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Some Evidence on the Export-Led Growth Hypothesis for Ireland

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Abstract

The objective of this paper is to test for the export-led growth hypothesis in Ireland over the last 40 years using the modern econometric analysis of non-stationary time series. We find that over the 1950–1990 period there is no long-run relationship between real GDP and export volume and no evidence for the export-led growth hypothesis either. The analysis of the more recent 1981–1994 period provides strong evidence in favour of a long-run relationship between industrial production and export volume and Granger-causality from exports to output. These results support the export-led growth hypothesis over the last fifteen years and highlight the importance of export-promoting policies.

Keywords: Export-led growth hypothesis, Granger causality

JEL Classification: F1, F4

1 Introduction

Ireland has experienced significant variations in the growth rate of Gross Domestic Product (GDP) over the last 40 years. During the 1980s, an increase in foreign demand for Irish goods and services combined with a decline in the growth of domestic demand has led to growing beliefs that Ireland's steady growth (except for the years 1983 and 1986) is primarily due to the large increase in the volume of exports. The objective of the present study is to test for the export-led growth hypothesis over the 1950-1990 period and the more recent 1981-1994 period using the econometric analysis of nonstationary time series. A finding that the prediction of GDP would improve if past export growth rates are considered would have important policy implications. It would mean that sustainable GDP growth would be attained if economic policies aimed at increasing the growth rate of exports. Among other things, it would support recent decisions for a devaluation of the punt in the Exchange Rate Mechanism (ERM).

The international evidence on exports' ability to predict future income growth has been rather weak. Jung and Marshall (1985) provide results from Granger-causality tests for developing countries that show the inability of export growth to forecast income growth. Similar evidence is provided by Afxentiou and Serletis (1991) for the 1950-1985 period for a group of 16 developed countries. Chow (1987) runs Sims-causality tests for a group of eight NICs that show bidirectional causality between export growth and manufacturing output. Kugler (1991) finds that in four out of six industrial countries examined, exports are not cointegrated with income, consumption, and investment. He therefore, concludes that the evidence on the export-led growth hypothesis is weak. In a recent paper, Marin (1992), using vector autoregression and cointegration techniques, finds that export-led growth cannot be rejected for four industrialized countries. These results are consistent with the 'new' trade theory that emphasises the link between technical efficiency and trade. Giles, Giles and McCann (1992) using Granger-causality tests determine that real export growth can predict real output growth in New Zealand only if exports are disaggregated into groups. Finally, Paul and Chowdury (1995) using Australian annual data for the 1949-1991 period conclude that even though there is not a long-run relationship between exports and real GDP, exports Granger-cause movements in real GDP.

There are several channels that predict why export growth should temporally lead output growth (Jung and Marshall 1985, Afxentiou and Serletis 1991). First, an open economy is exposed to international competition and, therefore, needs to adjust towards more efficient production structures. Second, small countries obtain access to international markets and hence receive the benefits of

increasing returns to scale. Third, the expansion of the exporting sector creates positive externalities to the rest of the economy. Fourth, an increase in exports provides additional foreign exchange that can finance purchases of productive intermediate goods. Finally, export growth can represent an increase in the demand for domestic output and hence lead to output growth. However, it is also possible, that export growth could lead to a reduction in output growth. This would arise, for example, if inward foreign direct investment causes domestic distortions that lower output.

Using modern econometric techniques on Irish data we derive the following results: first, exports are not cointegrated with real GDP over the 1950–1990 period. Second, using Granger-causality tests we find that exports do not have any predictive power in explaining future changes in real GDP over the same period. Third, exports do Granger-cause industrial production when data for the more recent 1981–1994 period are used suggesting that exports have become very important in predicting output growth in the Irish economy over the last fifteen years. This result implies that the export-led growth hypothesis applies in Ireland in recent years and highlights the importance of macroeconomic policies that promote growth in export-oriented industries.

The paper is organised as follows: Section 2 provides an overview of the variability and the determinants of Irish income growth during the last 40 years. Section 3 describes our approach and contains our results. Finally, Section 4 summarises the major conclusions.

2 An overview of Irish growth

Ireland has experienced large variability in the growth rate of real GDP over the last 40 years. In addition, the importance of various factors in GDP growth has changed significantly. During the 1960s, the important factor for Irish GDP growth was the part of the manufacturing sector producing internationally-traded goods. The growth in this sector was due to inward foreign direct investment. During the 1973–1981 period, the economy grew primarily due to the expansion of domestic demand whereas the foreign demand declined in part due to the recession affecting most industrial countries. The situation was reversed in the 1980–1985 period as the private consumption and investment components of domestic demand were adversely affected due to the first stabilisation that was initiated in 1982. Finally, during the latest 1986–1991 period, very high growth rates were observed possibly due to the credible fiscal consolidation that the second stabilisation attempt created and which might have led to the upsurge of private consumption and investment (Nolan and Nolan 1991).

In addition to these factors, foreign direct investment, that had declined during the earlier 1981-1986 period, has picked up again in recent years, possibly in anticipation of the creation of a 'Fortress Europe' as Nolan and Nolan (1991) argue in their recent study of Irish growth.

3 Estimation and Results

3.1 Annual Data: 1950-1990

We first use annual data from 1950 to 1990 on real GDP and export volume. The data are taken from the International Financial Statistics (IMF). Both series are logged. To avoid the problems of spurious regressions arising from nonstationary variables that have unit roots or stochastic trends and hence may lead to misleading inferences (Granger and Newbold 1974), we first test for stationarity of each individual time series. Table 1 reports the ADF tests on the levels and first differences of the series. As Table 1 indicates, both series are I(1). We therefore, proceed and test for cointegration between the two time series using the Engle and Granger (1987) methodology¹. The ADF statistics on the residuals of the cointegrating regressions are given in Table 2. We conclude that the null of no cointegration cannot be rejected.

We, therefore, estimate the Vector Autoregression (VAR) in first differences without including an error-correction term and use each of the estimated regressions to run Granger-causality tests. The estimated equations are as follows:

$$\Delta \ln(GDP)_t = a_0 + \sum_{i=1}^n a_i \Delta \ln(GDP)_{t-i} + \sum_{i=1}^m b_i \Delta \ln(exports)_{t-i} + error \quad (1)$$

$$\Delta \ln(exports)_t = b_0 + \sum_{i=1}^n c_i \Delta \ln(exports)_{t-i} + \sum_{i=1}^m d_i \Delta \ln(GDP)_{t-i} + error \quad (2)$$

Instead of choosing the order of the lag using some information criterion, we

¹We do not use the Johansen (1988) maximum likelihood approach to cointegration since as Gregory (1991) has shown the Johansen tests have lower power than the two-step ADF test and are sensitive to overfitting of the lag order.

report F tests for various lag structures with the maximum lag set at 4. The results in Table 3 imply a lack of Granger causality from exports to output growth (none of the F statistics is significant at 5%) and hence the export-led growth hypothesis is clearly rejected.

3.2 Monthly data: 1981:1–1994:9

Nolan and Nolan (1991) in their study of Irish economic growth have divided the 1980s into two periods: 1981–1986 and the 1986–1990 period. Considering the latest period 1986–1990, Nolan and Nolan claim that

the rapid expansion of the manufacturing sector over the period (8.2% per annum) is evidently significant. This growth can be explained by the ‘1992 effect’—the outcome of investment decisions taken in anticipation of the establishment of the single European market. (Nolan and Nolan 1991, p.247)

We, therefore, test for exports’ forecasting ability in explaining the growth rate of industrial production during the 1981–1994 period, using monthly data of the indexes of industrial production (a proxy for real output due to unavailability of monthly real GDP data) and export volume. The seasonally adjusted data were obtained from the *Economic Series*.

The tests for Granger causality are performed in the following two-equation system that is an extension of the system (1)-(2) used in the previous subsection:

$$\begin{aligned} \Delta \ln(IPI)_t = & \alpha_0 + \sum_{i=1}^n \alpha_i \Delta \ln(IPI)_{t-i} + \sum_{i=1}^m \beta_i \Delta \ln(exports)_{t-i} \\ & + \lambda_1 V1_{t-1} + error \end{aligned} \quad (3)$$

$$\begin{aligned} \Delta \ln(exports)_t = & \beta_0 + \sum_{i=1}^n \gamma_i \Delta \ln(exports)_{t-i} + \sum_{i=1}^m \delta_i \Delta \ln(IPI)_{t-i} \\ & + \lambda_2 V2_{t-1} + error \end{aligned} \quad (4)$$

where IPI is the industrial production index, λ_1 and λ_2 are the error-correction coefficients and $V1_t$ and $V2_t$ are the residuals of the cointegrating regressions of the form:

$$V1_t = \ln(IPI)_t - \alpha - \beta \ln(exports)_t$$

$$V2_t = \ln(exports)_t - \gamma - \delta \ln(IPI)_t$$

Cointegration implies Granger-causality in at least one direction (Granger 1988) since if exports and output are cointegrated, at least one of the two error-correction coefficients will be significantly different from zero. Hence, either $\Delta \ln(IPI)_t$ or $\Delta \ln(exports)_t$ (or both) will be Granger-caused by the lagged levels of the variables.

In testing for Granger-causality, we first determine the integration properties of the individual time series. The results in Table 4 show that the logs of both series are I(1), i.e., stationary in first differences. Engle-Granger residual based cointegration tests (Table 5) show that the two series, export volume and industrial production, are cointegrated as the null of no cointegration can be rejected at 5%. The results of the estimation of equations (3) and (4) are reported in Table 6. Regression results for 1 and 2 lags are not reported since the errors are serially correlated. The negative and significant estimates of the error-correction coefficients are consistent with the finding of cointegration. Even though the F statistics are insignificant, the significance of the error-correction coefficients in the output regressions implies that export volume Granger-causes output (i.e., lagged exports predict output) and hence provides strong evidence in favour of the export-led growth hypothesis in the 1981–1994 period.

4 Conclusions

In this paper we have tested for the export-led growth hypothesis in Ireland over the 1950–1990 and the more recent 1981–1994 period. We find strong evidence in favour of cointegration between exports and output and the export-led growth hypothesis only for the more recent 1981–1994 period. This finding highlights the importance of export-promoting policies in Ireland and provides support for the decision of the policymakers to devalue the punt on several occasions during the last fifteen years despite Ireland's participation in the ERM.

Table 1: Tests for unit roots: 1950-1990

Variable	ADF(1) Statistics	
	τ_μ	τ_τ
<i>exports</i>	0.65	-2.17
<i>GDP</i>	0.93	-2.42
$\Delta(\textit{exports})$	-7.35*	-8.06*
$\Delta(\textit{GDP})$	-4.07*	-4.37*

Note: τ_μ and τ_τ test for the null $b = 0$ in the regressions $\Delta y_t = a + by_{t-1} + c\Delta y_{t-1} + u_t$ and $\Delta y_t = a + by_{t-1} + c\Delta y_{t-1} + dt + u_t$, respectively

* rejects the null of a second unit root at 5%.

Table 2: Engle-Granger Cointegration Tests: 1950-1990

Regression	ADF(1)
exports, GDP	-3.32
GDP, exports	-3.20

Note: The critical value for the above cointegration test is -3.49 and was determined using Table 1 in MacKinnon (1991) on page 275 and the formula on page 272.

Table 3: Granger-causality tests: 1950–1990

Lag length: (n, m)	F Statistics	
	F_1	F_2
(1,1)	2.13	1.36
(2,2)	1.37	0.92
(3,3)	1.36	0.72
(4,4)	1.86	0.74

Notes. F_1 and F_2 test the null hypotheses $b_i = 0$ and $d_i = 0$, $i = 1, 2, 3, 4$ in equations (1) and (2) in the text. LM(1) statistics (not reported) show lack of serial correlation in the residuals.

Table 4: Tests for unit roots: 1981:1–1994:9

Variable	ADF(4)		ADF(12)	
	τ_μ	τ_τ	τ_μ	τ_τ
<i>exports</i>	-0.04	-3.26	-0.25	-2.93
<i>Industrial production</i>	0.64	-2.76	0.35	-2.82
$\Delta(\textit{exports})$	-9.27*	-9.24*	-4.13*	-4.10*
$\Delta(\textit{Industrial production})$	-8.91*	-9.01*	-3.76*	-3.78*

Note: τ_μ and τ_τ test for the null $b = 0$ in the regressions $\Delta y_t = a + by_{t-1} + c\Delta y_{t-1} + u_t$ and $\Delta y_t = a + by_{t-1} + c\Delta y_{t-1} + dt + u_t$, respectively. * rejects the null of a second unit root at 5%.

Table 5: Engle-Granger Cointegration Tests: 1981:1–1994:9

Regression	ADF(3)
Exports, Industrial Production	-3.76*
Industrial Production, Exports	-3.58*

Note: A * implies rejection of the unit root null on the residuals (and therefore the null of no cointegration) of the cointegrating regression at the 5% level. The critical value for the above cointegration tests is -3.37 and was determined using Table 1 in MacKinnon (1991) on page 275 and the formula on page 272. We use ADF(3) since 3 is the minimum number of lags for white errors.

Table 6: Error-correction coefficients and F Statistics for Granger causality: 1981:1–1994:9

Lag length (n, m)	Output regressions:		Export regressions:	
	F_1	λ_1	F_2	λ_2
(3,3)	1.77	-0.199(2.62)	0.88	-0.148(1.79)
(4,4)	1.53	-0.198(2.50)	0.70	-0.118(1.36)
(5,5)	1.26	-0.211(2.59)	0.77	-0.072(0.82)
(6,6)	1.30	-0.214(2.58)	0.91	-0.093(1.01)

Note: The estimated model is of the form

$$\begin{aligned} \Delta \ln(IPI)_t &= \alpha_0 + \sum_{i=1}^n \alpha_i \Delta \ln(IPI)_{t-i} + \sum_{i=1}^m \beta_i \Delta \ln(exports)_{t-i} \\ &\quad + \lambda_1 V1_{t-1} + error \\ \Delta \ln(exports)_t &= \beta_0 + \sum_{i=1}^n \gamma_i \Delta \ln(exports)_{t-i} + \sum_{i=1}^m \delta_i \Delta \ln(IPI)_{t-i} \\ &\quad + \lambda_2 V2_{t-1} + error \end{aligned}$$

F_1 and F_2 are the F -statistics for the null hypotheses $\beta_i = 0$ and $\delta_i = 0$, respectively. λ_1 and λ_2 are the error-correction coefficients. $V1_t$ and $V2_t$ are the error-correction terms defined in Section 3. The numbers in parentheses are absolute t -values. LM(12) statistics (not reported) show lack of serial correlation in the residuals.

References

- Afxentiou, P. and A. Serletis, "Exports and GNP causality in the industrial countries: 1950-1985," *Kyklos*, 1991, 44, 167-179.
- Chow, Peter, "Causality between export growth and industrial development," *Journal of Development Economics*, 1987, 26, 55-63.
- Engle, R. and C. Granger, "Cointegration and error correction: representation, estimation and testing," *Econometrica*, 1987, 55, 251-276.
- Giles, D., J. Giles, and E. McCann, "Causality, unit roots, and export-led growth: the New Zealand experience," *Journal of International Trade and Economic Development*, 1992, 1, 195-218.
- Granger, C., "Some recent developments in a concept of causality," *Journal of Econometrics*, 1988, 39, 199-211.
- and P. Newbold, "Spurious regressions in econometrics," *Journal of Econometrics*, 1974, 2, 111-120.
- Gregory, A., "Testing for cointegration in linear quadratic models," Mimeo, Department of Economics, Queens University, Kingston, Ontario 1991.
- Johansen, S., "Statistical analysis of cointegration vectors," *Journal of Economic Dynamics and Control*, 1988, 12, 231-254.
- Jung, W. and P. Marshall, "Exports, growth and causality in developing countries," *Journal of Development Economics*, 1985, 18, 1-12.
- Kugler, P., "Growth, exports, and cointegration: an empirical investigation," *Weltwirtschaftliches Archiv*, 1991, 127, 73-82.
- MacKinnon, J., "Critical values for cointegration tests," in R. Engle and C. Granger, eds., *Long-run Economic Relationships*, Oxford: Oxford University Press, 1991.
- Marin, D., "Is the export-led growth hypothesis valid for industrialized countries?," *Review of Economics and Statistics*, 1992, 74, 678-688.
- Nolan, S. and D. Nolan, "Economic growth; theory and analysis," in J. O'Hagan, ed., *The Economy of Ireland*, Dublin: Irish Management Institute, 1991.
- Paul, S. and K. Chowdury, "Export-led growth hypothesis: some empirical testing," *Applied Economics Letters*, 1995, 2, 177-179.