

## **International Diversification and the Irish Economy**

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*Abstract:* We take an initial step in investigating the international diversification of Irish production risk. We find evidence that Ireland displays some properties associated with international risk-sharing. These include: high gross stocks of foreign assets and liabilities; high international consumption correlations relative to output correlations; and pro-cyclical behaviour of the yield on net external liabilities.

### I INTRODUCTION

Openness to international capital flows promises myriad benefits. For a country with strong growth potential, the ability to borrow overseas enables it to converge more rapidly to its steady state. In addition, international borrowing and lending can help stabilise an economy *ex post* in the face of macroeconomic shocks. A third function is that international capital market activity allows a country to hedge local production risk *ex ante* via cross-ownership of equity stakes and an appropriately designed portfolio.

In this paper, we focus on the hedging role of international capital market integration. We do so in the context of the recent history of the Irish economy. The importance of foreign-owned firms in the Irish industrial sector; the rapidly increasing level of overseas investment by indigenous firms; the substantial external debt of the government; and the magnitudes of two-way portfolio capital

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flows suggest a profile of an economy that is heavily integrated into international capital markets. Our focus here is on whether such integration has enabled Ireland to hedge its macroeconomic risk.

Risk diversification promises significant benefits. First, by stabilising consumption, the welfare of risk-averse agents is raised. Second, if firms face credit constraints, then smooth cash flow is also beneficial in the corporate sector. Third, diversification may give investors the insurance to undertake high-mean high-variance projects, raising the economy's long-run growth rate (see Acemoglu and Zilibotti, 1997; Devereux and Saito, 1997; and Obstfeld 1994a).<sup>1</sup>

In studying the impact of international capital market integration, two features make Ireland an especially interesting case study. First, Ireland has relied heavily on external sources to finance domestic investment: the very large current account deficits of the late 1970s and early 1980s now have their counterpart in extraordinary trade balance surpluses (16-20 per cent during 1996-98) and a large discrepancy between GDP and GNP (11-13 per cent during 1996-98). Given the unusual macroeconomic significance of investment income flows in the Irish economy, it is important to understand their cyclical behaviour. Second, the composition of Ireland's external liabilities is unusually skewed towards FDI. As argued by Milesi-Ferretti and Razin (1996), such equity-type liabilities should provide better risk-sharing than debt-creating liabilities. The Irish economy provides an environment in which this notion can be empirically investigated.

Previewing our results, we find evidence that is consistent with significant international diversification. Indirect evidence is provided by significant levels of international capital market activity; two-way international investment income flows; and high international consumption correlations relative to international output correlations. Direct evidence is provided by the finding that the yield on net foreign liabilities moves pro-cyclically. A pro-cyclical yield on net foreign liabilities is attractive since it implies that GNP responds less than proportionately to GDP shocks, with the result that national income is smoothed in the face of output fluctuations.

In previous work, O'Malley and Scott (1987, 1994) related profit outflows to the sales or turnover of foreign-owned domestic subsidiaries.<sup>2</sup> Their focus was on forecasting and so they did not attempt to isolate the cyclical component of profit outflows. However, their finding of a significant positive relationship between the level of firm activity (as proxied by sales or turnover) and the level of profits in the foreign-owned sector is consistent with the evidence and arguments advanced here. An earlier literature (Prachowny, 1969; Bond, 1977)

1. Devereux and Smith (1994) show that diversification in the presence of additive income shocks (as opposed to multiplicative technology shocks) may lead to a fall in growth by reducing the volume of precautionary savings.

2. In their 1994 paper, they also consider the exchange rate as an explanatory variable.

also studied the behaviour of international investment income flows. However, the goal was to explain the levels of the rates of return on domestic and foreign investments rather than their risk-diversification properties.

The structure of the rest of the paper is as follows. In Section II, we review some basic facts about Irish international capital market activity. Section III investigates international consumption and output correlations. The cyclical behaviour of the yield on net foreign liabilities is examined in Section IV. Section V concludes.

## II BASIC FACTS

In this section, we first review the behaviour of various components of the balance of payments before turning to other measures of international capital market activity.

### *The Current Account and International Investment Income Flows*

Table 1 and Figure 1 detail the evolution of the current account, the stock of net foreign liabilities, international factor income flows (all expressed as ratios to GDP) and the implied yield on net external liabilities over 1975-98. As shown in Table 1, the ratio of the current account to GDP (CAY) severely deteriorated during 1976-81 but has been improving since 1982 and moved into sustained surplus in the early 1990s. Table 1 shows also shows the stock of net foreign assets as a ratio to GDP (NFAY). We calculate this stock as the cumulative current account deficit (in constant prices) since 1963.<sup>3</sup> In line with the evolution of the current account, the stock of net foreign assets has been persistently negative but has been steadily improving since 1986.

The data for international factor income flows are shown in Table 1 and graphed in Figure 1. The ratio of factor income outflows to GDP (INCMY) has been increasing over time, rising from 4.1 per cent in 1975 to a peak of 24.1 per cent in 1997. The ratio of factor income inflows to GDP (INCPY) fluctuated around a low level until 1986 but has significantly grown during 1987-98, more than trebling from 3.4 per cent in 1986 to 10.5 per cent in 1998. These data indicate that Ireland may continue to receive gross capital inflows but also has accumulated a sizeable stock of gross foreign assets in recent years, reflecting the overseas investment activities of domestic multinational corporations and the greater international diversification of domestic investment institutions. The net factor income flow (NFIY=INCPY-INCMY) became increasingly negative during 1975-85 but has since fluctuated with no clear trend. For completeness, Figure 1 also shows the evolution of the ratio of GNP to GDP ( $GNP/GDP=1+NFIY$ ).

3. We would like to adjust this measure for revaluation effects, such as capital gains and losses, but lack the data to make this correction.

Table 1: *Irish International Investment Data*

	<i>CAY</i>	<i>NFAY</i>	<i>INCMY</i>	<i>INCPY</i>	<i>NFIY</i>	<i>R</i>
1975	-1.43	-37.64	4.12	3.64	-0.48	1.28
1976	-5.00	-38.53	4.04	3.01	-1.03	2.68
1977	-5.13	-40.23	4.22	2.39	-1.84	4.57
1978	-6.32	-42.31	6.04	2.72	-3.32	7.85
1979	-12.57	-47.19	7.13	3.13	-4.00	8.47
1980	-10.73	-57.98	9.87	5.52	-4.35	7.50
1981	-13.65	-66.50	8.52	3.78	-4.74	7.13
1982	-9.60	-78.36	8.16	2.69	-5.47	6.99
1983	-6.06	-88.18	6.96	1.87	-5.08	5.76
1984	-5.59	-90.30	7.12	1.91	-5.21	5.77
1985	-3.77	-93.02	9.69	2.56	-7.14	7.67
1986	-3.22	-97.21	12.92	3.37	-9.56	9.83
1987	-0.22	-95.95	16.03	4.18	-11.84	12.34
1988	-0.03	-91.40	21.53	5.77	-15.76	17.25
1989	-1.57	-86.41	22.73	6.72	-16.01	18.53
1990	-0.76	-81.11	22.49	8.96	-13.53	16.68
1991	0.79	-80.23	18.69	7.75	-10.94	13.64
1992	1.10	-76.27	19.26	7.13	-12.13	15.90
1993	3.89	-72.91	17.41	6.01	-11.40	15.64
1994	2.80	-64.32	15.33	6.00	-9.33	14.51
1995	2.72	-55.37	19.64	8.07	-11.57	20.90
1996	2.75	-49.02	19.03	7.62	-11.41	23.27
1997	2.84	-42.14	24.12	10.44	-13.68	32.47
1998	3.71	-36.04	23.43	10.49	-12.94	35.91

*Note:* NFAY is ratio of the cumulative current account surplus to GDP. OUTFI and INFI are ratios of international factor income outflows and inflows to GDP respectively. NFIY=INFI-OUTFI. YIELD(R)=NFI/NFA.

*Data Source:* OECD *Economic Outlook*, December 1998.

We also show the implied yield on the stock of net foreign liabilities in the last column of Table 1. We calculate the yield as

$$R_t = \frac{NFI_t}{NFA_t} \quad (1)$$

We employ net factor income as a proxy for net investment income, since the OECD does not decompose factor income into payments to labour and capital. Ideally, we would like to measure yields separately for the stocks of gross foreign assets and liabilities but the Irish data are inadequate for this task. A perfect measure of the rate of return would also include capital gains and losses on the stocks of foreign assets and liabilities but data limitations preclude this step.  $NFA_t$  is the value of net foreign assets inherited from the previous year ( $NFA_t = NFA_{t-1} + CA_{t-1}$ ).

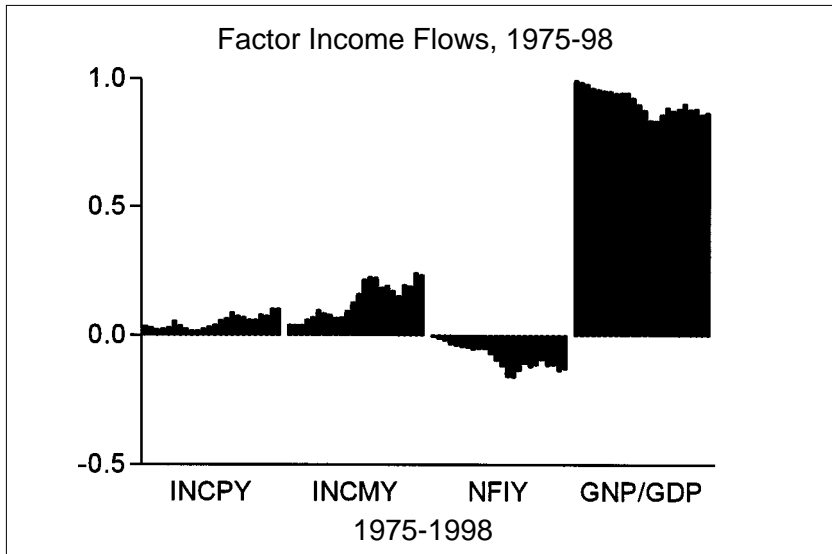


Figure 1: *GNP/GDP is Ratio of GNP to GDP.*  
See note to Table 1 for definitions of other variables.

We see from Table 1 that the yield has been rising throughout the period but has sharply increased during the 1990s. On an accounting basis, this is explained by the fact that net factor income flows have not significantly declined, despite the contraction in the stock of net foreign liabilities. If foreign assets and liabilities earned a similar, invariant rate of return, as in many textbook models, net factor income would have declined in line with net external liabilities and no increase in the net yield would have been observed. The pattern observed in the Irish data, in contrast, suggests that foreign investments in Ireland have been especially profitable in recent years.

#### *Other Indicators of International Capital Market Integration*

As a complement to the balance of payments data, we report some data on Irish participation in international capital markets in Tables 2-4. Table 2 shows the sum of international bonds raised by and bank loans issued to domestic agents as a ratio to GDP (ICAPY) and the subcomponents (BONDY, LOANY). It is clear that bond issues have grown in both absolute and relative importance, indicating that Irish entities are increasingly able to tap the international securities markets, reducing financing costs relative to exclusive dependence on domestic bank loans.

Estimates of bilateral investment income flows between Ireland and the United Kingdom over 1988-96 are provided in Table 3. The data indicate that bilateral investment income inflows and outflows are in approximate balance.

Table 2: *International Capital Market Activity*

	ICAPY	BONDY	LOANY
1975	5.2	0.5	4.8
1976	5.9	0.7	5.2
1977	6.8	1	5.8
1978	7.1	0.8	6.3
1979	6	1.3	4.7
1980	2.7	1.3	1.4
1981	8.1	2.7	5.4
1982	7	3.1	3.9
1983	6.7	5.4	1.3
1984	6.9	4.8	2.1
1985	8.6	7.6	0.9
1986	10.6	8.5	2.1
1987	5.7	3.1	2.6
1988	3.1	1.7	1.4
1989	11.1	4.5	6.6
1990	6	2.2	3.8
1991	6.9	3.5	3.5
1992	5.4	4.3	1.1
1993	6	5.6	0.4
1994	10.5	4	6.5
1995	7.9	3.8	4.1
1996	10.8	9.1	1.7
1997	4.1	3.5	0.6

*Notes:* ICAPY is sum of international bond issues and loans. BONDY is total bond issues; LOANY is total bank loans. All variables are expressed as ratios to GDP.

*Source:* OECD *International Capital Markets Statistics, 1950-95* and OECD *Financial Statistics Monthly* (January 1998).

A comparison of these figures to the aggregates in Table 1 indicates that the United Kingdom is an important destination for Irish outward investment but the United Kingdom plays a relatively smaller role as a source of inward investment into Ireland. More detail is available for Irish-German bilateral investment income flows (Table 4), which can be disaggregated into FDI, portfolio, bond and loan income flows. It is clear from Table 4 that Germany is a net recipient of investment income flows from Ireland but that the scale of the flows are far smaller than between Ireland and the UK. In addition, the flows are fairly evenly distributed across the different asset classes.

Finally, a partial source of information on bilateral direct investment patterns between the US and Ireland is provided by the United States Bureau of Economic Analysis which publishes data on the direct investment position of the US in other countries and the direct investment position of other countries in the US.

According to the most recent estimates (Bargas, 1998), the value (at historical cost) of the US direct investment position in Ireland was \$10,198 million in 1996 and \$14,476 million in 1997, or 14.8 per cent and 19.8 per cent of Irish GDP respectively. However, the value of the Irish direct investment position in the US is also extremely large, being \$6,621 million in 1996 and \$10,514 million in 1997, or 9.6 per cent and 14.4 per cent of Irish GDP respectively.

Table 3: *Bilateral Investment Income Flows: Ireland and the UK*

	<i>INCPY</i>	<i>INCMY</i>
1988	3.3	3.4
1989	3.4	3.3
1990	3.1	4.7
1991	3.2	5.6
1992	2.5	4.1
1993	3.2	4.8
1994	3.0	3.9
1995	3.3	3.5
1996	4.0	4.2

*Note:* OUTFI and INFI are ratios of investment income inflows and outflows from UK respectively, expressed as ratios to GDP.

*Data Source:* United Kingdom Balance of Payments "Pink Book" (1997) edition, Office of National Statistics.

Table 4: *Bilateral Investment Income Flows: Ireland and Germany*

	<i>INCPY</i>	<i>INCMY</i>	<i>DIRPY</i>	<i>DIRMY</i>	<i>PORTPY</i>
1993	0.87	2.34	0.06	0.85	0.25
1994	1.11	2.56	0.15	1.06	0.52
1995	1.06	2.25	0.09	0.68	0.47
1996	1.11	1.53	0.06	0.50	0.45
	<i>PORTMY</i>	<i>BONDPY</i>	<i>BONDMY</i>	<i>LOANPY</i>	<i>LOANMY</i>
1993	0.75	0.24	0.66	0.55	0.73
1994	0.79	0.49	0.69	0.44	0.71
1995	0.72	0.45	0.65	0.50	0.85
1996	0.42	0.44	0.36	0.59	0.61

*Note:* INCPY and INCMY are investment income inflows and outflows from/to Germany. DIRPY and DIRMY are income inflows/outflows associated with FDI positions; PORTPY and PORTMY on portfolio investment positions; BONDPY and BONDMY on bond investment positions; LOANPY and LOANMY on loan investment positions. All variables are expressed as a ratio to GDP.

*Data Source:* Bundesbank, *Balance of Payments by Region*, Special Statistical Publication 11, September 1997.

## III INTERNATIONAL CONSUMPTION AND OUTPUT CORRELATIONS

A basic prediction of international risk-sharing models is that consumption should be more highly correlated across countries than output: countries should share production risk in order to obtain a more stable path for consumption.<sup>4</sup> Tables 5 and 6 report output and consumption correlations between Ireland and various international groups of countries. In Table 5, we employ data from the Penn World Tables version 5.6 in order to ensure that consumption and output are measured in comparable terms across countries, at the cost of being unable to extend the sample into the 1990s. Table 6 employs OECD data that

Table 5: *International Consumption and Output Correlations I*

		1951-90	1951-72	1973-90
(1)	Cor(C, Y)	0.717	0.758	0.678
(2)	Cor(Y, Y <sub>ROW</sub> )	0.476	0.695	0.363
(3)	Cor(C, C <sub>ROW</sub> )	0.532	0.63	0.608
(4)	Cor(Y, Y <sub>EU15</sub> )	0.346	0.563	0.27
(5)	Cor(C, C <sub>EU15</sub> )	0.408	0.439	0.511
(6)	Cor(Y, Y <sub>EU12</sub> )	0.35	0.571	0.281
(7)	Cor(C, C <sub>EU12</sub> )	0.419	0.434	0.537
(8)	Cor(Y, Y <sub>EMU</sub> )	0.294	0.39	0.316
(9)	Cor(C, C <sub>EMU</sub> )	0.237	0.087	0.481
(10)	Cor(Y, Y <sub>UK</sub> )	0.263	0.553	0.081
(11)	Cor(C, C <sub>UK</sub> )	0.261	0.286	0.255
(12)	Cor(Y, Y <sub>US</sub> )	0.366	0.458	0.266
(13)	Cor(C, C <sub>US</sub> )	0.353	0.37	0.336

*Note:* Correlations of log first differences of per capita consumption and output in constant international dollars. ROW is a 40 country aggregate of all countries in Penn World Tables version 5.6 with continuous data over 1950-90 of quality grade C- or higher. EU15 is the aggregate of the fifteen current members of the EU. EU12 is the aggregate of the 12 EU members prior to 1996. EMU is the aggregate of the eleven founding members of EMU. UK and US denote United Kingdom and United States respectively.

4. See Obstfeld (1989, 1995), Backus *et al.* (1995) and Hess and Shin (1997) for reviews of this literature. Of course, full risk-sharing is limited by enforcement problems, asymmetric information, non-traded goods and non-tradable labour income risk. Even with complete insurance, a low consumption correlation can be rationalised if consumption and leisure are substitutes, fluctuations are driven by productivity shocks and agents are “on” their elastic labour supply schedules (during a domestic boom, agents work harder and hence require relatively high consumption as compensation), as shown by Devereux *et al.* (1992). However, these restrictions are unlikely to be valid for the Irish economy.

Table 6: *International Consumption and Output Correlations II*

		1973-98	1973-86	1987-98
(1)	Cor(C,Y)	0.55	0.56	0.56
(2)	Cor(Y,Y <sub>EU15</sub> )	0.08	-0.04	0.20
(3)	Cor(C,C <sub>EU15</sub> )	0.29	0.66	-0.36
(4)	Cor(Y,Y <sub>EMU</sub> )	0.05	0.01	0.08
(5)	Cor(C,C <sub>EMU</sub> )	0.22	0.68	-0.39
(6)	Cor(Y,Y <sub>UK</sub> )	0.10	-0.13	0.35
(7)	Cor(C,C <sub>UK</sub> )	0.27	0.33	0.08
(8)	Cor(Y,Y <sub>US</sub> )	0.16	0.13	0.43
(9)	Cor(C,C <sub>US</sub> )	0.29	0.30	0.41

*Note:* Correlations of log first differences of consumption and output at 1991 PPP exchange rates.

*Data Source:* OECD Analytical Database.

measures output and consumption on the basis of 1991 PPP values.<sup>5</sup> Although available for fewer countries, these data enable us to calculate correlations for the 1990s period.

In row (1) of Table 5, for informational purposes, we report the domestic correlation between consumption and output. In rows (2) and (3), following Obstfeld (1995), we report the international output and consumption correlations between Ireland and a “rest of the world” comprising all countries in the Penn World Tables with continuous data over 1950-90 that is of quality C- or better (in all cases, we exclude Ireland from the aggregate). In rows (4) and (5), the correlations are between Ireland and the EU15 consisting of all current members of the European Union. In rows (6) and (7), we consider only the EU12 which is the set of EU member countries prior to the 1996 enlargement; and, in rows (8) and (9), the eleven founding members of EMU.<sup>6</sup> Last, in rows (10)-(13), we calculated the correlations between Ireland and two key partner countries (UK and US).

Over the full 1951-90 period, the EMU group is the only case in which the consumption correlation falls substantially below the output correlation: even then the difference is small (0.237 versus 0.294). However, this hides a major change between 1951-72 and 1973-90. During the earlier period, the output correlation was in all cases above the consumption correlation whereas the

5. Table 6 refers to total output and consumption (population data are not yet available for the late 1990s for some countries). This makes little difference: we are looking at correlations of annual fluctuations — population growth does not contribute much to fluctuations since the variation around its trend would be minimal compared to the variation of output or consumption around their trends.

6. The EMU group is the EU15 minus Denmark, Greece, Sweden and the United Kingdom.

opposite is true for the more recent period. This is especially striking since the output correlation in all cases actually declined between 1951-72 and 1973-90.

Perhaps the most spectacular case is with respect to the EMU group. Although the output correlation fell from 0.39 to 0.32 between 1951-72 and 1973-90, the consumption correlation sharply increased from 0.09 to 0.48. The correlations of Irish and UK output and consumption growth rates also show a dramatic change. During the earlier period, the output correlation was higher than the consumption correlation (0.55 versus 0.29). In the latter period, the output correlation was almost zero and the consumption correlation was significantly higher than the output correlation (0.26 versus 0.08). A qualitatively similar pattern is also found for the US, with the consumption correlation rising above the output correlation in the 1973-90 period.

In Table 6, we turn to the correlations based on OECD PPP-adjusted data. In the first data column, the period is 1973-98 and we look at the sub-periods 1973-86 and 1987-98 in the second and third data columns. For the full 1973-98 period, we again have the result that the consumption correlation exceeds the output correlation for each comparator group, in line with the findings in Table 5. However, it is evident that this pattern breaks down for the most recent sub-period 1987-98: the consumption correlations with the EU15 and EMU groups turn negative, the consumption correlation with the UK is almost zero and is most positive with respect to the US (both absolutely and relative to the output correlation).<sup>7</sup> One interpretation is that consumption deviations over such a short time interval are unimportant. Another is that a permanent shift in output performance, as has plausibly happened in Ireland in recent years, can lead to a delinking of home and foreign consumption growth rates. This is the case if a country is not fully locked in to ex ante risk-sharing contracts so that it can permanently raise its consumption in the case of a permanent income shock. That said, it would be interesting to see if the 1987-98 pattern persists in future years.

This consideration notwithstanding, the overall pattern in Tables 5 and 6 clearly places Ireland in a rare set of countries for which the international consumption correlation tends to be higher than the output correlation — the usual case is the so-called “quantity anomaly” by which output is more highly correlated internationally than consumption (see Backus *et al.*, 1995) — and suggests that Ireland has limited consumption risk to a greater extent than many other industrial countries. Moreover, the higher cross-country consumption correlation post-1973 is also consistent with the sharp increase in the degree to which Ireland is integrated into global capital markets since that time.

7. It is worth noting that the strongest output correlation is typically with the US across Tables 5 and 6.

However, such correlation tests are only an indirect method of examining the extent of international risk-sharing, since they do not reveal the mechanisms by which consumption and output are delinked. For instance, agents can in principle share risk by writing cross-insurance contracts which specify payoffs that are contingent on GDP realisations, by building internationally-diversified portfolios, via the overseas investment activities of firms or by international lending and borrowing. In the next section, we consider a more direct test of one particular mechanism — a contingent yield on the stock of net foreign assets — in hedging domestic production risk.

#### IV ARE INTERNATIONAL INVESTMENT INCOME FLOWS STABILISING?

To investigate the cyclical behaviour of yields on net foreign assets, we take the following approach. Write GNP as

$$\text{GNP}_t = \text{GDP}_t + \text{NFI}_t \quad (2)$$

where  $\text{NFI}_t$  denotes net factor income. Equation (2) can be rewritten as

$$\text{GNP}_t = \text{GDP}_t + R_t * \text{NFA}_t \quad (3)$$

where  $R_t$  is the yield on net foreign liabilities in year  $t$  and  $\text{NFA}_t$  is the stock of net foreign assets.  $\text{NFA}_t$  is a predetermined variable since it depends on the lagged cumulative value of prior current account surpluses. Accordingly, the impact of a shock to GDP on GNP is given by

$$\frac{\partial \text{GNP}_t}{\partial \text{GDP}_t} = 1 + \frac{\partial R_t}{\partial \text{GDP}_t} * \text{NFA}_t \quad (4)$$

If a country (e.g. Ireland) has negative net foreign assets ( $\text{NFA}_t < 0$ ), it follows that  $\partial R_t / \partial \text{GDP}_t > 0$  is required for GNP to respond less than one-for-one to the GDP shock.<sup>8</sup>

Our next step is to empirically investigate whether the yield on net foreign

8. Following Asdrubali, Sorensen and Yosha (1996), Sorensen and Yosha (1998) and Lane (1999), we implicitly assume GDP is driven by a univariate stochastic process in reduced form. We do not attempt to decompose GDP fluctuations into constituent shocks (technology, taste, fiscal, monetary). A focus on a univariate stochastic process is a common simplifying technique in many quantitative business cycle models. Note that smoothing would be achieved via a countercyclical yield if a country had positive net foreign assets.

liabilities is indeed pro-cyclical in Ireland. Since unit root tests reveal the yield and GDP to be non-stationary variables, we must filter the data to ensure stationarity.<sup>9</sup> Accordingly, we employ the empirical specification

$$\Delta R_t = \alpha + \beta * \Delta \log(\text{GDP}_t) + e_t \quad (5)$$

In Equation (3),  $\Delta$  denotes a filtered measure,  $R_t$  is the yield on net foreign liabilities in year  $t$ ,  $\text{GDP}_t$  is an output indicator,  $e_t$  is an error term and  $\beta > 0$  is required for the yield to be pro-cyclical. For robustness, we consider three cyclical filters: (a) the first-difference filter; (b) the Hodrick-Prescott (1997) HP filter; and (c) the Baxter-King band-pass filter. The first-difference filter in essence captures cyclical variation around a constant long-run growth rate, whereas the HP filter allows the trend to be time-varying. Baxter and King (1994) criticise the HP filter for placing an excessive weight on high-frequency fluctuations in calculating the filtered component and propose instead a band-pass filter that focuses on the frequencies that matter for business cycle analysis.<sup>10</sup>

Under risk sharing, the yield on net foreign liabilities  $R_t$  should move pro-cyclically. A pro-cyclical yield means that, holding fixed the stock of net foreign liabilities, net payments to overseas investors rise during a boom and fall during a recession. In this way, domestic production risk is hedged: in exchange for sharing the fruits of an upturn by paying out a larger share to outside investors, domestic agents are cushioned against a downturn since the share of domestic output allocated to foreigners declines under those conditions. Similarly, investing in overseas assets that have a high payoff when the domestic economy is doing badly insulates domestic income from fluctuations in domestic output.

It should be recognised that a contingent yield on net foreign liabilities can be generated by equity-type investments (FDI or portfolio investment in stock markets) or via investments that promise a fixed income stream in a given currency. In the latter case, real exchange rate movements convert the fixed income stream in one currency into a time-varying real return in another currency. The importance of FDI in the Irish economy suggests that the yield is unlikely to be invariant, since profit rates fluctuate. However, it remains to be seen whether investment income flows co-move in such a way with domestic GDP to provide stabilisation. Unfortunately, the Irish data do not permit us to compare across different asset classes to explore whether there are indeed systematic differences in their income-hedging properties.

9. The Phillips-Perron unit root shows both are  $I(1)$  variables. For the yield,  $I(2)$  can be rejected at 5 per cent level. For GDP,  $I(2)$  can be rejected at the 10 per cent level.

10. In practice, as explained by Baxter (1995), the band-pass filter can be implemented by adjusting the smoothing parameter in the Hodrick-Prescott filter from 100 to 10 (for annual data). See also Hodrick and Prescott (1997).

In addition to Equation (5), we also examine the specification

$$\Delta R_t = \alpha + \beta * (\Delta \log(\text{GDP}_t) - \Delta \log(\text{GDP}_t^{\text{ROW}})) + e_t \quad (6)$$

In Equation (6),  $\text{GDP}_t^{\text{ROW}}$  is an output indicator for the “rest of the world” as proxied by a trade-weighted GDP average over Germany, the United Kingdom and the United States. We control for the international business cycle since hedging is only feasible if correlation between domestic and international output fluctuations is less than one. As a precursor to the estimation, Figure 2 plots the yield and  $\log(\text{GDP})$ , in first differences. The visual impression of a positive relationship is striking.

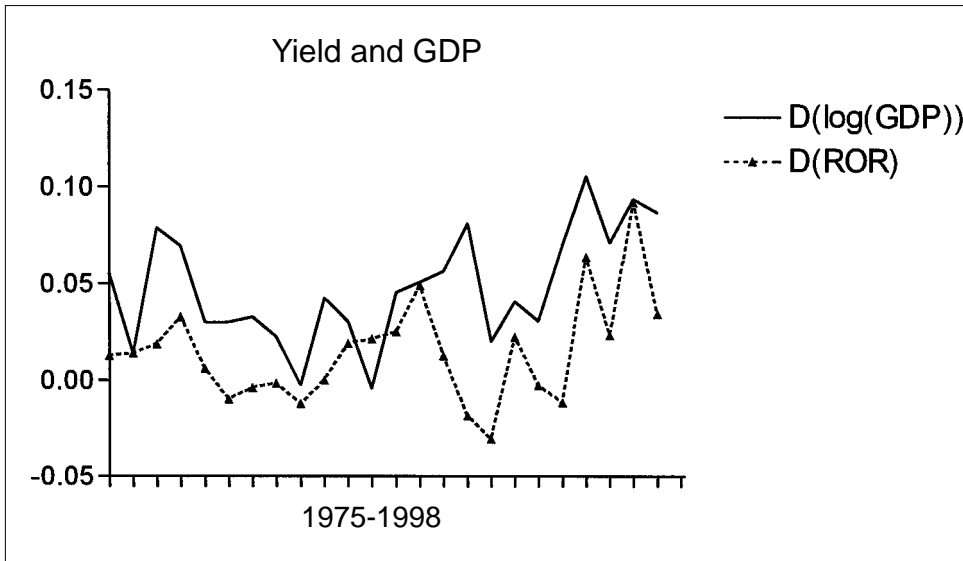


Figure 2: *First Differences of Yield and Log(GDP) over 1975-98.*

Source: OECD *Economic Outlook*.

The econometric results are presented in Table 7. The first-difference filter is employed in columns (1)-(2); the HP filter in columns (3)-(4); and the band-pass filter in columns (5)-(6). In columns (1), (3) and (5), the output measure is just domestic GDP; in columns (2), (4) and (6) it is the cyclical deviation of domestic GDP from “rest of world” GDP. Finally, columns (3)-(6) contain an AR(1) correction to control for serial correlation in the residuals. Estimation is by ordinary least squares, with White’s heteroscedasticity-corrected standard errors.

Table 7: *Regression Results: Dependent variable is  $\Delta R_t$  (Filtered Yield)*

	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-0.01 (-0.98)	-0.02 (-1.95)	0.003 (0.22)	0.004 (0.30)	0.001 (0.17)	0.001 (0.2)
$\Delta \log(\text{GDP})$	0.50 (2.44)	0.42 (2.00)	0.53 (2.26)	0.41 (1.76)	0.43 (2.37)	0.33 (1.81)
Adj R2	0.263	0.171	0.506	0.440	0.247	0.187
BG-LM	0.57	0.38	0.12	0.07	0.23	0.31
N	24	24	23	23	23	23
Period	1975-98	1975-98	1976-98	1976-98	1976-98	1976-98

*Note:* Dependent variable is the (filtered) yield on net external liabilities. BG-LM is p-value from Breusch-Godfrey serial correlation LM test. t-statistic in parenthesis.

Across the specifications, the robust finding is that the yield on net foreign liabilities is significantly pro-cyclical. The estimated effect is quantitatively large: taking the results in column (1) for illustrative purposes, a one standard deviation increase in the GDP growth rate increases the yield by 1.5 percentage points.<sup>11</sup> The point coefficients are slightly lower when the output measure is the cyclical deviation from “rest of world” output in columns (2), (4) and (6): the implication is that yields also have a positive dependence on global conditions. This finding is intuitive in the context of an export-orientated economy: profit levels are sensitive to both external and domestic economic conditions. As a robustness check, we recalculated the yield on the basis of the alternative estimates of the stock of external liabilities provided by Honohan and Kelly (1997) and obtained very similar results.<sup>12</sup> We also experimented with a trend term in specifications (1) and (2) but this also made no difference. Finally, the plot in Figure 2 indicates that the cyclical relationship between yields and output has tightened during the 1990s: in future work, it will be interesting to see if this pattern persists.

The evidence in Table 7 supports the notion that Irish production risk is at least partially hedged, since volatility in domestic GDP is offset by pro-cyclical movements in the yield paid on net external liabilities. Moreover, this finding is in line with the evidence in Sections II and III that Ireland has extensive gross

11. The standard deviation of GDP growth is 3 per cent. The point coefficient in column (1) of Table 7 is 0.5 so that a one standard deviation increase in GDP growth translates into a 1.5 percentage point ( $0.03 \times 0.5 = 0.015$ ) increase in the yield. For comparison purposes, the standard deviation of the first difference of the yield is 2.7 percentage points.

12. Honohan and Kelly (1997) attempt to correct for capital gains and losses on the holdings of net foreign liabilities by adjusting for the erosion of nominal values caused by domestic and foreign inflation. We thank Patrick Honohan for generously providing these data.

foreign assets and liabilities and the international consumption correlation exceeds the international output correlation. For Canada and the United Kingdom, Lane (1999) finds that the yields on many categories of foreign assets and liabilities are acyclical, which may indicate that the Irish performance is atypical. However, an important exception was that the yield on Canadian FDI liabilities was found to be significantly pro-cyclical. This is consistent with an interpretation that views our heavy dependence on FDI as explaining the stabilising pattern of international investment income flows in the Irish economy (see also Milesi-Ferretti and Razin 1996).<sup>13</sup> It would be desirable to study more disaggregated data (e.g. gross international investment positions) in the Irish case but confidentiality issues prevent the Central Statistical Office from publishing a detailed breakdown of the international investment position. It is to be hoped that the current IMF effort to improve data on international investment flows will provide some extra insights into risk-sharing patterns.

Finally, our focus here has been the hedging of cyclical output risk. International diversification can also play a role in hedging “trend” risk (long-term deviations of domestic output from world output) but we lack a sufficient span of data to investigate this dimension. Diversification is also potentially useful in stabilising the value of asset portfolios, as opposed to income, but this issue is beyond the scope of the present study. It would also be interesting to investigate the co-movements between investment income flows and the factor subcomponents of national output, to identify whether there are differences in the extent to which fluctuations in labour income and capital income are hedged.

## V CONCLUSIONS

In this paper, we have taken an initial step in examining international diversification in the context of the Irish economy. We found substantial evidence in support of partial hedging of domestic production fluctuations. Our focus here has been on the positive dimension of this question but future research should also address the normative issues involved. For instance, it may be useful to investigate how the advent of EMU alters the optimal pattern of international diversification — in the absence of the devaluation option, alternative hedging mechanisms may become yet more important, especially within the euro area.

Finally, an unexplored question is to identify the sources of Irish macro-economic risk. It would be interesting to learn whether changes in Ireland’s

13. It is possible that part of the negative comovement between net factor income and GDP is attributable to fluctuations in transfer pricing activity that simultaneously move recorded factor income outflows and GDP in the same direction. It would be difficult to test this alternative hypothesis.

commodity, country, trade and FDI patterns have raised or diminished vulnerability. A related topic is whether domestic fiscal and monetary policies have amplified or moderated GDP volatility. In Lane (1998), we provided evidence that fiscal policy has often been inappropriately pro-cyclical. If monetary and exchange rate policies were similarly destabilizing, the move to EMU may not necessarily raise the volatility of GDP.<sup>14</sup>

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14. To the extent that the devaluations during the EMS period were in response to Sterling weakness, exchange rate policy may have played a stabilising role during some of the sample period. However, this came at the price of destabilising speculative attacks (e.g. 1992/93) that are now eliminated under EMU. Moreover, a stabilising role was effectively abandoned much earlier than the formal starting date for EMU since the Maastricht conditions limited the responsiveness of exchange rate and monetary policy.

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