whole, when all changes in the steady-state unemployment rates are attributed to the unemployment history, the costs of cyclical unemployment between 1971 and 1986 was 7.4 percent of national income.

Summary. Another way of interpreting the costs of cyclical unemployment is to call them the benefits that would accrue from policies that eliminated cyclical unemployment. If these policies also have the effect of slowing down growth, it is useful to know the growth-unemployment tradeoff to see if the policies would have been worthwhile. For Canada between 1971 and 1986, in which real growth aver-

[3] See Lindbeck and Snower (1986) and Layard, Nickell, and Jackman (1991).

Table 4

Upper Limits of the Costs of Cyclical Unemployment, as a Percentage of Income

	Alb.	B.C.	Man.	N.B.	Nfl.	N.S.	Ont.	PEI	Que.	Sas.	Canada
1971	0.8	–0.2	1.1	–0.3	–2.3	1.8	2.0	5.7	0.6	0.5	1.1
1972	0.9	1.6	0.2	3.2	–0.2	1.7	0.4	9.5	1.1	5.1	1.0
1973	–0.8	–1.7	–2.9	5.3	1.2	0.7	–2.6	5.5	–1.0	0.0	–1.5
1974	–8.6	–3.3	–7.5	4.3	7.1	1.2	–2.0	4.6	–1.5	–4.1	–2.4
1975	–5.3	3.2	–3.3	10.0	8.5	4.1	5.4	5.9	2.7	–4.1	3.0
1976	–6.1	3.2	–2.7	13.0	7.5	8.3	4.8	6.4	4.1	2.6	3.5
1977	–3.7	3.1	2.2	17.0	11.0	11.0	7.4	7.0	7.9	5.2	6.2
1978	–2.8	2.6	4.1	16.0	12.0	11.0	8.1	6.9	9.0	6.9	6.9
1979	–6.5	0.9	0.0	13.0	10.0	9.8	5.9	9.8	6.2	3.5	4.3
1980	–7.3	–1.6	0.4	13.0	7.3	8.9	6.9	8.6	6.8	4.8	4.4
1981	–6.8	–1.6	1.9	14.0	8.1	9.9	6.1	9.8	8.0	6.1	4.5
1982	7.4	11.0	9.6	18.0	12.0	16.0	15.0	13.0	14.0	12.0	13.0
1983	15.0	14.0	12.0	20.0	15.0	16.0	16.0	12.0	15.0	16.0	15.0
1984	16.0	15.0	9.4	20.0	17.0	16.0	13.0	13.0	13.0	18.0	14.0
1985	13.0	14.0	8.9	20.0	17.0	17.0	10.0	14.0	11.0	19.0	12.0
1986	13.0	11.0	7.5	19.0	16.0	16.0	7.3	14.0	9.3	17.0	9.8
1987	12.0	10.0	6.6	17.0	14.0	14.0	4.4	14.0	7.8	16.0	7.9
1988	8.1	7.3	7.8	15.0	12.0	9.9	0.4	13.0	5.8	17.0	4.9
1989	5.9	4.5	7.2	16.0	11.0	9.3	0.7	15.0	5.7	17.0	4.4
1990	5.4	2.6	6.2	15.0	13.0	11.0	5.2	16.0	7.5	15.0	6.3
Sum	3.0	5.8	3.9	15.0	11.0	11.0	7.9	9.9	8.1	8.7	7.4

aged 3.6 percent a year, a growth rate that was 0.4-0.8 percent higher in each year would have generated enough income to compensate for the 3.3-7.4 percent costs of cyclical unemployment. In other words, the social benefit of eliminating cyclical fluctuations of unemployment during this period would have been the same as the social benefit of having a growth rate that was 0.4-0.8 percent higher in each year. Real growth in Canada averaged 4.6 percent a year from 1950 to 1970. If growth from 1971 to 1986 had kept up with this rate, even the upper limit of the costs of cyclical unemployment would have been compensated for.

Any complete discussion of our results must keep in mind that the results are very sensitive to the time period examined. We selected our time period because the migration data are much more reliable after 1970, and because the most recent estimates we have of the natural rate for all the provinces are from 1986. Adding years to the beginning or the end of our period would lower the estimated total costs, and also lower the additional growth that would have compensated for the costs. For instance, simply by including 1987-90 in calculating the upper limit of the costs of cyclical unemployment, the compensatory growth per year falls to 0.6 percent. In addition, because the years 1971-86 have been the most economically turbulent years in post-war Canada, our estimates of the costs of cyclical unemployment over the period are higher than for other periods. We should also keep in mind that policymakers may have already learned lessons from the period, and that the likelihood of a repetition of the reflation/deflation cycle of the late 1970s and early 1980s may be low. However, with policymaking being what it is, we should not count on this being true.

Unemployment Levels

Another way of looking at the costs of unemployment is that there is some benchmark level of unemployment that is viewed subjectively as desirable or optimal. An unemployment rate above this benchmark level is socially suboptimal and therefore

Table 5

Costs of Having Unemployment Above 6 Percent, as a Percentage of Income

	Alb.	B.C.	Man.	N.B.	Nfl.	N.S.	Ont.	PEI	Que	Sas.	Canada
1971	0.0	3.8	0.0	0.0	7.0	3.0	0.0	9.2	4.0	0.0	1.7
1972	0.0	5.7	0.0	3.4	9.2	2.9	0.0	13.0	4.5	0.0	2.1
1973	0.0	2.3	0.0	5.6	11.0	1.9	0.0	9.0	2.4	0.0	1.2
1974	0.0	0.6	0.0	4.6	17.0	2.5	0.0	8.1	1.8	0.0	1.0
1975	0.0	7.4	0.0	11.0	19.0	5.3	1.2	9.4	6.2	0.0	3.6
1976	0.0	7.4	0.0	13.0	18.0	9.6	0.6	9.9	7.7	0.0	4.0
1977	0.0	7.3	0.0	17.0	21.0	12.0	3.1	11.0	12.0	0.0	6.2
1978	0.0	6.7	1.8	16.0	22.0	12.0	3.8	10.0	13.0	0.0	6.8
1979	0.0	5.0	0.0	13.0	21.0	11.0	1.6	13.0	9.8	0.0	4.7
1980	0.0	2.4	0.0	13.0	17.0	10.0	2.6	12.0	11.0	0.0	4.9
1981	0.0	2.3	0.0	14.0	18.0	11.0	1.9	13.0	12.0	0.0	4.9
1982	5.2	15.0	7.2	19.0	23.0	17.0	10.0	17.0	18.0	0.4	13.0
1983	12.0	18.0	9.6	20.0	26.0	17.0	12.0	16.0	19.0	4.1	14.0
1984	13.0	20.0	6.9	20.0	28.0	17.0	8.6	17.0	17.0	6.1	13.0
1985	11.0	19.0	6.5	21.0	29.0	18.0	6.0	18.0	15.0	6.2	11.0
1986	10.0	16.0	5.1	19.0	27.0	17.0	3.0	18.0	13.0	5.1	9.0
1987	10.0	15.0	4.2	17.0	25.0	16.0	0.2	17.0	12.0	4.3	7.2
1988	5.9	12.0	5.4	15.0	23.0	11.0	0.0	17.0	9.5	4.8	5.6
1989	3.7	8.7	4.8	16.0	22.0	11.0	0.0	19.0	9.3	4.6	5.0
1990	3.2	6.7	3.9	15.0	24.0	12.0	0.9	20.0	11.0	3.2	5.6
Sum	4.7	10.0	3.0	15.0	21.0	12.0	4.2	14.0	12.0	1.8	7.5

imposes costs on society. Thus, the cost of unemployment can be viewed as the cost of it being above some acceptable benchmark level. The method described above can be adapted easily to include these other costs of unemployment. Note that our calculations are not net of the costs of achieving the benchmark rates.

Substitute any benchmark unemployment rate for U_j' in equation 7, and the interpretation of L_{it} becomes the percent of provincial income that people would be willing to pay to have the benchmark unemployment rate. In other words, it is the cost of having unemployment above the benchmark rate. Compared to the calculation of the costs of cyclical unemployment, the only difference here is that if a province's actual unemployment is lower than the benchmark rate, then the cost of unemployment is zero.

The selection of a benchmark unemployment rate is completely subjective. There are many different views about what the "desirable," "optimal," or "minimally acceptable" level of unemployment is. Without apologies, the arbitrary unemployment benchmark that we chose for each province for each year is 6 percent. The costs of unemployment above this benchmark are presented in Table 5. Although it is perfectly reasonable to believe that the desirable unemployment rate is different for provinces and across time, we leave this calculation to the reader. Note that in Table 5, the total costs over time are calculated for the years 1971-86, so that they are comparable to the total costs calculated in Tables 3 and 4.

As indicated by Table 5, the costs of having unemployment above 6 percent during 1971-86 varied widely across provinces. For British Columbia, New Brunswick, Newfoundland, Nova Scotia, Prince Edward Island, and Quebec, the costs were above 10 percent of provincial income. Saskatchewan and Manitoba, on the other hand, had costs of only 1.8 and 3.0 percent, respectively. For Canada as a whole, the cost of having unemployment above 6 percent was lowest during 1973-74, peaked at 14 percent during 1983, and was 7.5 percent of national income

over the period. Additional growth of 0.6 percent a year would have compensated for these costs.

CONCLUSIONS

The problem with existing methods of measuring the costs of unemployment is that they are not particularly useful for normative policy analysis. Their focus is on the output that is foregone when there is unemployment, instead of on the utility losses that result from unemployment. In contrast, we propose an approach that yields estimates of the utility costs of unemployment as measured by the amount that people would be willing to pay to avoid the risk of unemployment. Under the assumptions of our model, the difference in the standard of living between two regions is equal to the difference in the rates of cross migration. We then estimate the extent to which income, unemployment, and other amenities contribute to differences in the standard of living. Using these estimates, we calculate the amount of income that people would be willing to pay in order to avoid the possibility of unemployment. We estimate the cost of cyclical unemployment in Canada from 1971 to 1986 to have been between 3.3 and 7.4 percent of national income over the period. Additional growth of 0.4 to 0.8 percent per year would have generated enough income to have compensated for these costs.

REFERENCES

Blanchflower, David G., and Andrew Oswald. *The Wage Curve*, MIT Press, 1994.

Burns, Andrew. "The Natural Rate of Unemployment: Canada and the Provinces," in *Canadian Unemployment: Lessons from the 80's and Challenges for the 90's*, Surendra Gera, ed., Ottawa: Economic Council of Canada, 1991, pp. 39-51.

Clark, Kenneth, Derek Leslie, and Elizabeth Symons. "The Costs of Recession," *The Economic Journal* (January 1994), pp. 20-36.

Day, Kathleen M. "Interprovincial Migration and Local Public Goods," *Canadian Journal of Economics* (February 1992), pp. 123-44.

Dolmas, Jim. "Risk Preferences and the Welfare Cost of Business Cycles," *Review of Economic Dynamics* (1998), pp. 646-76.

Douglas, Stratford. "Estimating Relative Standard of Living in the United States Using Cross-Migration Data," *Journal of Regional Science* (August 1997), pp. 411-36.

_____, and Howard J. Wall. "Measuring Relative Quality of Life from a Cross-Migration Regression, With an Application to Canadian Provinces," *Research in Labor Economics* (2000), forthcoming.

Evans, Alan W. "The Assumption of Equilibrium in the Analysis of Migration and Interregional Differences: A Review of Some Recent Research," *Journal of Regional Science* (November 1990), pp. 515-31.

Ghatak, Subrata, Paul Levine, and Stephen Wheatley Price. "Migration Theories and Evidence: An Assessment," *Journal of Economic Surveys* (June 1996), pp. 159-98.

Greenwood, Michael J., Gary L. Hunt, Daniel S. Rickman, and George I. Treyz. "Migration, Regional Equilibrium, and the Estimation of Compensating Differentials," *American Economic Review* (December 1991), pp. 1382-90.

Hall, Robert E. "Why is the Unemployment Rate So High at Full Employment?" *Brookings Papers on Economic Activity* (1970), pp. 369-410.

Harris, John R., and Michael P. Todaro. "Migration, Unemployment, and Development: A Two-Sector Analysis," *American Economic Review* (March 1970), pp. 126-42.

Hunt, Gary L. "Equilibrium and Disequilibrium in Migration Modeling," *Regional Studies* (1993), pp. 341-49.

İmrohoroğlu, Ayse. "Cost of Business Cycles with Indivisibilities and Liquidity Constraints," *Journal of Political Economy* (December 1989), pp. 1364-83.

Layard, Richard, Stephen Nickell, and Richard Jackman. *Unemployment: Macroeconomic Performance and the Labour Market*, Oxford University Press, 1991.

Ledent, Jacques. "Canada," in *International Handbook on Internal Migration*, Charles B. Nam, William J. Serow, and David F. Sly, eds., Greenwood Press, 1990, pp. 47-61.

Lindbeck, Assar, and Dennis Snower. "Wage Setting, Unemployment, and Insider-Outsider Relations," *American Economic Review* (May 1986), pp. 235-39.

Lucas, Robert E. *Models of Business Cycles*, Blackwell, 1987.

Milne, William J. "Macroeconomic Influences on Migration," *Regional Studies* (1993), pp. 365-73.

Porell, Frank W. "Intermetropolitan Migration and the Quality of Life," *Journal of Regional Science* (May 1982), pp. 137-58.

Roback, Jennifer. "Wages, Rents, and the Quality of Life," *Journal of Political Economy* (December 1982), pp. 1257-78.

Rosen, Sherwin. "Wage-Based Indexes of Urban Quality of Life," in *Current Issues in Urban Economics*, Peter Mieszkowski and Mahlon Straszheim, eds., Johns Hopkins University Press, 1979, pp. 74-104.

Tiebout, Charles M. "A Pure Theory of Local Expenditures," *Journal of Political Economy* (1956), pp. 416-24.

Wall, Howard J. "Voting with Your Feet in the United Kingdom: Using Cross-Migration Rates to Estimate Relative Living Standards," *Papers in Regional Science* (2000), forthcoming.

Appendix

AGGREGATING THE PROVINCIAL COSTS OF UNEMPLOYMENT

As a percentage of national income, the total cost of cyclical unemployment in year t over the P provinces of Canada is

$$L_t = \left(\sum_{j=1}^{P} L_{jt} N_{jt} Y_{jt} \right) \Big/ \left(\sum_{j=1}^{P} N_{jt} Y_{jt} \right);$$

where N_{jt} is province j's population in year t. For combining costs over time, we simply use the share of all income generated over the entire period that would have compensated for the costs of cyclical unemployment. So, the cost of cyclical unemployment for province j over any T years is

$$L_j = \left(\sum_{t=1}^{T} L_{jt} N_{jt} Y_{jt} \right) \Big/ \left(\sum_{t=1}^{T} N_{jt} Y_{jt} \right).$$

Finally, the total costs of cyclical unemployment in Canada over the entire time period is obtained by summing the numerator and denominator of the above expression across provinces:

$$L = \left(\sum_{t=1}^{T} \sum_{j=1}^{P} L_{jt} N_{jt} Y_{jt} \right) \Big/ \left(\sum_{t=1}^{T} \sum_{j=1}^{P} N_{jt} Y_{jt} \right).$$