The Economic and Social Review, Vol. 20, No. 3, April, 1989, pp. 257-266

NOTES and COMMENTS

Tests for Macroeconomic Feedback from Large-scale Migration Based on the Irish Experience, 1948-87: A Note

BRENDAN M. WALSH*
University College, Dublin

Abstract: This short paper explores the relationship between the rate of migration and the rate of economic growth. A review of the literature shows that there is no unanimity regarding the net effect of migration on economic growth. Sims' causality tests on the data for Irish migration and the growth of GNP per person over the period 1948-87 reveal no evidence of feedback from migration to growth. This finding has important implications for the interpretation of the post-war Irish economic experience.

I INTRODUCTION

A wealth of empirical research has been undertaken on the economic determinants of migration. Far less attention has been paid to exploring whether there is feedback from migration to economic growth. The present paper examines the post-war Irish experience and addresses the question of whether migration affected the rate of change in income *per capita*. The Irish case is particularly interesting in this context because of the exceptionally high rates of both net out- and in-migration that have been experienced and because the view has often been expressed, but never rigorously tested, that a high rate of emigration not only reflects the country's poor economic performance but is also part of the explanation for this poor performance (Commission on Emigration, 1955; O'Mahony, 1967; Kennedy, Giblin and McHugh, 1988).

*I am grateful to Rodney Thom for help in the preparation of this paper and to the referees for constructive comments.

II THE EFFECTS ON MIGRATION

Several authors have suggested mechanisms through which immigration might raise the rate of economic growth. By increasing the rate of population growth it could help a country to achieve economies of scale (Kaldor, 1967) and to enjoy a higher rate of technical progress (Simon, 1986). The idea that population growth could stimulate economic growth through its effect on aggregate demand goes back to Keynes, if not further. Easterlin (1968) links this argument with the immigration to the United States, which he believes dampened the business cycle through its impact on the level of investment in durable household goods and urban infrastructure.

Immigration could also raise the rate of economic growth by increasing the human capital endowment of a country. As Reder (1963) stated, "It is cheaper to import workers than to grow them" (p. 224). It has been claimed that in 1912 "between 13 and 42 per cent of the capital stock of the American economy could be attributed to the social savings arising from immigration" (Neal and Uselding, 1972, p. 87). Blitz (1977) estimates that in the late 1960s the net benefit to the economy of the German Federal Republic from immigration came to about 3 per cent of GNP a year.[1]

Finally, it has been argued that an inflow of population could increase the rate of economic growth by redistributing the labour force to high productivity, rapidly growing sectors without disturbing wage differentials or narrowing profit margins (Cornwall, 1977).

Most of these points concerning the beneficial effects of immigration have their counterparts in possible adverse effects of emigration. A loss of population due to emigration could reduce the rate of growth through its depressing effects on the level of aggregate demand and by creating an environment that is not conducive to investment and risk taking. Regional economists such as Greenwood (1975) and Dahlberg and Holm (1978) have found some evidence that out-migration leads to a self-reinforcing cycle of slow growth in employment and economic opportunities. The possible adverse social and psychological effects of emigration have been frequently discussed in Ireland, most recently by Kennedy, Giblin amd McHugh (1988) but econometric techniques have not been used to try to establish the existence or magnitude of these effects.

It is, however, possible to take a more negative, malthusian view of the effect of population growth, and hence of immigration, on living standards. For example, I have argued elsewhere that the empirical evidence advanced by proponents of the beneficial effects of population are far from convincing

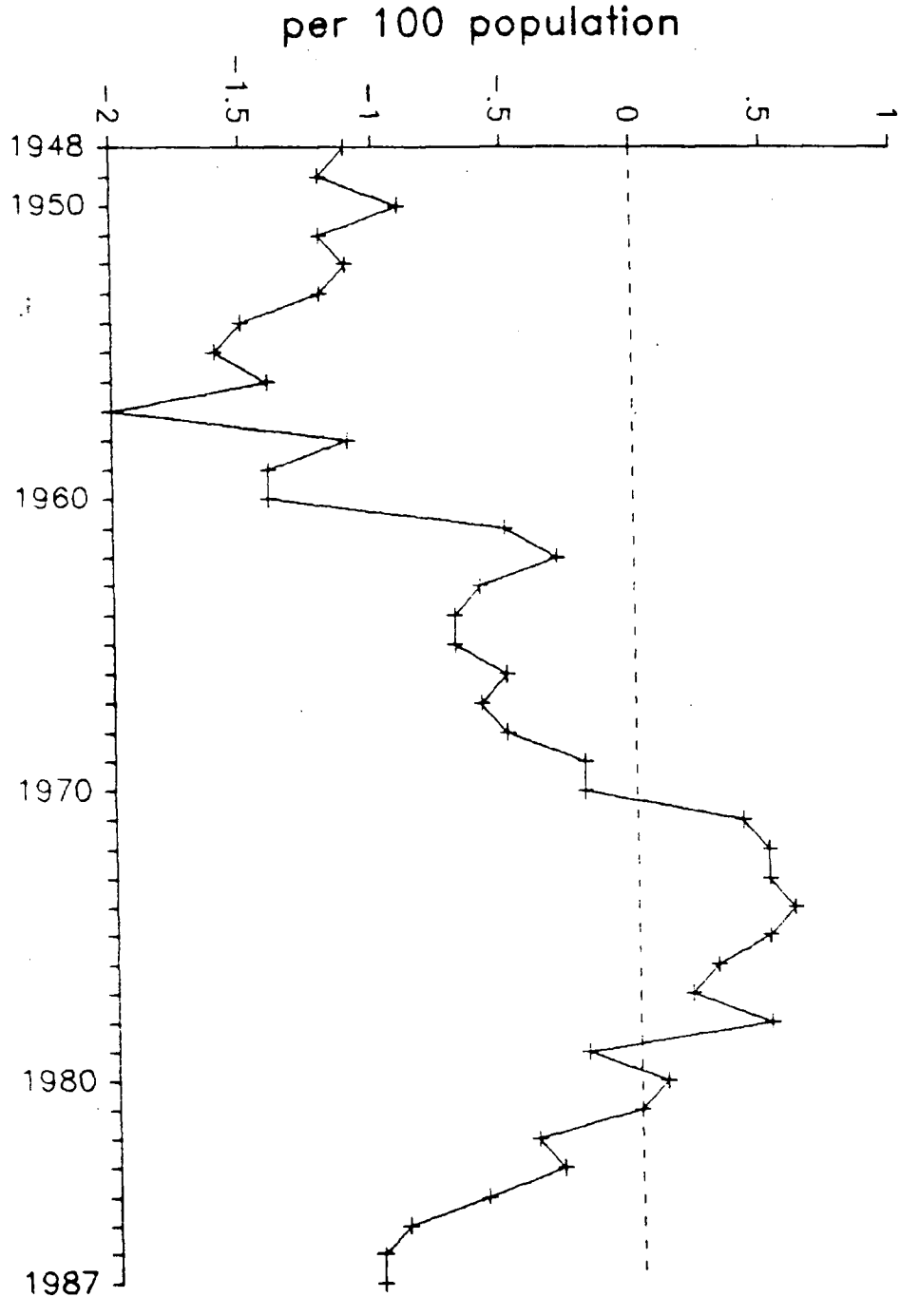
1. It may be noted that these studies relate to the 1960s or earlier. After the recessions of the 1970s international migratory flows have been at a low level, in Europe at least.

(Walsh, 1987). Denton and Spencer (1988) present a model in which population growth depresses the growth of income *per capita* by increasing the proportion of children in the population, which reduces the average level of productivity. Even though immigration increases the rate of population growth while at the same time increasing the proportion of active people in the population, it is possible to argue that the resultant growth of the labour force will lead to capital shallowing (Mishan and Needleman, 1968). In a fully employed economy, supplying additional workers with physical capital creates inflationary pressures.

Testing all of the possible effects of migration and population growth on the performance of an economy would obviously require a very detailed econometric model and make extreme demands on data. Simulation models, on the other hand, depend on parameter values that are assumed *a priori*, so that no consensus has been reached using this approach.[2] The present paper uses Sims' (1972) time series tests for causality to see if it can be said that there is a causal relationship between NMR and GNP and, if so, in which direction the causality runs. While this approach does not provide any insight into the *mechanisms* through which these variables interact, it can help settle the general question of whether unidirectional or bidirectional causality exists between them or whether they are unrelated variables. It seems appropriate to apply this test in this context because, as Pagan states, "Sims' methodology seems clearest when it is applied to the big questions of macroeconomics . . ." (1987, p. 20). Moreover, the Irish case is particularly suitable for testing for the existence of feedback from migration to economic growth. Few countries or regions have experienced the range of annual net migration rates – from -2.0 per cent in 1957 to +0.6 per cent in 1974 – that has been recorded in Ireland since the Second World War (Figure 1). If net migration had been zero throughout the post-war years, a rough calculation suggests that the population would now be between one-third and one-quarter higher than it actually is and there would be a markedly lower proportion of elderly in this larger population. Yet, although the economic influences on Irish migration have been empirically investigated in several studies (see Walsh, 1987), studies of the effects of migration on the economy have been confined to exploring the links between migration and the change in the level of unemployment (Walsh, 1987) and the role of the rate of household formation on the housing market (Thom, 1983).

2. See, for example, the contrasting conclusions reached by Denton and Spencer (1988) and Simon (1986).

Figure 1: *Net Migration Rate*



III TEST FOR FEEDBACK FROM MIGRATION TO GROWTH

The Sims' methodology was applied to the annual series on the net migration rate (NMR) and the percentage change in real GNP *per capita* (GNP) for the period 1948-87. (The data are contained in an Appendix.) The causality tests require that the series be covariance-stationary. For this reason the original series, NMR and GNP, were filtered until the residuals showed no evidence of autocorrelation up to the k^{th} order by the Liung-Box Q-statistic. The procedures used to filter the original series are shown in Table 1. It may be seen that the residual of GNP regressed on a one-year lag of itself showed no evidence of autocorrelation. A second-order autocorrelation of NMR, or the inclusion of a cubic time trend with a first order autocorrelation, was required to obtain stationary residuals.

Table 1: *Filtering of GNP and NMR*

Equation:						
1a. NMR_t =	-0.54	+ 0.26 NMR_{t-1}	- 0.15 T	+ 0.013 T^2	- 0.00024 T^3	
	(2.2)	(1.5)	(2.3)	(3.1)	(3.4)	
	Q(18) = 23.8		MSL = 0.16			
1b. NMR_t =	-0.046	+ 0.66 NMR_{t-1}	+ 0.24 NMR_{t-2}			
	(0.7)	(4.1)	(1.5)			
	Q(18) = 18.7		MSL = 0.41			
2. GNP_t =	1.53	+ 0.35 GNP_{t-1}				
	(2.9)	(2.2)				
	Q(18) = 11.2		MSL = 0.89			

t-ratios in parentheses.
MSL = minimum significance level. 1-MSL is the confidence level for the rejection of the null hypothesis.

The causality test proposed by Sims was performed on the residuals from these equations. It takes the general form of testing for the significance of the coefficients of the leading values of X in the following equation:

$$Y_t = a + \sum_{k=-j}^{+j} b_k X_{t-k} - v_t \qquad (1)$$

This test was performed with the NMR residuals as the dependent variable and the GNP residuals on the right hand side and then *vice versa*, providing

tests for the exogeneity of GNP and NMR, respectively. The logic of the test is that when Y is regressed on the lagged and leading values of X, if the leading values make a statistically significant contribution to explaining the variance in Y then there is feedback from Y to X. If, on the other hand, the lagged values alone are statistically significant, then it can be said that there is *unidirectional causality* from X to Y.

The results of the filtering of GNP and NMR are shown in Table 1. While there is scope for much experimentation with alternative filters, only one is shown for GNP and two for NMR. The null hypothesis of stationarity cannot be rejected at any of the usual confidence levels in Equations 1b and 2.

The results of the Sims' test for exogeneity are shown in Table 2. This consists of an F-test for the joint significance of the coefficients of the leading (i.e., $k < 0$) values of b_k in Equation 1. The most striking feature of these results is the low overall levels of significance of the F-statistic. The evidence of a causal relationship in either direction between these variables is not very strong. However, the evidence is much stronger that GNP causes NMR than *vice versa*. The F-statistic is significant at the 10 per cent level or better in two of the four equations testing for the significance of the leading values of NMR but in none of the equations testing for the significance of the leading values of GNP does it reach this level of significance.

Table 2: *Tests for Exogeneity Based on the Joint Significance of the Coefficients of the Leading Values of the RHS Variable*

Leads, lags		
	a. *Using residuals from equations 1a and 2*	
	Regression of GNP on NMR	
3, 3	F (3, 25) = 2.43	MSL = 0.089
4, 4	F (4, 21) = 0.93	MSL = 0.467
	Regression of NMR on GNP	
3, 3	F (3, 25) = 0.36	MSL = 0.780
4, 4	F (4, 21) = 0.76	MSL = 0.561
	b. *Using residuals from equations 1b and 2*	
	Regression of GNP on NMR	
3, 3	F (3, 24) = 2.43	MSL = 0.090
4, 4	F (4, 20) = 1.70	MSL = 0.188
	Regression of NMR on GNP	
3, 3	F (3, 24) = 1.20	MSL = 0.332
4, 4	F (4, 20) = 1.50	MSL = 0.240

The estimated coefficients are of interest in their own right. The results of the unrestricted regressions of the filtered variables NMR on GNP, and *vice versa*, with three and four leads and lags, are shown in Table 3. It will be noted the coefficients of the leading values of NMR in these equations are consistently positive, indicating that higher growth in GNP increases net migration (or lower growth leads to increased emigration), whilst the leading coefficients of GNP alternate between positive and negative and their sum is close to zero.

Table 3: *Regressions Using Filtered NMR and GNP (Residuals from Equations 1a and 2)*

Lag	*Coefficient*	*t-ratio*	*Lag*	*Coefficient*	*t-ratio*
		lhs variable: GNP			
-4	0.5083	0.27			
-3	2.8610	1.45	-3	3.1659	1.86
-2	0.5022	0.27	-2	0.8342	0.48
-1	2.1831	1.22	-1	2.9474	1.83
0	-1.3993	0.80	0	-0.7856	0.50
1	1.6277	0.92	1	1.1235	0.71
2	0.1866	0.10	2	0.1576	0.09
3	2.1767	1.12	3	2.2277	1.23
4	-2.0559	1.09			
(Constant	0.0404	0.97	Constant	0.1507	0.38)
		lhs variable: NMR			
-4	-0.0447	1.77			
-3	0.0414	1.56	-3	-0.0296	1.28
-2	-0.0114	0.44	-2	0.0010	0.04
-1	0.0364	1.35	-1	0.0385	1.57
0	0.0154	0.57	0	0.0078	0.30
1	0.0462	1.64	1	0.0259	2.20
2	-0.0085	0.28	2	-0.0028	0.11
3	0.0488	1.67	3	0.0472	1.65
4	0.0064	0.21			
(Constant	0.0212	0.35	Constant	0.0098	0.18)

IV CONCLUSION

The negative finding that there is no evidence of feedback from NMR to GNP has interesting implications for the interpretation of post-war Irish economic growth. In fact it is consistent with the observations that the extraordinarily high rate of emigration recorded during the 1950s seemed to have

no long-term adverse effect on the performance of the economy, which grew very rapidly during the 1960s in subsequent years, and that the sustained inflow of population during the 1970s did not help the economy to avoid underperforming the OECD average during the 1980s.

Some explanations may be offered for the failure of the Sims' test to reveal significant feedback from NMR to GNP. It is possible, for example, that NMR affects GNP in a number of offsetting ways, with the result that the *net* effect is negligible. The individual effects may be too small that they are not discernible in the data for GNP. Finally, it is possible that the effects of NMR on GNP become apparent only in the long run. Much more detailed, structural estimation of the effects of population growth and its components is required before we shall be able to discriminate between these alternatives.

REFERENCES

BLITZ, R.C., 1977. "A Benefit-Cost Analysis of Foreign Workers in West Germany", *Kyklos*, Vol. 30, No. 4, pp. 479-502.

COMMISSION ON EMIGRATION AND OTHER POPULATION PROBLEMS, 1948-1954, 1955. *Reports*, Dublin: The Stationery Office.

CORNWALL, J., 1977. *Modern Capitalism: Its Growth and Transformation*, London: Martin Robertson.

DAHLBERG, A., and B. HOLMLUND, 1978. "The Interaction of Migration, Income and Employment in Sweden", *Demography*, Vol. 15, No. 3, pp. 259-266.

DENTON, F.T., and B.G. SPENCER, 1988. "Endogenous versus Exogenous Fertility: What Difference for the Macroeconomy?", in R.D. Lee, W.B. Arthur and G. Rodgers (eds.), *Economics of Changing Age Distributions in Developed Countries*, Oxford: Clarendon Press.

EASTERLIN, R.A., 1968. *Population, Labor Force and Long Swings in Economic Growth: The American Experience*, New York: National Bureau of Economic Research.

GREENWOOD, M.J., 1975. "A Simultaneous-equation Model of Urban Growth and Migration", *Journal of the American Statistical Association*, Vol. 70, pp. 797-810.

KALDOR, N., 1967. *Strategic Factors in Economic Development*, Ithaca N.Y.: Cornell University Press.

KENNEDY, K.A., T. GIBLIN, and D. McHUGH, 1988. *The Economic Development of Ireland in the Twentieth Century*, London and New York, Routledge.

MISHAN, E.J., and L. NEEDLEMAN, 1968. "Immigration: Long-run Economic Effects", *Lloyds Bank Review*, January, 15-25.

NEAL, L., and P. USELDING, 1972. "Immigration: A Neglected Source of American Economic Growth: 1870 to 1912", *Oxford Economic Papers*, (New Series), Vol. 24, No. 1, pp. 68-88.

O'MAHONY, D., 1967. *The Irish Economy: An Introductory Analysis*, Cork: Cork University Press.

PAGAN, A., 1987. "Three Econometric Methodologies: A Critical Appraisal", *Journal of Economic Surveys*, Vol. 1, No. 1, pp. 3-24.

REDER, M.W., 1963. "The Economic Consequences of Increased Immigration", *Review of Economics and Statistics*, Vol. 45, No. 2, pp. 221-230.

SIMON, J.L., 1986. *Theory of Population and Economic Growth*, Oxford: Basil Blackwell.

SIMS, C.A., 1972. "Money, Income and Causality", *American Economic Review*, Vol. 42, pp. 540-552.

THOM, D.R., 1983. "House Prices, Inflation and the Mortgage Market", *The Economic and Social Review*, Vol. 15, No. 1, pp. 57-68.

WALSH, B.M., 1974. "Expectations, Information and Human Migration: Specifying an Econometric Model of Irish Migration to Britain", *Journal of Regional Science*, Vol. 4, No. 1, pp. 107-120.

WALSH, B.M., 1987. "Why is Unemployment in Ireland so High?", in *Perspectives on Economic Policy*, Vol. 1, pp. 3-42.

DATA APPENDIX

Year	*NMR*	*GNP*
1948	-1.1	3.5
1949	-1.2	5.5
1950	-0.9	2.6
1951	-1.2	1.3
1952	-1.1	3.4
1953	-1.2	2.7
1954	-1.5	1.2
1955	-1.6	3.5
1956	-1.4	-1.1
1957	-2.0	0.3
1958	-1.1	0.0
1959	-1.4	4.2
1960	-1.4	5.4
1961	-0.5	5.4
1962	-0.3	3.2
1963	-0.6	4.0
1964	-0.7	3.8
1965	-0.7	2.2
1966	-0.5	-0.2
1967	-0.6	4.4
1968	-0.5	7.8
1969	-0.2	4.4
1970	-0.2	2.3
1971	0.4	2.0
1972	0.5	6.0
1973	0.5	2.5
1974	0.6	1.9
1975	0.5	-0.9
1976	0.3	0.2
1977	0.2	5.3
1978	0.5	3.8
1979	-0.2	1.7
1980	0.1	1.5
1981	0.0	1.5
1982	-0.4	-3.5
1983	-0.3	-1.5
1984	-0.6	2.4
1985	-0.9	-2.4
1986	-1.0	-1.2
1987	-1.0	5.4

NMR = the estimated net migration rate (per 100 population). For the year t, the flow relates to the interval April$_t$ to April $_{t+1}$. *Source*: Central Statistics Office.

GNP = the percentage change in real GNP *per capita. Source*: *National Income and Expenditure* and Department of Finance Data Bank.