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A Simulation Model to Test the Economic Effects of Immigration

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by

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A Simulation Model to Test the Economic Effects of Immigration

Introduction

The use of macroeconomic models to test the effects of government monetary and fiscal policy is by now an established practice in economics.[1] Similar models have been used to test the effects of a variety of demographic events on economic performance.[2] Many of these models have been directed at the problems of over-population and poor health in less developed countries. This paper reports on a model which is designed to test the economic effects of changes in a number of demographic variables. The use of the model is assessing the economic impact of changes in immigration is also illustrated.

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[1] See, for example, N. K. Choudhry, et al., The TRACE Econometric Model of the Canadian Economy (Toronto: University of Toronto Press, 1972); J. P. Cooper and S. Fischer, "Simulation of Monetary Rules in the FRB-MIT-Penn Model," Journal of Money, Credit, and Banking (May, 1972), 384-396; J. S. Duesenberry, O. Eckstein, and G. Fromm, "A Simulation of the United States Economy in Recession," Econometrica, XXVIII (October, 1960), 749-809; M. K. Evans, "An Econometric Model of the Israeli Economy, 1952-1965," Econometrica, XXXVIII, No. 5 (September, 1970), 624-660; G. Fromm and P. Taubman, Policy Simulations with an Econometric Model (Washington, D.C.: The Brookings Institution, 1968); and R. S. Holbrook, "An Approach to the Choice of Optimal Policy Using Large Econometric Models," Bank of Canada Staff Research Studies, No. 8 (Ottawa, 1973). Simulation has been used to a lesser extent in analyzing micro-economic problems. An example is G. H. Orcutt, et al., Microanalysis of Socioeconomic Systems: A Simulation Study (New York: Harper and Row, 1961).

[2] Primary examples of this type of model are found in the following: A. J. Coale and E. M. Hoover, Population Growth and Economic Development in Low Income Countries (Princeton, N.J.: Princeton University Press, 1958); R. Barlow, The Economic Effects of Malaria Eradication (Ann Arbor, Michigan: Bureau of Public Health Economics, University of Michigan, 1969); S. Enke and R. G. Zind, "Effect of Fewer Births on Average Income," Journal of Biosocial Sciences, I (January, 1969), 41-55; F. T. Denton and B. G. Spencer, "A Simulation of the Effects of Population Change on a Neoclassical Economy" (Hamilton, Canada: Working Paper No. 71-01, Department of Economics, McMaster University, 1971); S. Enke et al., Population Growth and Economic Development, 5 Vols. (Santa Barbara, California: TEMPO, n.d.); and R. Barlow and G. W. Davies, "Policy Analysis with a Disaggregated Economic-Demographic Model," mimeo., 1973.

The next section contains a description of the model. The following section describes the tracking ability of the model and illustrates its use in evaluating the effects of changes in immigration. The paper concludes with a section on the policy implications of the results and a brief summary. Appendix I contains a complete listing of the equations of the model and a glossary of variable names.

Description of Model

The model used in these experiments is a modified version of TRACE 1969 which is a Canadian annual econometric model designed to test the short- and medium-term effects of changes in monetary and fiscal policy.[3] The TRACE model itself is a medium-sized Keynesian model of the Canadian economy with an endogenous supply sector which influences wages and prices. Briefly, the model uses variations of standard consumption, investment, and export and import functions to determine real or constant dollar aggregate demand. A number of capital stocks are also endogenous in the model and they, in conjunction with the potential supply of labour, determine potential or capacity output in the economy. Prices and wages in the TRACE model are endogenous and depend on the relative magnitudes of actual and potential output. Prices are then used to adjust the real values of the various aggregates to current dollar or national account values.

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[3] The version of the model used in this research is reported on in N. K. Choudhry, et al., "TRACE 1969: An Annual Econometric Model of the Canadian Economy," (Toronto: Institute for the Quantitative Analysis of Social and Economic Policy, Working Paper 6818, 1969). A subsequent version and applications of the model are presented in N. K. Choudhry, et al., The TRACE Econometric Model of the Canadian Economy (Toronto: University of Toronto Press, 1972).

The modifications to TRACE involved making endogenous the population, labour force participation rates, the supply of labour, and variables measuring the accumulation of human capital through formal education and work experience. A brief description of the complete modified model follows. The major interactions in the model which are important for our purposes are schematically represented in Figure 1. The mechanics of the model will be discussed further when we consider the results of the simulation experiments.

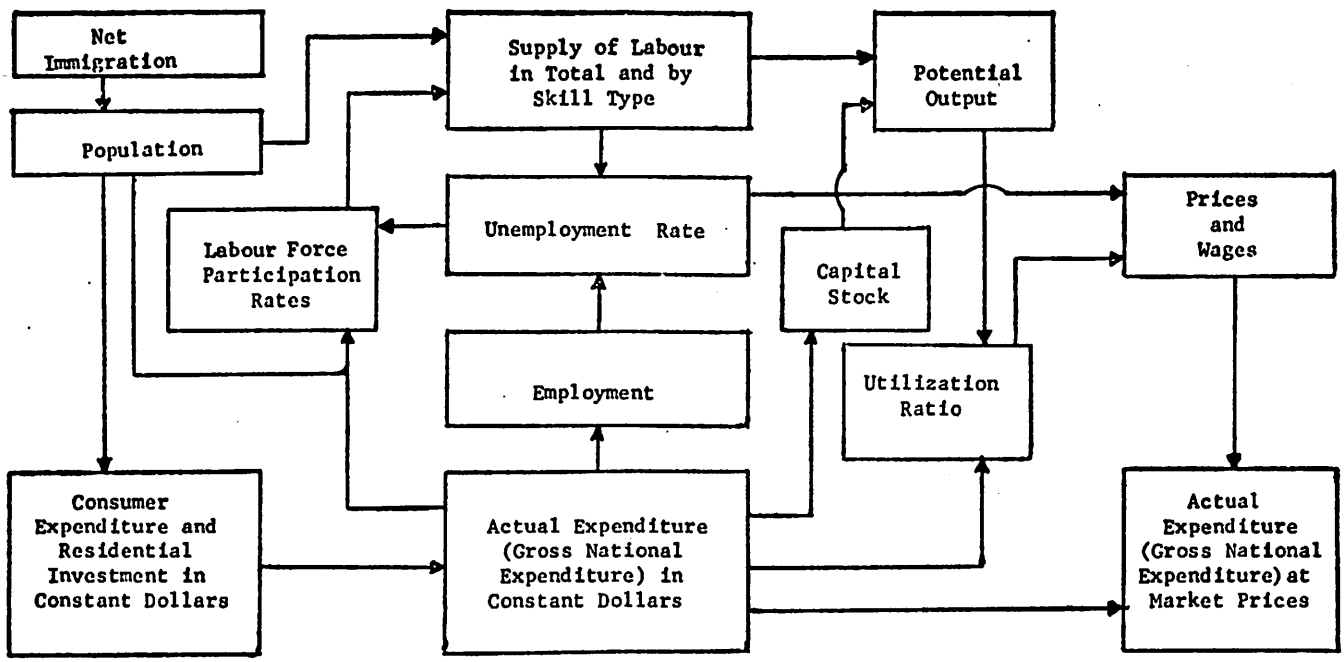

Figure 1. Schematic Representation of Model

The total population is disaggregated by single years of age, sex, and three skill types. The value of each age-sex-skill specific population cohort is related to the size of the cohort aged one year younger in the preceding year reduced appropriately for mortality occurring in the interim and augmented by net immigration of the corresponding age, sex, and skill type. Total births are determined by applying age specific fertility rates to the appropriate female population subgroups. The demographic part of the model therefore allows immigration to affect the size, rate of growth, and the age, sex, and skill composition of the total population.

The size of the total population affects both demand and supply in the economy. Considering demand first, the size of the current population in this model influences the level of total consumption expenditures and, indirectly, the level of residential investment which are two components of gross national expenditure.

Real per capita consumption of durables, non-durables, and services are each functions of their own lagged values, real per capita personal disposable income and relative prices. In addition, per capita durables are related to the long term rate of interest and per capita non-durables and per capita services to the change in real per capita disposable income. Total real values of these variables equal the per capita values multiplied by the total population. Taking the consumption sector as a whole but in isolation from the rest of the model we calculate for 1952 an elasticity of total real consumption with respect to total population equal to .48.

It should be noted here that a more sophisticated specification of the effects of population change on consumption expenditures is possible. Specifically, it would be desirable to take into account not only changes in

the total size of the population but changes in it's age structure as well, since we would expect the per capita consumption needs of the dependent population (e.g., aged under fifteen and over sixty-five) to be different than for the population of working age.[4] Another possible modification would be to take into account differences in consumption tendencies between the recently immigrated population and the longer established population.[5]

The housing market is represented by eight equations which determine lenders approvals, housing starts, housing completions, and residential construction expenditure in constant dollars and at market prices. Institutional lenders approvals are related to the total population, the difference between the maximum NHA mortgage rate and the long term interest rate, a weighted average of the price of residential construction over the residential rental cost index in periods t, t-1, and t-2, the lagged housing stock, and the maximum NHA mortgage rate. Central mortgage approvals are related to the total population, the long term interest rate, the difference between the NHA mortgage and the long term interest rate, and by the utilization ratio. A more appropriate variable which might be used in these equations in place of the total population is the number of recently formed households.[6] Single and multiple housing starts are both functions of NHA and CMHA mortgage approvals

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[4]Empirical studies by Leff and others have shown per capita savings to be inversely related to the dependency rate which equals the dependent population over the total population. See N. H. Leff, "Dependency Rates and Savings Rates," American Economic Review, LIX (December 1969), 886-896.

[5]For an example of per capita consumption functions which include the ratio of recent flows of net immigration to the total population as a dependent variable, see Wm. L. Marr, "The Economic Impact of Canadian Inward and Outward Migration and Their Determinants," (unpublished Ph.D. dissertation, University of Western Ontario, 1972).

[6]For a complex simulation model describing family formation and the effect of such on housing needs, see J. Herzog, "Long-Run Changes in the Number and Characteristics of Households: A New Method for Preparing Detailed Household Projections and Studying Their Economic Implications Applied to Housing Needs in the United States," (unpublished Ph.D. dissertation, University of Michigan, 1970).

(which are exogenous) adjusted by the price level of residential construction, by institutional lenders approvals current and lagged, and by central mortgage approvals. Single housing completions are in turn determined by the current and lagged values of single housing starts; likewise, multiple housing completions are determined by the current and lagged values of multiple housing starts. Finally, residential construction expenditure in constant dollars is a function of the current values of single and multiple housing completions.

The remaining components of Gross National Expenditure are business capital formation, exports, imports, and government expenditures on goods and services. Briefly, investment depends on a term representing the cost of capital and on the utilization ratio which is defined as the ratio of actual to potential output in business non-agriculture. Higher values of the utilization ratio give rise to increases in investment. Exports are related to the indexes of production in other countries and relative prices. Imports depend on domestic spending, relative prices, and the utilization ratio. The only component of government spending which is endogenous is military pay and allowances which depend on the total wage bill divided by total employment and on the unemployment rate.

The unemployment rate is fully endogenous in the model, being defined as the total labour force (endogenous) minus total employment (endogenous) divided by the total labour force. Employment in this model is directly proportional to the size of aggregate real expenditure: a higher level of output requires a higher level of employment for that level of output to be produced. Appropriate labour force participation rates are applied to the corresponding population subgroups to determine the supplies of unskilled, skilled, and professional labour. The total labour force is the sum of these three groups. Participation rates are specific to skill level, sex, and

five-year age groups. In all cases they are related to the unemployment rate, in most cases to per capita income, in some cases to their own lagged values and, for three female population subgroups, to the ratio of total births to the female population aged 14 to 44. These equations are from a study which uses quarterly data for Canada from the first quarter of 1950 to the second quarter of 1967.[7] The values of the constant terms used here were set so that the variables take on their actual values in 1951. Also, the coefficients on the unemployment rate in these equations are adjusted to correspond to the coefficients on rates of unemployment of different duration (e.g., short term and long term) which are used in place of the overall unemployment rate in the original study. Also, in the original study the participation rates are related to the current value of the unemployment rate. Because of the simultaneity between unemployment, participation rates, and the supply of labour, the complete model would not iterate to a solution in most of the simulation experiments so we were forced to lag the unemployment rate in the participation equations. Although these modifications to the original equations are certainly unjustifiable from an econometric point of view, we thought it preferable to use these modified functions rather than make the rates exogenous: since population change does influence the unemployment rate and per capita income, we would expect the size, if not the direction, of the results to be distorted by omitting these effects.

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[7] L. H. Officer and P. R. Anderson, "Labour-Force Participation in Canada," Canadian Journal of Economics, II, No. 2 (May, 1969), 278-287.

The size of the stock of capital in a given period is related to the size of the stock in the previous period with an adjustment for depreciation occurring in the interim plus investment occurring in the current period.

Potential or capacity output is determined by a four-factor Cobb-Douglas production function, the factors being the three types of labour (quality-adjusted) and the stock of capital. The function also contains a trend term to take account of technological change. The quality adjustment of the three labour force subgroups is made by applying an index of labour quality to the number of potential manhours of each type of labour. The quality indexes are endogenous in the model and depend on number of years of schooling and number of years of work experience. Years of schooling and of work experience are also endogenous and depend, respectively, on school enrollment and number of manyears worked which are likewise endogenous in the model.

The utilization ratio is defined as the ratio of actual to potential output in business non-agriculture. The unemployment rate is another such measure of the pressure of output demanded on productive capacity or supply.

Wages in the model behave according to the standard Phillips curve model. The proportional rate of change in money wages is related inversely to the unemployment rate: a lower unemployment rate (tighter labour market) results in a rise in the wage rate. Wages are also a positive function of the rate of change in the consumer price index. Prices in turn are positively related to the wage rate and to the utilization ratio. The various prices in the model are used to convert real output and its components to market price or national account values..

This completes a brief and skeletal outline of the simulation model the complete equations for which are given in Appendix I. The model is considerably more complex than implied by the description above: we have attempted only to outline the mechansims which are important for the purposes at hand. The next section illustrates the use of the model in simulating the economic effects of immigration.

Simulation Results

We begin by comparing the actual values of the objective variables with the standard case or reference simulated values. In the reference simulation all exogenous variables take on their actual, observed values. The model uses these values of exogenous variables and lagged endogenous variables generated by the program to solve for the time paths of the 600 variables in the model. We then vary the rate of net immigration and compare the results of this simulation with the results in the reference simulation and thereby obtain a quantitative estimate of the impact of immigration. Our choice of objective variables is conventional: per capita income, the unemployment rate, and the price level are common measures of economic performance and the consequent welfare of the constituent population. Briefly, per capita income is chosen as an index of the standard of living; the unemployment rate measures both the performance of the economy and serves as an index of the welfare of a portion of the population; the price level is included for its distributional effects and its possible effects on the balance of payments.

The complete model tracks quite well. Figure 2 shows the actual and simulated time paths of real per capita income, the consumer price index,

and the unemployment rate. The model undersimulates per capita income, on average, by $47. However, the implied average annual rate of growth of the simulated per capita income series is 2.00 percent which is close to the value of 2.07 percent for the actual series. The consumer price index is undersimulated in a little over one-half of the periods: the average simulated value of this variable is 1.047 which is very close to the average actual value of 1.055. The implied average annual rate of growth of prices is 1.6 percent for the simulated series, as opposed to 1.9 percent for the actual series. Finally the average simulated value for the unemployment rate is 5.2 percent which compares favorably with an average actual value of 4.8 percent.

We now look at the results of experiments which involve a fifty percent reduction in net immigration and a fifty percent increase in net immigration. These changes apply to the years 1951 through 1968, but, because the population is dated at the mid-point of a given year, only one-half of the change in the immigration series in the years 1951 and 1968 is picked up by the model. Taking this factor into account, a fifty percent reduction in net immigration implies that 990.0 thousand fewer persons enter the country from 1951 to 1968. Counting the last half of 1951 and the first half of 1968 as one year, this constitutes a reduction, on average, of 58.29 thousand immigrants per year. This may be compared with the rate of gross immigration: a fifty percent reduction in net immigration implies, on average, a forty percent reduction in gross immigration.

Figure 3 illustrates the results obtained from a fifty percent reduction and a fifty percent increase in net immigration. In this figure, the standard case simulated values of per capita income, the price level,

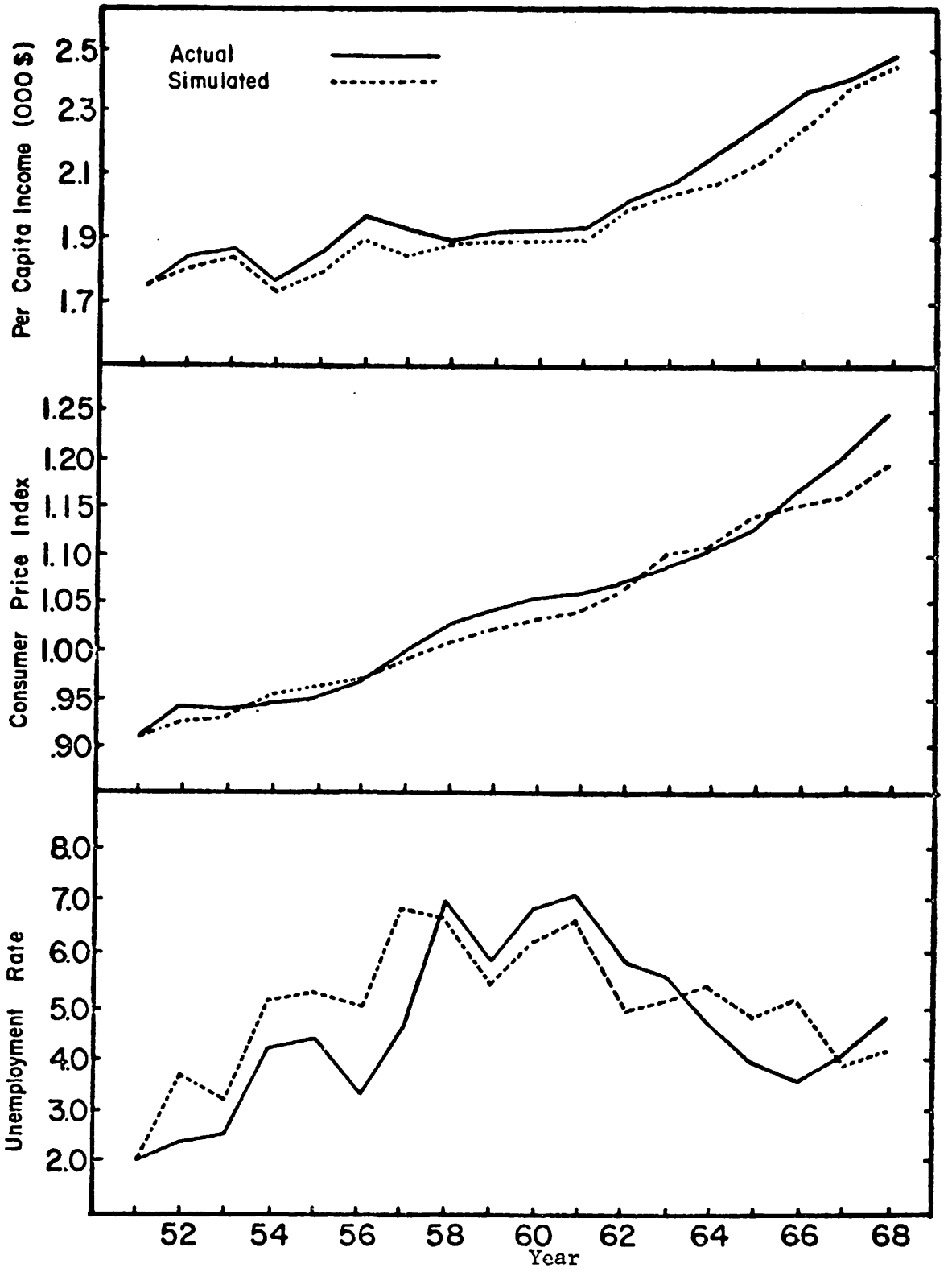

Figure 2. Actual and Standard Case Simulated Values of Per Capita Income, Price Level, and Unemployment Rate, 1951-68

and the unemployment rate are compared with the values of these variables when net immigration is reduced and when it is increased by fifty percent. Also, averages and implied average annual rates of growth of these variables (except for the unemployment rate) are compared in Table 1. To clarify the middle column of this table, it should be noted that each of the first three figures in this column is an average of ratios of values of the price variable to its value in a given base year. The actual value of the consumer price index equals 1.0 in 1957. Each of the second three figures in the same column is an implied average annual rate of growth in the price index.

TABLE 1

COMPARISON OF RESULTS FOR STANDARD CASE, DECREASE, AND INCREASE IN RATE OF NET IMMIGRATION

Policies	Objective Variables		
	Real Per Capita Income	Consumer Price Index	Unemployment Rate
	($)	(%)	(%)
Average Value, 1952-68:			
50% Decrease	2,052	1.065	3.89
Standard Case	1,990	1.046	5.18
50% Increase	1,936	1.034	6.64
	(%)	(%)	---
Implied Average Growth Rate, 1951-68:			
50% Decrease	2.38	1.86	---
Standard Case	2.00	1.60	---
50% Increase	1.68	1.41	---

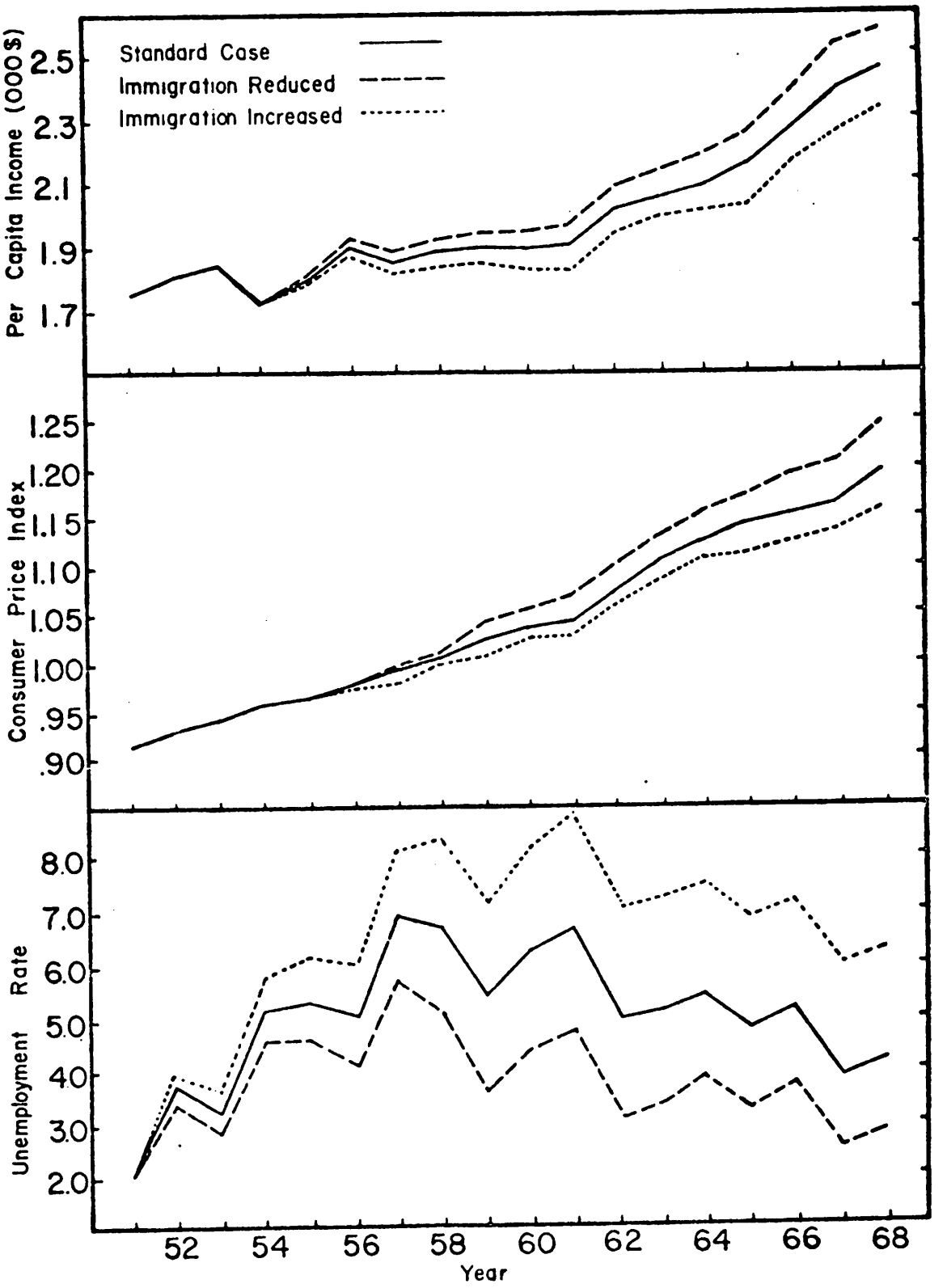

Figure 3. Per Capita Income, Unemployment Rate, and Price Level, 1951-68: Standard Case, Fifty Percent Decrease, and Fifty Percent Increase in Net Immigration

It is apparent from an inspection of these data that a reduction in net immigration gives rise in the model to higher per capita income, a higher price level, and a lower unemployment rate. Conversely, an increase in net immigration gives rise to lower per capita income, a lower price level, and a higher unemployment rate. These results are important insofar as they are at variance with the commonly accepted proposition that immigration is, in an aggregate sense, desirable since in contributes to long run economic growth either through the favorable effect due to economies of scale or because immigrants are typically more skilled than the native population and are therefore capable of generating a proportionally larger income stream than the native population. There are, however, a few qualifications to make concerning the results and, what is more important, the results may be interpreted in two different ways, one of which favors immigration as a source of potential economic growth and the other of which does not. This issue is taken up in the next section of this report. It is important first to understand the precise mechanisms in this model which give rise to these results.

The rate of growth in constant dollar Gross National Expenditure is virtually unchanged as a result of higher immigration. Since higher levels of immigration result in a higher rate of growth in the total population, per capita GNE is therefore lower. To understand why population change has negligible effects on aggregate real GNE, we shall consider separately the various components of GNE: some of them increase more in proportion to the increase in the total population and some of them increase less than in proportion.

Consider first the effects on total consumption expenditures. Higher levels of immigration cause total consumption expenditures to increase but

the increase in the average annual rate of growth in these expenditures is less, in each case, than the increase in the average annual rate of growth in the total population. This is explained by the fact that although there are more persons available to earn incomes, some immigrants are employed in jobs which would otherwise go to prior residents. Although total income is higher or about the same with higher levels of immigration, per capita income is therefore lower. Another way of expressing this result is to say that, although there is an increased volume of income as a result of more immigration, there are proportionally more people who have a share in that income stream: each person's share is therefore less with higher levels of immigration. Per capita consumption is a function of per capita income: higher values of per capita income give rise to increases in per capita consumption expenditures. We have noted that per capita income declines with increased immigration. Since per capita consumption is related to per capita income, it also declines with increases in immigration. Total consumption, which equals per capita consumption times the total population, therefore increases less than in proportion to the increase in the total population.

Consider now the effects on total government expenditures. The only component of total government expenditures which is determined within the model is military pay and allowances and these are not related directly to the size of the population. Since the remaining categories of government expenditures are exogenous and are the same in the different experiments, total government expenditures therefore increase less than in proportion to the increase in the total population. It is perhaps unreasonable for government expenditures to be unrelated to the size of the total population: the extent of the understatement of the effects on total spending

introduced by this omission is difficult to determine but may be important.[8]

Another important category of GNE is residential construction expenditures. These expenditures depend indirectly on mortgage approvals which, in the model, are related to the size of the total population and the unemployment rate. The total population is a demand variable in the approvals equation. The unemployment rate enters into the determination of institutional lenders approvals as a supply variable: a higher unemployment rate indicates increased capacity to produce residential investment and therefore gives rise to an increase in lenders approvals. Since immigration constitutes a direct increase in the total population, it therefore acts as a direct stimulus to residential investment. Also, the unemployment rate increases with higher levels of immigration for reasons which will be explained shortly. Both of these effects therefore give rise to an increase in residential investment expenditures an increase which, as we have noted, is somewhat larger than the increase in the total population.

A further component of GNE is investment in non-residential construction. The rate of growth of constant dollar investment in non-residential construction is actually lower with higher levels of immigration. The components of investment in non-residential construction are constant dollar business non-agriculture investment in non-residential construction (which is determined in the model), constant dollar agriculture investment in non-residential construction (which is exogenous at market prices in the model), and a reconciliation term (which is exogenous and constant). Business non-agriculture investment in non-residential construction depends positively

[8] Subsequent experiments with the model which involved relating the time paths of government cash transfers to persons and of contributions to the Canada and Quebec pension plans to the size of the total population indicated that the results are quite insensitive to the particular assumptions made about the time paths of these two forms of cash transfers.

on the utilization ratio. This relationship reflects the accelerator mechanism: higher levels of output relative to capacity stimulate higher levels of investment in order to maintain some desired capital/output ratio. For reasons that will soon be explained, immigration produces an increase in capacity relative to demand which implies a decline in the utilization ratio which, as noted, causes investment in non-residential construction in the business non-agriculture sector to be lower.

The final components of GNE which we consider are exports and imports. Exports are related mainly to foreign economic indicators and therefore do not increase with increased domestic economic activity. Imports, on the other hand, are related to the level of domestic output and therefore increase with increases in GNE. Since exports are added to and imports subtracted from GNE, the net effect of these two variables is therefore to make GNE lower in absolute terms than it otherwise would be.

The above covers the major effects of immigration on actual output or demand. We now consider the supply effects of increased immigration.

Consider first the effects on the supply of labour. Immigration gives rise to a direct increase in the total population. Moreover, because immigration is concentrated in the working ages, relative to the total population, the population of working age increases more than in proportion to the increase in the total population. Labour force participation rates depend on per capita income and the unemployment rate. The direction and magnitude of the effect of these variables on participation rates varies depending on the age and sex of the cohort. In general, the effects on participation rates are not large and, since the rates change in different directions, the net effect of changes in participation rates on the supply

of labour is very slight. An increase in immigration therefore gives rise to a substantial increase in the supply of labour and this increase is proportionally greater than the increase in the total population.

We have noted that employment depends on the level of output: higher levels of output require more employed workers to produce that level of output. Output increases with increases in immigration and this causes employment to increase. We have seen, however, that the increase in output is proportionally less than the increase in the population. The increase in employment is therefore proportionally less than the increase in the total population. Since the supply of labour increases more than in proportion to the total population and employment increases less than in proportion to the total population, it follows that the unemployment rate increases with higher levels of immigration.

Potential output is related to the size of the quality-adjusted labour force, the capital stock, and a trend term representing technological change. Since increases in immigration give rise to an increase in the labour force which is proportionally larger than the increase in the total population and since immigrants are more skilled than the domestic labour force, increases in immigration therefore give rise to an increase in potential output which is proportionally larger than the increase in the total population. But actual output increases less than in proportion to the total population so that the utilization ratio falls with increased immigration.

The rate of increase in prices and wages is related to the two capacity variables: negatively to the unemployment rate and positively to the utilization ratio. Since immigration results in a higher unemployment rate and a lower utilization ratio, the rate of increase in prices and wages is therefore lower with higher levels of immigration.

Policy Implications of Results

We have seen that the tests described above show that increases in immigration cause per capita income to be lower, the unemployment rate higher, and the rate of inflation to be slightly lower. It is important to make the obvious point that these results follow, as do all research results, from the broad methodological framework used, the particular structural aspects of the economy which are modeled, and the specific form of these structural relationships. Concerning methodology, we have made the implicit assumption that the economy, and the effects of immigration on the economy, can be adequately represented by a series of interdependent equations. Although this is a common procedure in contemporary economic research, we should point out that much research on the economic effects of immigration has centered, for example, on the effects that immigration has only on the labour market and has not mathematically modeled the workings of this market. The disadvantage of such a technique is that it is concerned with only some of the effects of immigration and may therefore err by excluding other effects which are equally, if not more, important.

Regarding the structure of the model we have used, we have noted that the income determination process in the model is basically Keynesian. In other words, actual output is determined largely by demand; supply considerations are secondary to the income determination process. The implication of this is that the model ascribes only a minor and indirect role for immigration in inducing economic growth by facilitating larger markets which give rise, in turn, to economies of scale and higher levels of output per capita. This characteristic of the model will affect the way in which we interpret the policy implications of these results.

Concerning the specific structural relationships that are a part of the model, we have noted a few respects in which the model might be improved for the purposes of making these tests. For example, we have seen that immigrants and nonimmigrants have the same consumption propensities in the model, housing starts are related to the total population and not to an age structure variable, and government spending on goods and services is unrelated to the size of the total population. There is no way of determining a priori whether these aspects of the model would affect the results in any important way. The only way of assessing the importance of modifications such as these would be to reformulate the model and redo the simulation experiments.

Assuming that these results accurately reflect the real impact of immigration on the economy, a few general statements about policy can be made. The first of these concerns the role of immigration as a source of economic growth. We have noted that one way of interpreting these results is to assert that immigration should be discouraged since it is unlikely that policymakers would opt for only a slight improvement in the rate of inflation at the expense of a decline in per capita income and an increase in the unemployment rate. Another way of interpreting the results is to state that immigration is capacity-producing and that the appropriate combination of policies is to allow increases in immigration and to exploit the increase in capacity generated in this way by appropriate expansionary monetary and fiscal policies. Immigration, in this model, is capacity-producing in the sense that it gives rise to an increase in capacity output which is larger than the increase in actual output and to an increase in the labour force which is larger than the increase in employment. Both of these results cause wages and prices to rise less rapidly than they otherwise would. In other words, the increase in the unemployment rate and the decrease in the rate of inflation

simply reflect the fact that immigration produces "excess" capacity which can be exploited, as noted, by an appropriate mix of monetary and fiscal policies.

Other experiments with the model in which government non-wage and salary expenditures are increased with the higher level of immigration indicate that this combination of policies, for the appropriate level of government expenditures, indicates that we may be able to have a higher level of immigration and be no worse off in terms of the effects on per capita income, the unemployment rate, and consumer prices than with a lower level of immigration. This result is very important if one ascribes any importance to economies of scale. If economies of scale are important, then immigration should be encouraged provided that complementary expansionary policies are pursued. The importance of the effect of economies of scale is an open issue: there is simply no research in existence which conclusively assesses their importance in a country with population and resources similar to Canada's in the 1970's. Professional opinions vary with some tending toward the view that these effects, if important at all, are much less important now than they were at an earlier stage in our development.[9]

The second important implication of these results concerns the role of immigration in the formulation of an effective set of short run anti-cyclical policies. Our results indicate that immigration does have a significant impact on the unemployment rate and the rate of inflation which are two of the important target variables of monetary and fiscal policy. It follows

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[9]See, for example, J. J. Spengler, "Effects Produced in Receiving Countries by Pre-1939 Immigration," in Economics of International Migration: Proceedings of a Conference Held by the International Economic Association, ed. by Brinley Thomas (London: Macmillan and Company, 1958), p. 41.

that immigration should be coordinated with other macroeconomic policy variables in order to arrive at an optimal policy strategy. Varying the rate of gross immigration as an instrument of fiscal policy raises certain difficulties, the most important of which is that it may in practice be difficult to vary the rate of immigration quarterly or annually according to domestic economic conditions. A better approach therefore might be to establish two- or three-year planning horizons and to vary the rate of immigration accordingly. If it is not feasible to vary the rate of immigration even over such a two- or three-year horizon, then the rate of immigration determined to be optimal from the long run point of view should at least be stable from year to year and should be taken into account in the formulation of other stabilization measures.

Summarizing, one interpretation of these results is that in the long run, if economies of scale are considered to be important, immigration should be encouraged as a way of exploiting the advantages of larger markets, provided that appropriate complementary long run fiscal and monetary policies are pursued. Also, the rate of immigration should either be varied cyclically depending on short run domestic economic conditions or at least should be taken into account in the formulation of other governmental policies.

There are a few other considerations which are important in formulating immigration policy. We have, in this research, concentrated on the aggregate macroeconomic effects of immigration. Regardless of what level of immigration is appropriate, if there is an excess demand for labour of a certain type or occupation, as many immigrants possessing these characteristics should be admitted as is necessary to rectify the structural imbalance in the labour market. For example, even if a low level of immigration were selected, it would still be appropriate to permit entry to an increased number of immigrants who have the particular skills which are in short supply in the economy.

Also, it is important to note that we have not considered the distributional implications of these results. For example, it is entirely possible that immigration makes the average income of the total population lower but at the same time improves the per capita income position of immigrants compared with their situation in the sending country without worsening, or even with improving, the situation of the nonimmigrant population. The same consideration applies to the unemployment rate: if immigration causes only unemployment of immigrants then the native population is not made worse off, except insofar as they may bear the brunt of welfare assistance to these unemployed immigrants. The implication here is that it may be possible to have immigration which makes everyone better off but which makes the statistics look worse. Those who feel we bear a responsibility to foreigners whom we can help by allowing them to migrate to Canada might argue that we should encourage immigration for humanitarian reasons even if it does make prior Canadian residents genuinely worse off. To what extent we bear such a responsibility to persons of other countries is an equity issue which certainly cannot be resolved here.

Summary

This paper has reported on simulation experiments to test the effects of immigration on the Canadian economy from 1952 to 1968. The tests make use of a macroeconomic model of the Canadian economy. The model is basically Keynesian in structure and it includes a sector describing the formation of population cohorts, the total population and the accumulation of human capital. The economic effect of immigration was assessed by comparing the time paths of per capita income, the unemployment rate, and the price level in simulations in which the rate of gross immigration was first increased and then decreased by fifty percent to a reference or standard case simulation where all exogenous variables, including the rate of gross

immigration, took on their actual values. The policy implications of these simulations were then analyzed. There were two interpretations of these results for the role of immigration in inducing long run economic growth: one, that immigration should be discouraged because of its detrimental effects on per capita income and the unemployment rate and the other, that immigration is capacity producing and should therefore be encouraged provided that it is accompanied by complementary expansionary monetary and fiscal policies. Concerning the role of immigration as an instrument of short run stabilization policy, it was noted that because immigration affects the unemployment rate and the rate of inflation, the level of immigration should be considered part of the set of governmental stabilization policies. The rate of immigration should be varied as an instrument of fiscal policy according to current domestic economic conditions or it should remain fairly stable and be taken into account in the formulation of other stabilization measures.

We conclude by pointing out that the model presented here is also suited to test the effects of post war changes in rates of fertility, mortality, labour force participation, and school retention. The demographic part of the model is structured so that changes in these rates affect the size and the age, sex, and skill structure of the total population. The model accordingly measures resulting changes in the size and quality of the labour force which in turn affect potential output. For example, changes in school retention rates would affect the sizes of the three labour force sub-groups and, in addition, the quality adjustment applying to these factors. The quality indices are endogenous in the model and depend in part on changes in school enrollment over time. We contend that models such as the one presented here are valuable tools for assessing demographic events in both developed and less developed countries.

APPENDIX I

SIMULATION MODEL

Notation

Endogenous variables are indicated by upper case letters and exogenous variables by lower case letters. Both endogenous and exogenous variables are given a basic one to three character alphabetic name which is augmented by a digit which indicates the units of measurement (the number of places the decimal point is moved to the left) and, if necessary, by an additional alphabetic character to indicate whether the variable is in real terms, first differenced, per capita, or per man-hour. The meaning of this last character is as follows: R = constant dollar; C = per capita; D = first difference; and M = per man-hour. For example, DUR9 is the variable name for consumer expenditures on durable goods at market prices measured in billions of dollars and DUR3RC is the name for constant dollar per capita expenditures on consumer durables measured in thousands of dollars.

In addition, some variables are superscripted as follows: ψ = m (male) or f (female); ϕ = u (unskilled), s (skilled), or p (professional); i = 0, 1, 2,...,64, 65 and over (age); and i-j which is an index of the age group to which the variable corresponds. For example, $W_t^{\psi,\phi,i-j}$, where ψ = m, ϕ = u, and i-j = 20-24, indicates the participation rate for unskilled males aged 20 to 24.

The symbol EXP(x) means natural number e to the power x or e^x.

Equations of the Model

Population

① $$B3_t = \sum_{i-j} f_t^{i-j} \left(\sum_{\phi=u,s,p} \left(\sum_{i}^{j} P3_t^{f,\phi,i} \right) \right)$$

[i-j = 15-19, 20-24,...,45-49]

(2-3) $$P3_t^{\psi,\phi,0} = \left(b_{t-1}^{\psi} \frac{B3_{t-1}}{2} + \frac{k3_{t-1}^{\psi,u,0}}{2}\right)\left(1 - \frac{d_{t-1}^{\psi,0}}{4}\right)\left(1 - \frac{d_t^{\psi,0}}{2}\right) + \left(b_t^{\psi} \frac{B3_t}{2} + \frac{k3_t^{\psi,u,0}}{2}\right)\left(1 - \frac{d_t^{\psi,0}}{4}\right)$$

[ψ = m, f; ϕ = u]

(4-317) $$P3_t^{\psi,\phi,i} = P3_{t-1}^{\psi,\phi,i-1}\left(1 - \frac{d_{t-1}^{\psi,i-j}}{2}\right)\left(1 - \frac{d_t^{\psi,i-j}}{2}\right) + \frac{k3_{t-1}^{\psi,\phi,i-1}}{2}\left(1 - \frac{d_{t-1}^{\psi,i-j}}{4}\right)\left(1 - \frac{d_t^{\psi,i-j}}{2}\right) + \frac{k3_t^{\psi,\phi,i}}{2}\left(1 - \frac{d_t^{\psi,i-j}}{4}\right)$$

[ψ = m, f; ϕ = u: i = 1,2,...,13,15,...,64; ϕ = s: i = 15,...,18,20,...,64; ϕ = p: i = 20,...,64]

(318-321) $$P3_t^{\psi,\phi,i} = \left(P3_{t-1}^{\psi,\phi,i-1} - SE3_{t-1}^{\psi,i-1}\right)\left(1 - \frac{d_{t-1}^{\psi,i-j}}{4}\right)\left(1 - \frac{d_t^{\psi,i-j}}{2}\right) + \frac{k3_{t-1}^{\psi,\phi,i-1}}{2}\left(1 - \frac{d_{t-1}^{\psi,i-j}}{4}\right)\left(1 - \frac{d_t^{\psi,i-j}}{2}\right) + \frac{k3_t^{\psi,\phi,i-1}}{2}\left(1 - \frac{d_t^{\psi,i-j}}{4}\right)$$

[ϕ = u: i = 14; ϕ = s: i = 19]

(322-325) $$P3_t^{\psi,\phi,i} = SE3_{t-1}^{\psi,i-1}\left(1 - \frac{d_{t-1}^{\psi,i-j}}{2}\right)\left(1 - \frac{d_t^{\psi,i-j}}{2}\right) + \frac{k3_{t-1}^{\psi,\phi,i-1}}{2}\left(1 - \frac{d_{t-1}^{\psi,i-1}}{4}\right)\left(1 - \frac{d_t^{\psi,i}}{2}\right) + \frac{k3_t^{\psi,\phi,i}}{2}\left(1 - \frac{d_t^{\psi,i}}{4}\right)$$

[ϕ = s: i = 14; ϕ = p: i = 19]

(326-331) $$P3^{\psi,\phi,65+}_t = P3^{\psi,\phi,65+}_{t-1}\left(1 - \frac{d^{\psi,65+}_{t-1}}{2}\right)\left(1 - \frac{d^{\psi,65+}_t}{2}\right) + P3^{\psi,\phi,64}_{t-1}\left(1 - \frac{d^{\psi,60-64}_{t-1}}{2}\right)\left(1 - \frac{d^{\psi,65+}_t}{2}\right)$$
$$+ \frac{k3^{\psi,\phi,64}_{t-1}}{2}\left(1 - \frac{d^{\psi,60-64}_{t-1}}{4}\right)\left(1 - \frac{d^{\psi,65+}_t}{2}\right) + \frac{k3^{\psi,\phi,65+}_{t-1}}{2}\left(1 - \frac{d^{\psi,65+}_{t-1}}{4}\right)\left(1 - \frac{d^{\psi,65+}_t}{2}\right)$$
$$+ \frac{k3^{\psi,\phi,65+}_t}{2}\left(1 - \frac{d^{\psi,\phi,65+}_t}{4}\right)$$

$[\psi = m,\ f;\ \ \phi = u,\ s,\ p]$

(332) $$POP6_t = \sum_{\psi=m,f}\ \sum_{\phi=u,s,p}\ \left(\sum_i P3^{\psi,\phi,i}_t\right) \cdot 10^{-3}$$

$[\phi = u:\ i = 0,1,\ldots,65+;\ \phi = s:\ i = 14,15,\ldots,65+;\ \phi = p:\ i = 19,20,\ldots,65+]$

(333) $$BR3_t = B3_t/POP6_t$$

(334) $$F_t = B3_t/\left(\sum_{\phi=u,s,p}\ \sum_i P3^{f,\phi,i}_t\right)$$

$[\phi = u,s:\ i = 14,15,\ldots,44;\ \phi = p:\ i = 19,20,\ldots,44]$

(335) $$DR3_t = \left(\sum_{\psi=m,f}\ \sum_{i-j} d^{\psi,i-j}_t \left(\sum_{\phi=u,s,p}\ \sum_i^j P3^{\psi,\phi,i}_t\right)\right)/POP6_t$$

$[\phi = u:\ i = 0,1,\ldots,65+;\ \phi = s:\ i = 14,15,\ldots,65+;\ \phi = p:\ i = 19,20,\ldots,65+]$

Supply of Labor

(336-337) $$W^{m,\phi,14-19}_t = \alpha^{m,\phi,14-19} - 0.01382\ U_t - 0.000822\ Y3RC_t$$

$[\alpha^{m,u,14-19} = .9913;\ \alpha^{m,s,14-19} = .2301]$

(338-339) $$W^{f,\phi,14-19}_t = \alpha^{f,\phi,14-19} - 0.003728\ U_t - 0.000155\ Y3RC_t$$

$[\alpha^{f,u,14-19} = .2154;\ \alpha^{f,s,14-19} = .3079]$

(340-342) $$W^{m,\phi,20-24}_t = \alpha^{m,\phi,20-24} + 0.001989\ U_t - 0.000399\ Y3RC_t$$

$[\alpha^{m,u,20-24} = 1.1466;\ \alpha^{m,s,20-24} = .8121;\ \alpha^{m,p,20-24} = .5281]$

(343-345) $$W^{f,\phi,20-24}_t = \alpha^{f,\phi,20-24} + 0.0005153\ U_t + 0.000213\ Y3RC_t - 0.005682\ F_t$$

$[\alpha^{f,u,20-24} = .1485;\ \alpha^{f,s,20-24} = .5779;\ \alpha^{f,p,20-24} = .6515]$

(346-348) $$W^{m,\phi,25-34}_t = \alpha^{m,\phi,25-34} + 0.000599\ U_t + 0.482\ W^{m,\phi,25-34}_{t-1}$$

$[\alpha^{m,u,25-34} = .4761;\ \alpha^{m,s,25-34} = .5049;\ \alpha^{m,p,25-34} = .4871]$

(349-351) $$W^{f,\phi,25-34}_t = \alpha^{f,\phi,25-34} + 0.00533\ U_t + 0.000258\ Y3RC_t - 0.00506\ F_t$$

$[\alpha^{f,u,25-34} = .1821;\ \alpha^{f,s,25-34} = .3133;\ \alpha^{f,p,25-34} = .2804]$

(352-354) $$W^{m,\phi,35-44}_t = \alpha^{m,\phi,35-44} - 0.0001849\ U_t + 0.434\ W^{m,\phi,35-44}_{t-1}$$

$[\alpha^{m,u,35-44} = .4756;\ \alpha^{m,s,35-44} = .6066;\ \alpha^{m,p,35-44} = .5531]$

(355-357) $W_t^{f,\phi,35-44} = \alpha^{f,\phi,35-44} + 0.009884\ U_t + 0.000557\ Y3RC_t - 0.005265\ F_t$

$[\alpha^{f,u,35-44} = .1496;\ \alpha^{f,s,35-44} = .3503;\ \alpha^{f,p,35-44} = .2208]$

(358-360) $W_t^{m,\phi,45-54} = \alpha^{m,\phi,45-54} + 0.0007188\ U_t + 0.467\ W_{t-1}^{m,\phi,45-54}$

$[\alpha^{m,u,45-54} = .4457;\ \alpha^{m,s,45-54} = .5619;\ \alpha^{m,p,45-54} = .4878]$

(361-363) $W_t^{f,\phi,45-54} = \alpha^{f,\phi,45-54} + 0.0068232\ U_t + 0.001090\ Y3RC_t$

$[\alpha^{f,u,45-54} = .1309;\ \alpha^{f,s,45-54} = .3968;\ \alpha^{f,p,45-54} = .1819]$

(364-366) $W_t^{m,\phi,55-64} = \alpha^{m,\phi,55-64} + 0.001306\ U_t - 0.000022\ Y3RC_t$

$[\alpha^{m,u,55-64} = .7526;\ \alpha^{m,s,55-64} = .9667;\ \alpha^{m,p,55-64} = .9226]$

(367-369) $W_t^{f,\phi,55-64} = \alpha^{f,\phi,55-64} + 0.005772\ U_t + 0.000891\ Y3RC_t$

$[\alpha^{f,u,55-64} = .0797;\ \alpha^{f,s,55-64} = .3121;\ \alpha^{f,p,55-64} = .1143]$

(370-372) $W_t^{m,\phi,65+} = \alpha^{m,\phi,65+} - 0.005071\ U_t - 0.000688\ Y3RC_t$

$[\alpha^{m,u,65+} = .3814;\ \alpha^{m,s,65+} = .3828;\ \alpha^{m,p,65+} = .5504]$

(373-375) $W_t^{f,\phi,65+} = \alpha^{f,\phi,65+} + 0.001439\ U_t - 0.000126\ Y3RC_t$

$[\alpha^{f,u,65+} = .0376;\ \alpha^{f,s,65+} = .1394;\ \alpha^{f,p,65+} = .0343]$

(376-378) $L6_t^{\phi} = \sum_{\psi=m,f} \left(\sum_{i-j} W_t^{\psi,\phi,i-j} \left(\sum_{i}^{j} P3_t^{\psi,\phi,i} \right) \right) \cdot 10^{-3}$

$[\phi = u,\ s:\ i-j = 14\text{-}19, 20\text{-}24, \ldots, 65+;\ \phi = p:\ i-j = 20\text{-}24, 25\text{-}34, \ldots, 65+]$

(379) $L6_t = \sum_{\phi=u,s,p} L6_t^{\phi}$

(380) $LB6_t = EB6_t / (1.0 - (U_t - 4.0)/100.0)$

(381-383) $LB6_t^{\phi} = LB6_t (L6_t^{\phi}/L6_t)$

$[\phi = u,s,p]$

(384-386) $SLB9_t^{\phi} = LB6_t^{\phi} (SHB_t)(52)(10^{-3})$

$[\phi = u,s,p]$

Human Capital Formation

(387-388) $$SE3_t^{\psi,6} = rr_{t-1}^{\psi,5}\ P3_{t-1}^{\psi,u,5} + rr_{t-1}^{\psi,5} \frac{k3_{t-1}^{\psi,u,5}}{2} \left(1 - \frac{d3_{t-1}^{\psi,5-9}}{4}\right)\left(1 - \frac{d3_{t-1}^{\psi,5-9}}{2}\right) + \frac{SE3_{t-1}^{\psi,6}}{P3_{t-1}^{\psi,u,6}} \cdot \frac{k3_t^{\psi,u,6}}{2} \left(1 - \frac{d3_t^{\psi,5-9}}{4}\right)$$

$[\psi = m,f]$

(389-428) $$SE3^{\psi,i}_t = rr^{\psi,i-1}\ SE3^{\psi,i-1}_{t-1} + \frac{SE3^{\psi,i-1}_{t-1}}{P3^{\psi,\phi,i-1}_{t-1}} \cdot \frac{k3^{\psi,\phi,i-1}_{t-1}}{2}\left(1 - \frac{d3^{\psi,i-j}_{t-1}}{4}\right)\left(1 - \frac{d3^{\psi,i-j}_{t}}{2}\right)$$

$$+ \frac{SE3^{\psi,i}_{t-1}}{P3^{\psi,\phi,i}_{t-1}} \cdot \frac{k3^{\psi,\phi,i}_{t}}{2}\left(1 - \frac{d3^{i-j}_{t}}{4}\right)$$

[ψ = m,f; ϕ = u for i = 7,8,...,14; ϕ = s for i = 15,16,17,18; ϕ = p for i = 19,20,...,26]

(429-431) $$SL3^{\phi}_t = SL3^{\phi}_{t-1}(1 - DR3_{t-1}) + \sum_{\psi=m,f}\ \sum_{i} (i-6)\left(SE3^{\psi,i-1}_{t-1}\left(1 - \frac{d3^{\psi,i-j}_{t-1}}{2}\right)\left(1 - \frac{d3^{\psi,i-j}_{t}}{2}\right) - SE3^{\psi,i}_{t}\right)$$

$$+ slk^{\phi}_{t-1} \sum_{\psi=m,f}\ \sum_{i} k3^{\psi,\phi,i}_{t-1} + 21 \sum_{\psi=m,f} SE3^{\psi,26}_{t-1}$$

[ϕ=u: last term = 0 and i=7,8,...,13; ϕ=s: last term = 0 and i=14,15,...,18;
ϕ=p: last term positive and i = 19,20,...,26]

(432-434) $$SLOC^{\phi}_t = SL3^{\phi}_t / \left(\sum_{\psi=m,f}\ \left(\sum_{i} P3^{\psi,\phi,i}_t - \sum_{j} SE3^{\psi,j}_t\right)\right)$$

[ϕ=u: i=14,15,...,65+; ϕ=s: i=14,15,...,65+ and j=14,15,...,19;
ϕ=p: i=20,21,...,65+ and j=20,21,...,26]

(435-437) $$TL3^{\phi}_t = TL3^{\phi}_{t-1}(1 - DR3_{t-1}) + L6^{\phi}_{t-1}(1 - U_{t-1}/100) \cdot 10^3 + \left(\sum_{\psi=m,f}\ \sum_{i} k3^{\psi,\phi,i}_{t-1}\right) TLOC^{\phi}_{t-1}$$

[ϕ=u: i=14,15,...,65+; ϕ=s: i=15,16,...,65+ ϕ=p: i=20,21,...,65+]

(438-440) $$TLOC^{\phi}_t = TL3^{\phi}_t / \left(\sum_{\psi=m,f}\ \left(\sum_{i} P3^{\psi,\phi,i}_t - \sum_{j} SE3^{\psi,j}_t\right)\right)$$

[ϕ=u: i=14,15,...,65+; ϕ=s: i=14,15,...,65+ and j=14,15,...,19;
ϕ=p: i=20,21,...,65+ and j = 20,21,...,26]

(441-443) $$QL^{\phi}_t = \beta^{\phi}\ TLOC^{\gamma^{\phi}}_t\ SLOC^{\delta^{\phi}}_t$$

[ϕ=u: β=1.0633, γ= -.09, δ = .11; ϕ=s: β = .6705, γ = -.09, δ = .72;
ϕ=p: β= .0872, γ= -.09, δ =1.73]

Personal Expenditure on Consumer Goods and Services

(444) $$DUR3RC_t = 0.11842 + 0.418709\ DUR3RC_{t-1} + 0.103648\ PDI3RC_t - 0.134115\ PD2_t/PC2_t - 0.007931\ LIC_t$$

(445) $$ND3RC_t = 0.097509 + 0.519056\ ND3RC_{t-1} + 0.181740\ PDI3RC_{t-1} + 0.216714(PDI3RC_t - PDI3RC_{t-1})$$
$$- 0.031274\ PND2_{t-1}/PC2_{t-1}$$

(446) $$SER3RC_t = - 0.002276 + 0.766955\ SER3RC_{t-1} + 0.085335\ PDI3RC_{t-1} + 0.189428(PDI3RC_t - PDI3RC_{t-1})$$
$$- 0.039033(PSR2_t/PC2_t - PSR2_{t-1}/PC2_{t-1})$$

(447) $DUR9R_t = DUR3RC_t \cdot POP6_t$ (448) $ND9R_t = ND3RC_t \cdot POP6_t$ (449) $SER9R_t = SER3RC_t \cdot POP6_t$

(450) $DUR9_t = DUR9R_t \cdot PD2_t$ (451) $ND9_t = ND9R_t \cdot PND2_t$ (452) $SER9_t = SER9R_t \cdot PSR2_t$

(453) $C9R_t = POP6_t \cdot (DUR3RC_t + ND3RC_t + SER3RC_t)$ (454) $C9_t = PD2_t \cdot DUR9R_t + PND2_t \cdot ND9R_t + PSR2_t \cdot SER9R_t$

Government Expenditure on Goods and Services

(455) $G9R_t = G9_t/PG2_t$ (456) $G9_t = wsg9_t + gnw9_t + MPA9_t$

Business Gross Capital Formation

(457) $IIA9R_t = -3.335578 + 0.43804\ POP6_t + 0.269074(nha2_t - LIC_t) + 0.042533\ U_t$
$+ 0.342807(PRC2_t/PRS2_t + PRC2_{t-1}/PRS2_{t-1} + PRC2_{t-2}/PRS2_{t-2})/3.0$
$- 0.136295\ KRS9R_{t-1} - 0.300715\ nha2_t$

(458) $CNA9R_t = 0.183945\ POP6_t - .0320477\ LIC_t - 0.273731(nha2_t - LIC_t) - 0.998759\ GAP_t$

(459) $MHS3_t = 6.486649 + 47.940368\ cha9_t/PRS2_t + 27.631234\ IIA9R_t + 89.744601\ CNA9R_t - 14.586405\ IIA9R_{t-1}$

(460) $SHS3_t = 42.995247 + 55.211673\ cha9_t/PRS2_t + 69.426399\ IIA9R_t - 17.080895\ CNA9R_t + 20.450255\ IIA9R_{t-1}$

(461) $MHC3_t = 0.448707\ MHS3_t + 0.518916\ MHS3_{t-1}$ (462) $SHC3_t = 0.863238\ SHS3_t + 0.132937\ SHS3_{t-1}$

(463) $RES9R_t = 0.295652 + 0.010723\ SHC3_t + 0.006436\ MHC3_t$ (464) $RES9_t = RES9R_t \cdot PRS2_t$

(465) $EME9R_t = -0.20456\ KMB9R_{t-1} + .024156\ KMB9R_{t-1} \cdot ALOG(CPG9_t/(KCB9R_{t-1} + KMB9R_{t-1})/$
$(PME2_t \cdot (0.01\ LIC_t + .12))) + 0.577583\ EME9R_{t-1} + 0.289281\ GAP_t \cdot KMB9R_{t-1}$

(466) $AME9R_t = ame9_t/PME2_t$ (467) $SME9R_t = EME9R_t + AME9R_t + rme9r_t$

(468) $BNR9R_t = -0.109583\ KCB9R_{t-1} + 0.003236\ KCB9R_{t-1} \cdot ALOG(CPG9_t/(KCB9R_{t-1} + KMB9R_{t-1})/$
$(PNR2_t \cdot (0.01\ LIC_t + 0.035))) + 0.692354\ BNR9R_{t-1} + 0.139241\ GAP_t \cdot KCB9R_{t-1} - 0.048410$

(469) $ANR9R_t = anr9_t/PNR2_t$ (470) $SNR9R_t = BNR9R_t + ANR9R_t + rnr9r_t$

(471) $BCF9R_t = EME9R_t + AME9R_t + BNR9R_t + ANR9R_t + rnr9r_t + rme9r_t$

(472) $SCF9R_t = SNR9R_t + SME9R_t + RES9R_t$

(473) $DHB9R_t = -0.0520 - 0.1501\ IKB9R_{t-1} + 0.7680(DUR9R_{t-1} - DUR9R_{t-2}) + 0.3249\ IMP9R_t - 0.3568\ DUR9R_t$

(474) $VPC9R_t = DHB9R_t + dha9r_t$ (475) $EME9_t = EME9R_t \cdot PME2_t$

(476) $RME9_t = rme9r_t \cdot PME2_t$ (477) $SME9_t = EME9_t + ame9_t + RME9_t$

(478) $BNR9_t = BNR9r_t \cdot PNR2_t$ (479) $RNR9_t = rnr9r_t \cdot PNR2_t$

(480) $SNR9_t = BNR9_t + anr9_t + RNR9_t$

(481) $BCF9_t = EME9_t + ame9_t + BNR9_t + anr9_t + RNR9_t + RME9_t$ (482) $SCF9_t = SNR9_t + SME9_t + RES9_t$

(483) $DHB9_t = -0.2458 + 0.0535\ iva9_t + 0.9782\ DHB9R_t + 0.0268\ IKB9R_{t-1} + 0.6596(PYB2_t - PYB2_{t-1})/PYB2_{t-1}$

(484) $VPC9_t = DHB9_t + dha9_t$ (485) $KMB9R_t = EME9R_t + (1.0-.12)KMB9R_{t-1}$

(486) $KMA9R_t = AME9R_t + (1.0 - .14)KMA9R_{t-1}$ (487) $KCB9R_t = BNR9R_t + (1.0-.035)KCB9R_{t-1}$

(488) $KCA9R_t = ANR9R_t + (1.0 - 0.035)KCA9R_{t-1}$ (489) $KA9R_t = KMA9R_t + KCA9R_t$

(490) $KRS9R_t = RES9R_t + (1.0 - 0.02)\ KRS9R_{t-1}$ (491) $IKB9R_t = IKB9R_{t-1} + DHB9R_t$

(492) $KBORM_t = (KMB9R_{t-1} + KCB9R_{t-1} + KRS9R_{t-1})/EMB9_t$

(493) $KAORM_t = (KMA9R_{t-1} + KCA9R_{t-1})/EMA9_t$

Foreign Trade

(494) $XMG9R_t = -0.10923 + 0.42607\ ipg2_t$

(495) $XMU9R_t = 0.175414 + 1.746397\ ipu2_t - 0.868418(pxm2_t/EXC_t)/pmu2_t$

(496) $XMW9R_t = 0.88222 + 0.46691\ ipw2_t - 0.83901(pxm2_t/EXC_t)/pmu2_t$

(497) $XPG9R_t = 0.092045 + 0.234724\ ipg2_t - 0.032391\ (pxp2_t/pps2_t) \cdot (exs_t/EXC_t)$

(498) $XPU9R_t = 1.17365 + 0.44687\ ipu2_t + 0.27391\ XPU9R_{t-1} - 0.72445(pxp2_t/EXC_t)/ppu2_t$

(499) $XPW9R_t = 0.144318 + 0.167898\ ipw2_t - 0.030552(pxp2_t/pps2_t) \cdot (exs_t/EXC_t)$

(500) $IDR9_t = (IDR9_{t-1}^{0.961844})EXP(0.5 \cdot 0.0144)$

(501) $X9_t = pxm2_t \cdot (XMW9R_t + XMG9R_t + XMU9R_t) + pxp2_t \cdot (XPW9R_t + XPG9R_t + XPU9R_t) + IDR9_t + XRE9_t$

(502) $XRE9_t = xre9r_t \cdot PEX2_t \cdot pfx2_t$

(503) $X9R_t = X9_t/PX2_t$

(504) $IDR9R_t = IDR9_t/PIM2_t$

(505) $IDP9_t = -0.01772 + 1.104032\ IDP9_{t-1}$

(506) $IDP9R_t = IDP9_t/PX2_t$

(507) $NMP9R_t = 2.46971 + 0.880530(0.285\ DUR9R_t + 0.212\ ND9R_t + 0.120\ SER9R_t + 0.088\ G9R_t + 0.123(RES9R_t + BNR9R_t + ANR9R_t) + 0.464(EME9R_t + AME9R_t) + 0.142\ X9R_t) + 0.351975\ VPC9R_t - 4.885741(PIM2_t/PY2_t) + 3.119369\ GAP_t + api9r_t$

(508) $IMP9R_t = NMP9R_t + IDP9R_t$

(509) $IMP9_t = IMP9R_t \cdot PIM2_t$

(510) $CRA9_t = X9_t - IMP9_t$

Gross National Expenditure

(511) $Y9R_t = C9R_t + BCF9R_t + G9R_t + RES9R_t + X9R_t - IMP9R_t + DHB9R_t + dha9r_t$

(512) $Y3RC_t = Y9R_t/POP6_t$

(513) $Y9_t = PY2_t \cdot Y9R_t$

(514) $ERA9_t = Y9_t - (C9_t + BCF9_t + X9_t - IMP9_t + G9_t + DHB9_t + dha9_t)$

(515) $FS9_t = Y9_t - DHB9_t - dha9r_t$

(516) $FS9D_t = FS9_t - FS9_{t-1}$

Production

(517) $YA9_t = ya9r_t \cdot pya2_t$

(518) $YAORM_t = ya9r_t/EMA9_t$

(519) $YPA9_t = WGP9_t + MPA9_t + irg9_t$

(520) $YPA9R_t = (WGP9_t + MPA9_t)/pgw2_t + irg9_t/PYI2_t$

(521) $YGD9_t = Y9_t - (IT9_t - su9_t) + IDP9_t - IDR9_t$

(522) $YGD9R_t = Y9R_t - (IT9R_t - SU9R_t) + IDP9R_t - IDR9R_t$

(523) $YB9_t = YB9R_t/PYB2_t$

(524) $YB9R_t = YGD9R_t - ya9r_t - YPA9R_t$

(525) $YBORM_t = YB9R_t/EMB9_t$

(526) $YBP9R = (QL^u_t \cdot SLB9^u_t)^{.0922} \cdot (QL^s_t \cdot SLB9^s_t)^{.2601} \cdot (QL^p_t \cdot SLB9^p_t)^{.1303}$
$\cdot (KMB9S_t + KCB9S_t + KRS9S_t)^{.517442} \cdot EXP(-0.489763 + 0.016807 \cdot t_t + 0.007132 \cdot$
$\cdot 4.0 - 0.002322\ (4.0)^2 + .00021)$

(527) $GAP_t = YB9R_t/YBP9R_t$

(528) If $GAP_t \leq 1.01$, $GAPB_t = 0.0$ If $GAP_t > 1.01$, $GAPB_t = GAP_t - 1.01$

Price Indexes and Wages

(529) $WRB_t = WRB_{t-1} \cdot (EXP(0.013195 + 0.139554(1.0/U_t) + 0.5 \cdot 0.000212) \cdot (PC2_t/PC2_{t-1})^{.309225})$

(530) $PYI2_t = (Y9_t - X9_t + IMP9_t)/(Y9R_t - X9R_t + IMP9R_t)$

(531) $PG2_t = G9_t/((wsg9_t + MPA9_t)/pgw2_t + (G9_t - wsg_t - MPA9_t)/PYI2_t)$

(532) $PYB2_t = PYB2_{t-1} \cdot EXP(0.004307 - 0.043037\ dkw_t + 0.5 \cdot 0.000308) \cdot (WRB_t/WRB_{t-1})^{0.488980}$
$\cdot (YBORM_t/YBORM_{t-1})^{-0.666731} \cdot (PYB2_{t-1}/PYB2_{t-2})^{0.282141} \cdot (PIM2_t/PIM2_{t-1})^{0.310505}$

(533) $PPA2_t = YPA9_t/YPA9R_t$ (534) $PYG2_t = (PYB2_t \cdot YB9R_t + pya\ 2_t \cdot ya9r_t + PPA2_t \cdot YPA9R_t)/YGD9R_t$

(535) $PY2_t = (PYG2_t \cdot YGD9R_t + PSI2_t \cdot (IT9R_t - SU9R_t) - PX2_t \cdot IDP9R_t + PIM2_t \cdot IDR9R_t)/Y9R_t$

(536) $PD2_t = PD2_{t-1} + PD2_{t-1} \cdot (0.057933 + 1.096281\ ((PY2_t - PY2_{t-1})/PY2_{t-1}) - 0.002389(ttb_t + 21.0))$

(537) $PND2_t = (-0.0083 + (0.8358((PY2_t - PY2_{t-1})/PY2_{t-1})) + (0.3384((PIM2_t - PIM2_{t-1})/PIM2_{t-1}))) \cdot PND2_{t-1} + PND2_{t-1}$

(538) $PSR2_t = (-0.0766 + (0.2372\ ((PY2_t - PY2_{t-1})/PY2_{t-1})) + (0.5136\ ((PSR2_{t-1} - PSR2_{t-2})/PSR2_{t-2}))$
$+ 0.0861\ GAP_t) \cdot PSR2_{t-1} + PSR2_{t-1}$

(539) $PC2_t = C9_t/C9R_t$ (540) $PRC2_t = .211107 - 0.1192(KRS9R_{t-1}/POP6_{t-1}) + 0.9797\ PRC2_{t-1}$

(541) $PRS2_t = ((0.2735\ ((PIM2_t - PIM2_{t-1})/PIM2_{t-1})) + (0.9360\ ((PY2_t - PY2_{t-1})/PY2_{t-1})) + 0.0064\ GAP_t$
$+ 0.2881\ GAPB_t) \cdot PRS2_{t-1} + PRS2_{t-1}$

(542) $PNR2_t = (0.017372 - 0.047159\ BNR9R_t/YB9R_t + 0.023344(PYB2_t - PYB2_{t-1})/PYB2_{t-1}$
$+ 0.051058\ ((BNR9R_t - BNR9R_{t-1})/BNR9R_{t-1} - (YB9R_t - YB9R_{t-1})/YB9R_{t-1})$
$+ 0.626604\ (PRS2_t - PRS2_{t-1})/PRS2_{t-1}) \cdot PNR2_{t-1} + PNR2_{t-1}$

(543) $PME2_t = (-0.267491 + 0.283697\ GAP_{t-1} + 0.185664\ (PYB2_t - PYB2_{t-1})/PYB2_{t-1}$
$+ 0.735405\ (PIM2_t - PIM2_{t-1})/PIM2_{t-1}) \cdot PME2_{t-1} + PME2_{t-1}$

(544) $PBC2_t = BCF9_t/BCF9R_t$ (545) $PX2_t = pxx2_t$ (546) $PIM2_t = pfr2_t \cdot PEX2_t$

(547) $PSI2_t = psiz2_t$ (548) $WRBOD_t = WRB_t - WRB_{t-1}$ (549) $WRBOR_t = WRB_t/PYB2_t$

(550) $U_t = ((L6_t - E6_t)/L6_t) \cdot 100.0$

(551) $HB_t = EXP(3.755 - 0.00284\ ttb_t + 0.00191\ U_t - 0.00061\ U_t^2 + 0.5 \cdot 0.00010)$

(552) $SHB_t = EXP(3.7555 - 0.00284\ ttb_t + 0.00191 \cdot 4.0 - 0.00061 \cdot 16.0 + 0.5 \cdot .00010)$

(553) $EA6_t = (EXP(.551061 + .007605\ t_t - .175097\ dma_t - .016535\ ttb_t + 0.5 \cdot .001018) \cdot KA9R_{t-1}^{-.169418} \cdot EMA9_{t-1}^{.587133} \cdot (YA9_{t-1}/(EMA9_{t-1} \cdot WRB_{t-1}))^{.0068850})/(.052\ HB_t)$

(554) $EB6_t = (YB9R_t/(.052\ HB_t)) \cdot (EXP(-0.509333 - 0.005196\ t_t - 0.009632\ ttb_t + 0.027698\ dma_t + .5 \cdot 0.000313) \cdot (WRB_t/PYB2_t)^{-0.58066})$

(555) $EMA9_t = EA6_t \cdot HB_t \cdot 52.0 \cdot 10.0^{-3}$ (556) $EMB9_t = EB6_t \cdot HB_t \cdot 52.0 \cdot 10^{-3}$

(557) $E6_t = EB6_t + EA6_t + eg6_t$

Income

(558) $WGP9_t = wsg9_t + wsp9_t$ (559) $WSA9_t = wsaz_t$ (560) $WSB9_t = WRB_t \cdot EMB9_t$

(561) $WSS9_t = WSB9_t + WSA9_t + WGP9_t$

(562) $MPA9_t = ((WSS9_t/E6_t)^{3.667038}) \cdot EXP(-1.691117 + 0.061897\ U_t - 0.098289 \cdot t_t + 0.5 \cdot 0.012755)$

(563) $CPG9_t = -1.6587 + 0.4499(YB9_t - WSB9_t) + 1.6065\ GAP_t + 0.0229\ t_t$ (564) $CPN9_t = CPG9_t - cab9_t$

(565) $DIV9_t = -0.003689 + 0.130465(CPN9_t - CT9_t) + 0.811068\ DIV9_{t-1}$

(566) $UCP9_t = CPN9_t - DIV9_t - CT9_t - ccd9_t$

(567) $IPD9_t = -0.031784 + 1.104535\ IPD9_{t-1} + 0.008697\ (GDF9_t \cdot LIC_t)$

(568) $MIN9_t = NFC9_t - WSS9_t - MPA9_t - CPN9_t$ (569) $NFC9_t = Y9_t - IT9_t - su9_t - cca9_t$

(570) $PI9 = NFC9_t + tr9_t + IPD9_t - UCP9_t - CT9_t - wt9_t - gi9_t - agt9_t - iva9_t - SIP9_t$

(571) $PDI9_t = PI9_t - PT9_t$ (572) $PDI3RC_t = PDI9_t/(POP6_t \cdot PC2_t)$

(573) $PDI3RCD_t = PDI3RC_t - PDI3RC_{t-1}$ (574) $PS9_t = PDI9_t - C9_t$

(575) $ECS9_t = E6_t \cdot (0.007127 + 0.988777\ (ECS9_{t-1}/E6_{t-1}))$ (576) $SIP9_t = ECS9_t + ccp9_t + qcp9_t$

Taxes

(577) $PIT9_t = (PI9_t/E6_t - el3_t)^{1.189221} \cdot (100.0\ rpt_t)^{0.743994} \cdot EXP(-4.531474 + 0.191292\ E6_t + 0.426333\ GAP_t + 0.5 \cdot 0.0036)$

(578) $POT9_t = -0.212218 + 0.78114\ POT9_{t-1} + 0.017753\ POP6_t$ (579) $PT9_t = PIT9_t + POT9_t$

(580) $CT9_t = hs2_t \cdot CPN9_t + (hr2_t - hs2_t) \cdot (4.962559 - 3.589086\ GAP_t + 0.685288\ CPN9_t - 0.041341 \cdot \ell 3_t + 0.002008 \cdot \ell 3_t \cdot CPN9_t)$

(581) $IT9_t = -0.116710 + 1.087943(EME9_t + AME9_t) \cdot RIT_{t-1} + 1.044156(DUR9_t + ND9_t) \cdot RIT_{t-1} + .819683\ dmi_t \cdot (RES9_t + BNR9_t + anr9_t) \cdot RIT_{t-1} - 0.793868(dmi_t - dmi_{t-1}) \cdot (RES9_t + BNR9_t + anr9_t) \cdot RIT_{t-1}$

(582) $RIT_t = IT9_t/(DUR9_t + ND9_t + ((RES9_t + BNR9_t + anr9_t) \cdot dmi_t) + BME9_t + ame9_t)$

(583) $ITS9_t = IT9_t - su9_t$ (584) $IT9R_t = IT9_t/PSI2_t$ (585) $SU9R_t = su9_t/PSI2_t$

Interest Rates

(586) $SIC_t = 4.429849 + 0.963229\ siu_t + 8.439313\ (EXC_t - EXC_{t-1}) - 10.703708(m9_t/Y9_t)$

(587) $LIC_t = 1.017071 + 0.30353\ SIC_t + 0.592041\ LIC_{t-1}$

International Capital Flows and Exchange Rate

(588) $LDU9_t = -0.434705 + 0.073321\ BCF9R_t - 0.180586\ dmf_t + 0.480294\ ((PY2_t/pyu2_t)/EXC_t)$
$- 0.784577\ ((m9_t - m9_{t-1})/m9_{t-1})$

(589) $CIF9_t = 1.290166 + 0.057514\ BCF9_t + 0.138184\ (LIC_t - liu_t) - 1.197821\ PY2_t/(pyu2_t \cdot EXC_t)$
$+ 0.144289(SIC_t - siu_t) - 0.144613(liu_t - siu_t)$

(590) $S9_t = IMP9_t - X9_t - LDU9_t - CIF9_t - in9_t - f9_t + dr9_t$

(591) $CAP9_t = LDU9_t + CIF9_t + S9_t + in9_t$ (592) $CR9_t = X9_t - IMP9_t + f9_t$

(593) If $t < 25$, or $t > 36$, $EXC_t = xxu_t$ (after 1961)

If $25 < t < 36$, $EXC_t = 0.5249 - 0.0278(SIC_t - siu_t) + 0.0780\ S9_t + 0.0482\ dr9_t$
$+ 0.4653\ EXC_{t-1}$ (1952 to 1961 inclusive)

(594) $PEX2_t = EXC_t/0.9588$

Government Revenue and Expenditure Account

(595) $GEX9_t = G9_t + tr9_t + IPD9_t + su9_t + cas9_t$ (596) $GRV9_t = PT9_t + CT9_t + IT9_t + wt9_t + gi9_t + SIP9_t$

(597) $GDF9_t = GEX9_t - GRV9_t$

Capital Formation and Saving Account

(598) $CF9_t = BCF9_t + RES9_t + VPC9_t + CRA9_t$

(599) $SAV9_t = PS9_t + UCP9_t + cca9_t + agt9_t + cas9_t + iva9_t - GDF9_t$

(600) $ERB9_t = CF9_t - SAV9_t$

Glossary of Variables

Endogenous Variables

AME9R	agriculture and fishing gross investment in machinery and equipment in constant (1957) dollars
ANR9R	real agriculture and fishing gross investment in non-residential construction in constant (1957) dollars
B3	total live births
BCF9	business gross fixed capital formation in new non-residential construction, machinery and equipment
BCF9R	business gross fixed capital formation in new non-residential construction, machinery and equipment in constant (1957) dollars
BME9	business non-agriculture gross investment in machinery and equipment

EME9R	business non-agriculture gross investment in machinery and equipment in constant (1957) dollars
BNR9	business non-agriculture gross investment in non-residential construction
BNR9R	business non-agriculture gross investment in non-residential construction in constant (1957) dollars
BR3	crude birth rate
C9	personal expenditure on consumer goods and services
C9R	personal expenditure on consumer goods and services in constant (1957) dollars
CAP9	capital inflow
CF9	total gross capital formation
CIF9	net long-term capital movement in securities, including trade in outstanding securities between U.S. and Canada
CNA9R	conventional mortgage approvals in constant (1957) dollars: CMHC direct NHA approvals
CPG9	corporation profits before capital consumption allowances
CPN9	corporation profits before taxes
CR9	current account balance of international payments
CRA9	adjusted current account balance of international payments
CT9	corporations income tax liabilities
DHB9	value of physical change in non-farm business inventories
DHB9R	value of physical change in non-farm business inventories in constant (1957) dollars
DIV9	total dividends paid to residents and non-residents
DR3	crude death rate
DUR3RC	personal expenditure on consumer durables in constant (1957) dollars per person
DUR9	personal expenditure on consumer durable goods
DUR9R	personal expenditure on consumer durable goods in constant (1957) dollars
E6	total civilian labor force employed
EA6	employment in agriculture
EB6	employment in business non-agriculture
ECS9	employer and employee contributions to social insurance and government pension plans exluding Canada and Quebec pension plans
EMA9	weighted average employed man-hours per annum in agriculture
EMB9	weighted average employed man-hours per annum in business non-agriculture
ERA9	residual error (in national expenditure)
ERB9	residual error (in capital formation)
EXC	foreign exchange rate: number of Canadian dollars per U.S. dollar (average noon spot rate)
F	ratio of total births to female population aged 14 to 44
FS9	final sales
FS9D	change in final sales
G9	government expenditure on goods and services
G9R	government expenditure on goods and services in constant (1957) dollars
GAP	utilization ratio in business non-agriculture
GAPB	excess of utilization ratio above normal capacity
GDF9	government deficit
GEX9	total government expenditure
GRV9	total government revenue
HB	average weekly hours per employee in business non-agriculture
IDP9	interest and dividends paid to non-residents
IDP9R	interest and dividends paid to non-residents in constant (1957) dollars
IDR9	interest and dividends received from non-residents
IDR9R	interest and dividends received from non-residents in constant (1957) dollars
IKB9R	business non-farm stock of inventories in constant (1957) dollars

IIA9R	institutional lenders approvals under the national housing act in constant (1957) dollars
IMP9	imports of goods and services
IMP9R	imports of goods and services in constant (1957) dollars
IPD9	interest on the public debt
IT9	total indirect taxes
IT9R	total indirect taxes in constant (1957) dollars
ITS9	indirect taxes less subsidies
KAORM	capital stock in agriculture per man-hour in constant (1957) dollars
KA9R	capital stock in agriculture in constant (1957) dollars
KBORM	capital stock in business non-agriculture per man-hour in constant (1957) dollars
KCA9R	capital stock of non-residential construction in agriculture and fishing in constant (1957) dollars
KCB9R	capital stock of non-residential construction in business non-agriculture in constant (1957) dollars
KMA9R	capital stock of machinery and equipment in agriculture and fishing in constant (1957) dollars
KMB9R	capital stock of machinery and equipment in business non-agriculture in constant (1957) dollars
KRS9R	capital stock of housing in constant (1957) dollars (2% depreciation)
LDU9	U.S. direct investment in Canada
L6	total civilian labor force supply
$L6^{\phi}$	number of persons of skill level ϕ in civilian labor force
LB6	total potential labor force available in business non-agriculture
$LB6^{\phi}$	potential labor force of skill ϕ available in business non-agriculture
LIC	long-term interest rate in Canada (average Wednesday market yield, over the year, in government bonds with 14 years to maturity)
MHC3	multiple house completions
MHS3	multiple housing starts
MIN9	miscellaneous national income
MPA9	military pay and allowances
ND3RC	personal expenditure on consumer non-durables in constant (1957) dollars per person
ND9	personal expenditure on consumer non-durable goods
ND9R	personal expenditure on consumer non-durable goods in constant (1957) dollars
NFC9	net national income at factor cost
NMP9R	imports of goods and services in constant (1957) dollars
$P3^{\psi,\phi,i}$	population cohort of sex ψ, skill level ϕ, and age i
PBC2	implicit price index for business gross fixed capital formation (1957 = 1.0)
PC2	implicit price index of personal expenditure on consumer goods and services (1957 = 1.0)
PD2	price level of consumer expenditure on durable goods (1957 = 1.0)
PDI3RC	personal disposable income per person in constant (1957) dollars
PDI3RCD	personal disposable income per person, constant (1957) dollars, 1st difference
PDI9	personal disposable income
PEX2	index of the foreign exchange rate (1957 = 1.0)
PG2	implicit price index of government expenditures on goods and services (1957 = 1.0)
PI9	personal income
PIM2	implicit price index of imports of goods and services in Canadian dollars (1957 = 1.0)
PIT9	personal income tax
PME2	price level of gross investment in machinery and equipment (1957 = 1.0)
PND2	price level of consumer expenditure on non-durable goods (1957 = 1.0)
PNR2	price level of gross investment in non-residential construction (1957 = 1.0)
POP6	total population

POT9	personal other direct taxes
PPA2	deflator for output in the government and personal sectors (1957 = 1.0)
PRC2	residential rent cost index (1949 = 1.0)
PRS2	price level of residential construction (1957 = 1.0)
PS9	personal net saving
PSI2	deflator for indirect taxes less subsidies (1957 = 1.0)
PSR2	price level of consumer expenditure on services (1957 = 1.0)
PT9	personal direct taxes
PX2	implicit price index of exports of goods and services (1957 = 1.0)
PY2	implicit price index of gross national expenditure (1957 = 1.0)
PYB2	deflator for output in business non-agriculture (1957 = 1.0)
PYG2	deflator for GDP at factor cost (1957 = 1.0)
PYI2	price level of gross domestic expenditure
QL^{ϕ}	quality index for labor of skill level ϕ
RES9	new residential construction expenditures
RES9R	new residential construction expenditures in constant (1957) dollars
RIT	realized rate of indirect tax
RME9	national accounts machinery and equipment reconciliation
RNR9	national accounts non-residential construction reconciliation
S9	net movement of short-term securities
SAV9	total saving
SCF9	national accounts business gross fixed capital formation
SCF9R	national accounts business gross fixed capital formation in constant (1957) dollars
$SE3^{\psi,i}$	school enrollment of sex ψ and age i
SER3RC	personal expenditures on services per person in constant (1957) dollars
SER9	personal expenditures on services
SER9R	personal expenditures on services in constant (1957) dollars
SHB	standard hours per week in business non-agriculture
SHC3	single housing completions
SHS3	single housing starts
SIC	treasury bill rate in Canada, average yield in three month bills
SIP9	total employer and employee contributions to social insurance and government pension funds
$SLOC^{\phi}$	accumulated number of years of school per person of working age not in school in skill group ϕ
$SL3^{\phi}$	total number of years of schooling completed by persons of working age not in skill group ϕ
$SLB9^{\phi}$	potential standard man-hours per annum of skill level ϕ available in business non-agriculture
SME9	total investment in machinery and equipment
SME9R	total investment in machinery and equipment in constant (1957) dollars
SNR9	total investment in non-residential construction
SNR9R	total investment in non-residential construction in constant (1957) dollars
SU9R	subsidies in constant (1957) dollars
$TLOC^{\phi}$	accumulated number of years of work experience per person of working age not in school in skill group ϕ
$TL3^{\phi}$	total number of years of work experience accumulated by persons of working age not in school in skill group ϕ
U	unemployment as a per cent of the labor force
UCP9	undistributed corporate profits
VPC9	value of the physical change in inventories

VPC9R	value of the physical change in inventories in constant (1957) dollars
$W^{\psi,\phi,i-j}$	participation rate for persons of sex ψ, skill level ϕ, in age group i-j
WGP9	wages, salaries and supplementary labor income arising in government and personal sectors (non-military)
WRB	wage rate in the business non-agricultural sector
WRBOD	change in business non-agricultural wage rate per hour
WRBOR	wage rate in business non-agriculture in constant (1957) dollars
WSA9	wage bill in agriculture
WSB9	wage bill in business non-agriculture
WSS9	total wage bill
X9	total exports of goods and services
X9R	total exports of goods and services in constant (1957) dollars
XMG9R	mineral and mineral products exports to U.K. in constant (1957) dollars
XMU9R	mineral and mineral products exports to U.S.A. in constant (1957) dollars
XMW9R	mineral and mineral products exports to the rest of the world (excluding Communist countries) in constant (1957) dollars
XPG9R	paper and paper product exports to U.K. in constant (1957) dollars
XPU9R	paper and paper product exports to U.S.A. in constant (1957) dollars
XPW9R	paper and paper product exports to the rest of the world (excluding Communist countries) in constant (1957) dollars
XRE9	other exports of goods and services
Y3RC	gross national expenditure per capita in constant (1957) dollars
Y9	gross national expenditure
Y9R	gross national expenditure in constant (1957) dollars
YAORM	output per man-hour in agriculture in constant (1957) dollars
YA9	output in agriculture
YBORM	output per man-hour in business non-agriculture in constant (1957) dollars
YB9	output in business non-agriculture at factor cost
YB9R	output in business non-agriculture at factor cost in constant (1957) dollars
YBP9R	potential output in business non-agriculture at factor cost in constant (1957) dollars
YGD9	gross domestic product at factor cost
YGD9R	gross domestic product at factor cost in constant (1957) dollars
YPA9	output in government and personal sectors
YPA9R	output in government and personal sectors in constant (1957) dollars

Exogenous Variables

agt9	adjustment on grain transactions
ame9	agriculture and fishing gross investment in machinery and equipment
anr9	agriculture and fishing gross investment in non-residential construction
api9r	estimated volume of imports of automobiles and parts due to U.S.A. Canada automobile pact in constant (1957) dollars
b^{ψ}	per cent of total live births that are of sex ψ
cab9	corporate capital consumption allowances
cas9	capital assistance
cca9	capital consumption allowances and evaluation adjustments
ccd9	corporate charitable donations
ccp9	employer and employee contributions to Canada pension plan
cha9	mortgage approvals: NHA, CMHA
$d^{\psi,i-j}$	number of deaths per 1,000 persons of sex ψ in age group i-j

dha9	value of physical change in farm inventories and grain in commercial channels
dha9r	value of physical change in farm inventories and grain in commercial channels in constant (1957) dollars
dkw	1952: dkw = -1; 1953-68: dkw = 0
dma	1952-68: dma = 1
dmf	1952-62: dmf = 0; 1963-68: dmf = 1
dmi	1952-62: dmi = 0; 1963: dmi = .30; 1964: dmi = .42; 1965: dmi = .84; 1966-68: dmi = 1.0
dr9	changes in the official gold and foreign exchange reserves, change in international monetary fund position, and other international financial assistance
eg6	employment in the government and personal sectors
el3	basic federal personal income tax exemption level for a single individual
exs	rate of exchange: Swedish krona per U.S. dollars
f^{i-j}	number of live births per 1,000 females in age group i-j
f9	current account balance minus exports, plus imports, i.e., national accounts adjustment
gi9	government investment income: interest, profits of government business enterprises
gnw9	government non-wage and salary expenditures
hr2	high corporate profit tax rate
hs2	low corporate profit tax rate
ipg2	index of industrial production, U.K.
ipu2	index of industrial production, U.S.A.
ipw2	index of industrial production, world
irg9	imputed rent on government buildings
iva9	inventory valuation adjustment
$k3^{\psi,\phi,i}$	net immigration of sex ψ, skill level ϕ, and age i
ℓ3	cutoff point between high and low corporate tax rate
liu	U.S. government long-term bond interest rate
ln9	net long-term capital movement between Canada and the rest of the world
m9	total currency and money supply in Canada: chartered bank deposits held by general public including personal savings deposits, average of December Wednesdays
nha2	maximum NHA mortgage rate
pfr2	implicit price index of imports of goods and services in U.S. dollars
pfx2	foreign price index of Canadian exports (1957 = 1.0)
pgw2	deflator for wages and salaries in government and personal sectors
pmu2	wholesale price of metal products in U.S.
pps2	price of exports of newsprint from Sweden in krona
ppu2	price of pulp and paper products in the United States in U.S. dollars
psiz2	implicit deflator for indirect taxes less subsidies
pxm2	Canadian price of mineral exports
pxp2	Canadian price of wood and paper products exports
pxx2	implicit price index of exports of goods and services
pya2	implicit price index of GDP in agriculture
pyu2	implicit price deflator for GNP in U.S.A.
qcp9	employer and employee contributions to the Quebec pension plan
rme9r	national accounts machinery and equipment reconciliation in constant (1957) dollars
rnr9r	national accounts non-residential construction reconciliation in constant (1957) dollars
rpt	weighted average personal income tax rate ($4000-$4500 class)
$rr^{\psi,i}$	school retention rate for persons of sex ψ and age i
siu	treasury bill rate U.S.A.

slk^{ϕ}	mean number of years of schooling attained by immigrants of skill level ϕ
su9	subsidies
t	1952-68 = 27,28,...,43
tr9	transfer payments
ttb	1952-68 = 6,7,...,22
wsaz	wage bill in agriculture
wsg9	wages, salary and supplementary labor income in the government sector
wsp9	wages, salary and supplementary labor income in the personal sector
wt9	withholding taxes
xre9r	other exports of goods and services in constant (1957) dollars
xxu	foreign exchange rate: Canadian dollars per U.S. dollar
ya9r	GDP in agriculture in constant (1957) dollars

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