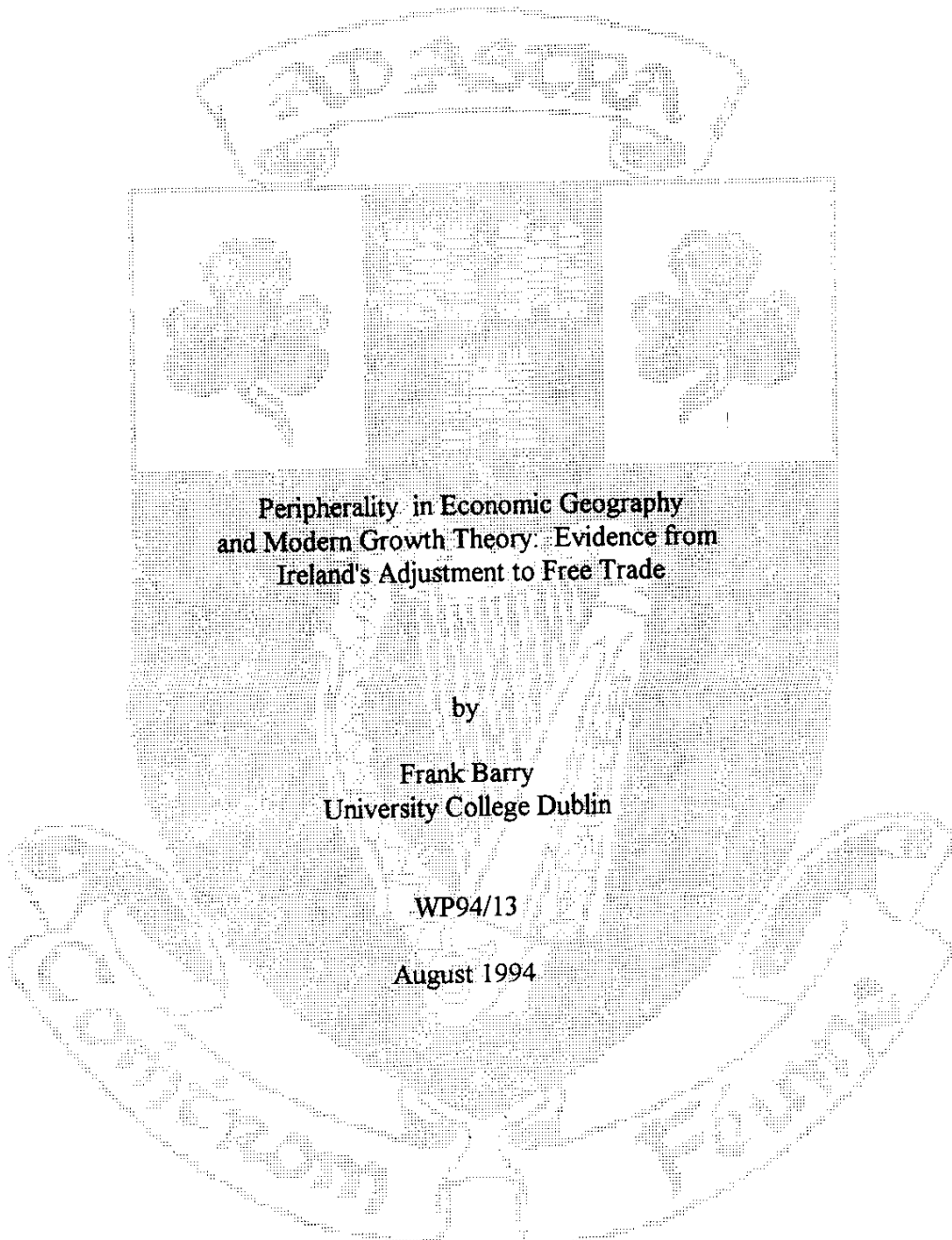| Title	Peripherality in economic geography and modern growth theory : evidence from Ireland's adjustment to free trade
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Peripherality in Economic Geography
and Modern Growth Theory: Evidence from
Ireland's Adjustment to Free Trade

by

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PERIPHERALITY IN ECONOMIC GEOGRAPHY
AND MODERN GROWTH THEORY:
Evidence from Ireland's Adjustment to Free Trade

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July 1994

Abstract

In light of the ambiguous convergence experience of peripheral regions in the EU and in the post-War world economy, this paper studies the implications of some recent trade models that do not predict convergence as a necessary outcome of market integration. These models are then confronted with data on the Irish experience under free trade. The Irish case is arguably of general interest because it has served as one of the longest-running examples of the type of outward-oriented strategies recommended for developing countries by international institutions such as the World Bank and the IMF. The purpose of the paper is twofold: to identify lacunae in the recent theoretical analyses and to develop further insights into the structural transformation of a peripheral economy.

1. Introduction

The traditional view among Neo-Classical economists has been that freer trade and greater infrastructural development in peripheral regions will hasten convergence to the income levels of the periphery's richer trading partners. These implications are of major importance for the peripheral regions of Europe in the context of the Single European Market and the Structural Funds programme; they are also crucial for the longer-term prospects of developing countries. Empirically, however, one can reject the notion of absolute convergence as applying to regions or economies that differ substantially from each other in important respects, even though they might have strong trading links; see e.g. Barro and Sala-i-Martin (1992) and Mankiw, Romer and Weil (1992).

At the same time as these empirical results have been emerging, the theoretical results underlying the traditional conventional wisdom have been challenged or substantially modified by developments in the fields of international trade, economic geography and endogenous growth theory. The purpose of the present paper is to compare the predictions emerging from this recent work with data drawn from Ireland's period of adjustment to freer trade and more rapid infrastructural development.

The next section of this paper defines peripherality and indicates the structural similarities between the European periphery and the developing world. The evidence on convergence and divergence is also briefly discussed. There follows an explication of recent results on the impact of market integration on peripheral regions; these emerge from the new theories of economic geography and endogenous growth. Ireland's adjustment to free trade is then analysed in this light. The purpose of the paper is not only to shed new light on the Irish experience but to identify lacunae in the new theoretical literature. The paper concludes with a summary of the main findings.

2. Peripherality and Convergence

Peripherality

The term "peripherality" will be used here to refer to regions which are weak economically relative to their trading partners. This is the definition of "Objective 1" regions used by the EU. Those regions, with 75% or less of the EU average GDP per capita, comprise the

western and southern seaboards of the Union. This connection between geographic peripherality and relative poverty is not explored here; rather it is assumed, as is clearly relevant in the EU case[1]. Exploration of the connection is a topic for future research.

Relatively poor EU regions share several other characteristics which can be associated with peripherality in general, e.g. a high share of employment in agriculture, greater unemployment and underemployment, a higher proportion of sensitive sectors and of small and marginally efficient firms, a dualistic industrial structure (overlapping to some extent with the distinction between indigenous and multinational firms) a low share of producer services and a higher share of consumer services [CEC (1990),p.216; NESC (1989), p.336; Barry, Bradley, Kennedy and O'Donnell (1994)].

This emphasis placed here on measurement relative to a region's trading partners, it should be noted, stands in contrast to the perspective of growth theorists such as Barro and Sala-i-Martin (1991,1992) and Mankiw, Romer and Weil (1992) who, inspired by the steady-state equilibrium of the Solow growth model, downplay trade relations with one's encompassing region as a primary determinant of regional growth[2].

Convergence

According to Neo-Classical tradition regions should converge over time in terms of income per head. This can come about for one of several reasons. The current orthodoxy holds that if regions are similar in terms of the technology at their disposal, attitudes to saving and levels of human capital, they should share the same steady-state equilibrium growth rates. The poorer a region is then, the further it is away from the steady-state, the higher the marginal product of capital per head, and the more rapid investment per head and growth per head should be. This is the classical convergence prediction, and empirical support for this has been presented by Barro and Sala-i-Martin (1991), for broadly similar regions of the US and Europe.

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[1] Krugman and Venables (1990) note the strong connection between regional GDP per capita in Europe and "distance from purchasing power".

[2] Some empirical evidence that trade relations are important is provided by Ben David (1994).

和Europe.

<u>and Europe</u>.

Not all countries in the world would be expected to have the same steady-state equilibrium, however, and the world data [graphed for example in Barro and Sala-i-Martin (1992)] indeed shows divergence rather than convergence. These authors, however, and Mankiw, Romer and Weil (1992) argue that when the stock of human capital is controlled for, relative convergence makes an appearance; i.e. that if the steady-state is related to a country's stock of human capital per head then the further away a country is from its own steady-state the more rapidly it grows.

O'Grada and O'Rourke (1993) and Walsh (1993), however, even controlling for human capital, find Ireland to be an outlier in terms of European convergence; i.e. it has grown less rapidly than would have been expected on the basis of initial conditions. Prados et al. (1993) report similar findings for the whole European periphery. Many of these findings however depend strongly on the time period of the sample. Table 1 extends the data period beyond the years 1988 and 1990 used by O'Grada and O'Rourke (1993) and Prados et al. (1993) respectively, and seems to indicate much more rapid convergence in recent years.

Table 1: Relative GDP (GNP) per capita (PPP; EU12=100)

	1960	1973	1980	1985	1990	1993
Irl	61 (62)	59 (59)	64 (62)	65 (58)	71 (62)	77 (69)
Spn	60	79	74	71	75	76
Grce	39	57	58	51	47	49
Port	39	56	55	51	56	61

Source: CEC Annual Report (1994)

Taking Barro and Sala-i-Martin's (1991) finding of an average speed of convergence of 2% per annum, we find that while each peripheral country performed worse than expected over the whole 1960-1993 period, each country except Greece performed somewhat better than

expected (in terms of GDP per head) since accession into the EU[3,4].

Neven and Gouyette (1994), however, look at much more disaggregated regional data and find that Northern European regions, after a period of stagnation in the early 1980s, converged strongly between 1985 and 1989, while Southern European regions stagnated following a period of rapid convergence in the early 1980s.

On the basis of this conflicting evidence one is forced to be somewhat agnostic on the relationship between market integration and convergence. It is for precisely these reasons that the Structural Funds programme of the European Union was substantially reformed in 1988, its financial allocation doubled in real terms for the 1987-1993 period, and funding almost doubled once again for the 1994-1999 period[5].

Traditional trade theory stressed the absolute gains from trade rather than the relative gains with which convergence is associated. There is an importance sense, however, in which convergence is predicted. This follows from the fact that the gains arise because trade brings down a country's import prices and improves its export prices; i.e. the gains result from a change in relative prices. If small peripheral economies are more likely to be specialised (and thus their products comprise a low share in consumption bundles in the rest of the world) than more mature core economies, then the change in relative prices they experience when they integrate with core economies are relatively large, and trade should therefore benefit the poor periphery more than the rich core.

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[3] Note that there is controversy in Ireland over the accuracy of recent growth figures, many economists holding that they are overestimated due to the transfer pricing behaviour of MNCs.

[4] Dates of accession are 1973 (Ireland), 1981 (Greece) and 1986 (Spain and Portugal).

[5] The Structural Funds 1989-93 allocations, as a proportion of regional GDP was 3.5% for Portugal, 2.9% for Greece, 2.3% for Ireland, 1.2% for the 70% of Spain classed as Objective 1 regions, and 0.8% for the Italian Mezzogiorno. [CEC (1992)].

Factor price equalisation, [which arises if factor proportions are not "too dissimilar"; cf. Mussa (1979)], it is sometimes suggested, also implies convergence. This is incorrect, since GDP per capita equals the common wage rate plus the common return on capital times the differing capital-labour ratios. Capital and/or labour mobility, in traditional trade models should tend to bring about convergence, however, though there is an important distinction between them. Labour mobility should equalise GDP and GNP per head, because the owner of the factor moves. Capital mobility, however, would be expected to equalise GDP per head but not GNP per head.

In light of the conflicting evidence on convergence driven by EU membership, however, and the lack of convergence in the world economy even under the liberal trade regimes of the post-War period, it becomes of interest to look at newer trade models which do not necessarily imply convergence.

3. Models of Possible Divergence: Economic Geography and Endogenous Growth
New Trade Theory and Economic Geography

Recent developments in international-trade theory which take account of economies of scale and imperfect competition suggest that the overall benefits of freer trade are likely to be substantially larger than the gains predicted by traditional models[6]. The problem for peripheral regions is that whereas poorer countries are deemed likely to gain most from trade liberalisation within the Heckscher-Ohlin model, there is no such guarantee in these newer models. While poorer countries are unlikely to lose overall, because the impact of lower consumer prices is felt no matter where the production of goods characterised by economies of scale takes place [Ethier (1982)], there is a possibility that richer regions will gain most because of their enhanced attractiveness as locations for those industries. The implication is that average productivity in the regions which capture the increasing-returns-to-scale industries

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[6] Thus the Cecchini report (1988) suggested that the benefits of the Single Market, which traditional models would have estimated at around 2% of EC GDP, could be doubled when these other factors are taken into account. Subsequently Baldwin (1989) argued that taking the change in steady-state income into account could double these gains once again, while, in the context of an endogenous growth model the present discounted value of future income gains could be between 11% and 35% of EC GDP.

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rises while it falls elsewhere [Heffernan and Sinclair (1990), pps.123-128][7].

This issue has been explored in a series of papers by Paul Krugman, and by Krugman and Venables (1990,1993).

Krugman (1991) analyses the combination of circumstances that will give rise to a core-periphery distinction. The specific model focuses on generalized external economies rather than those specific to a particular industry. The crucial point is that firms have an incentive to locate close to each other, to benefit from agglomeration economies. Low spillover effects or high transport costs induce suppliers of goods and services to another constant returns sector that is tied to its current location (i.e. agriculture) to locate close to their markets. For a given level of spillover effects a decline in transport costs induces migration of increasing-returns-to-scale industries out of peripheral regions, leading to a divergence of real wages.

Krugman and Venables (1990) add an extra twist to this story: when transport and trading costs become very low, the advantage shifts to the peripheral location because of its lower labour costs, so it becomes cheaper to produce there and transport the goods to the core market.

They use the following simple example to illustrate the forces at work. For given consumption levels, and a given amount, therefore, of total production, let production and trading costs be as in Table 2. Production costs are lowest if all production takes place in the periphery (because wages there are low). Total production costs are highest if production occurs in both locations (because economies of scale are not exploited). Since most demand is in the core region, shipping costs are highest if all production occurs in the periphery. It is clear from the table that cost minimisation dictates that when shipping costs are very high, production takes place in both regions, when shipping costs are zero production takes place in the periphery, and at intermediate levels of shipping costs production takes place in the core.

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[7] Empirically there is a strong correlation between per capita GDP and the presence of increasing returns industries; see e.g. Loertscher and Wolter (1980), Balassa (1986) and Leamer (1992).

Table 2: Hypothetical effects of lowering trade barriers

	Total production costs	Shipping Costs		
		High	Medium	Low
Produce in core	10	3	1.5	0
Produce in periphery	8	8	4	0
Produce in both locations	12	0	0	0

The model therefore generates a U-shaped curve that depicts the share of increasing-returns industries that the periphery captures as trade barriers are reduced, and the response of relative wages is similar[8].

These models have several interesting implications. First, they provide a rationale for Williamson's (1965) well-known hypothesis that the process of trade and market integration generates divergence in its initial stages and later leads to convergence. Second, it rationalises various empirical findings reported by Martin and Rogers (1994). These include the fact that the share of intra-industry trade in a region's EC trade (which is identified with the location of increasing-returns industries) is not strongly correlated with a region's transport infrastructure[9]. Nor, again, is per capita GDP, for which there is a strong correlation with telecommunications and education infrastructure. Third, these models warn, as Martin and Rogers note, against overallocating EU Structural Funds towards the development of transport infrastructure in the periphery (on which more later).

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[8] Durkan and Reynold's (1992) analysis suggests another factor that inhibits peripheral regions from capturing IRS industries. This is that transport costs for differentiated products may be many times higher than for standardised products.

[9] It is strongly correlated with other forms of public infrastructure, particularly education and energy.

and Rogers note, against overallocating EU Structural Funds towards the development of transport infrastructure in the periphery (on which more later).

Endogenous Growth

As Sala-i-Martin (1990) shows, the essential property of an endogenous growth model is that there should be constant returns to the factors that can be accumulated. With a declining marginal product of capital, as in the Solow (exogenous) growth model, growth will slow down as one approaches the steady state, and will ultimately stop altogether unless exogenous technical change occurs to stimulate further increases in capital per head. Several of the ways in which this problem of a declining marginal product of capital can be surmounted include (a) learning-by-doing, (b) human capital accumulation, and (c) R&D-driven technological progress under imperfect competition.

In this section we consider core-periphery models of each of these types, in order to analyse the dynamic effects of international trade on growth and technical progress. The first model is due to Young (1991), the second to Stokey (1991) and the third to Grossman and Helpman (1991).

In Young's model trade between core and periphery raises the growth rate of the core and reduces that of the periphery. The periphery (if small) is still likely to gain overall, because of the traditional static gains from trade, but the model clearly implies divergence. In this model there is a bound on the cumulative productivity gains from learning by doing (LBD) in the production of any particular good, but LBD exhibits spillovers across goods. Thus growth involves the production of a changing basket of goods and an evolving trade structure. With no international diffusion of knowledge, the main growth effect of trade is to force periphery firms to wait in industries in which they have already exhausted LBD while core firms (i.e. those in regions with a technological lead) speed ahead into more high-growth sectors. Only after core firms exhaust the potential for LBD in these new sectors can periphery firms follow them in and continue their technical progress. Thus the progress of the periphery is retarded, LBD is slower than it would be under autarky, and the growth rate falls.

The human capital model can generate endogenous growth since both human and physical capital can be accumulated. A constant steady-state growth rate emerges if the return to investing in human capital is constant. In the Stokey model, since individuals have finite lives, the only source of steady-state growth is the externality effect whereby private investment in schooling raises the social stock of knowledge, increasing the effectiveness of time spent in school by later cohorts. (Knowledge, once again, does not spill over across international boundaries.) Different types of labour are imperfectly substitutable, which in this model means that as aggregate human capital grows, lower quality goods are dropped from production and higher quality goods added.

Now consider the impact of free trade on a small economy that is fairly backward relative to the rest of the world. Free trade lowers the relative price of the goods produced by highly-skilled labour in the periphery, and so reduces the incentive to acquire skills. Thus the growth rate of the economy falls. (The static gains from trade may nevertheless outweigh these losses from slower growth.)

Stokey concludes her analysis as follows, referring to the Young paper and others: "If the industries in which the less developed country has a static comparative advantage are industries in which there are limited opportunities for learning, then the effect of free trade is to speed up learning in the more developed country and to slow it down in the less developed one. The model here shows that similar reasoning applies when the external effect operates at arm's length from the production process".(P. 608)

Unlike the previous two models in which endogenous growth occurs through the presence of externalities, Grossman and Helpman (1991) assume that increasing returns are internal to the firm, giving rise to an imperfectly competitive market structure which generates profits out of which R&D can be funded.

Consider first the case where technological spillovers are confined to the country in which they are generated. These models again predict that for a small lagging economy, free trade induces specialization in low-tech goods because its researchers cannot compete successfully in the world technology race. This induced resource reallocation reduces long-run output

growth, and may imply losses from free trade (if the static efficiency gains are dominated by the reduced growth). [pps.249,257].

When technological spillovers are international in scope, however, the rate of innovation cannot fall in the R&D-resource poor country. While it enjoys faster technological progress in manufacturing, its overall output growth rate may fall, since it specialises in the less dynamic sectors, but its consumption growth rate must rise [pp. 256].

The implications of these endogenous growth models for peripheral regions, then, are as follows. First, freer trade appears likely to confine peripheral regions to less dynamic sectors than they would have entered in autarky. Second, learning by doing, human capital accumulation, R&D expenditures, and output and productivity growth rates appear likely to decline as the periphery becomes more integrated with the core. Third, peripheral regions still appear likely to gain overall, but divergence rather than convergence of growth rates is the general outcome of these models.

4. The Irish Adjustment to Free Trade

According to the models of economic geography and endogenous growth theory surveyed above, the Single Market process may well cause divergence. Increasing integration (and European-funded development of transportation infrastructure) may represent a threat to Ireland's increasing returns industries, and the free trade process at some stage may have reduced output- and productivity-growth rates and the incentive to fund R&D and to accumulate human capital.

The thesis of this section of the paper is that these dire predictions have not come to pass over the course of Ireland's adjustment to free trade.

This adjustment began around 1960 when explicit steps to attract multinational industry were taken and signals were sent that the era of protectionism was ending. The Anglo-Irish Free Trade Agreement was signed in 1965 and the country acceded to the EC in 1973. The extent of opening-up is revealed by the ratio of Merchandise Exports to GDP which climbed from 27% in 1958 to 43% in 1974, and by 1990 stood at 62%. The origin of imports and the

dramatic still was the change in the destination of exports. In 1960 75% of exports had gone
to the UK and 6% to the other "EC10". By 1989 the respective figures were 34% and 38%.
The most dramatic change of all however was in the composition of exports. In 1960 30%
of exports consisted of live animals, 30% of "Other Foods", and 19% of Manufactures. By
1989 live animals were down to 1.3%, "Other Foods" were down to 21%, and Manufactures
were up to 67%.

Clearly the economy underwent tremendous structural changes as it opened up to free trade.
This allows us analyse whether the predictions of the economic geography and endogenous
growth models were borne out over the course of this adjustment.

Before proceeding, however, it is worthwhile considering briefly why we concentrate on
structural changes within the manufacturing sector, leaving agriculture, and more importantly
services, in which the bulk of employment is located, to one side. The evidence in Table 3
below tends to justify our concentration on industry, as it suggests that industrial employment
in Ireland is below the norm. The table shows the proportion of the labour force employed
in agriculture, industry and services in 1990 in Ireland, Spain, Greece and Portugal, alongside
the proportions predicted on the basis of their 1990 levels of GDP per head (in PPP values)
from a historical analysis of structural transformation in 16 countries over the last century and
a half [Prados et al. (1993)]. These data reveal that Ireland's industrial sector is remarkably
small, whichever standard of comparison is used.

Table 3: Actual and Predicted Industrial Employment

	Actual proportions 1990			Predicted Proportions		
	Agric	Indst	Serv	Agric	Indst	Serv
Irl	15	29	56	13	37	50
Spn	12	33	55	10	38	52
Grc	25	28	47	21	35	44
Port	18	35	47	19	35	46

Sources: Eurostat. and Prados et al. (1993).

Productivity

We can begin by looking at the development of the Irish manufacturing sector during the

three industrial strategies followed since independence. Industrialisation under protectionism clearly ran out of steam in the 1950s; employment-growth and productivity-growth were both low compared to the first two decades of outward orientation[10].

Productivity and Employment Growth

Table 4
% Growth per annum (volume), Manufacturing Sector

	Employment	Productivity
Laissez-faire 1926-1931	1.6	0
Protectionism 1932-1960	3.1	1.1
of which: 1950-1960	0.8	2.3
Outward-orientation 1961-1973	2.3	4.0
1974-1979	0.8	4.3
1980-1988	-2.1	8.9

Sources: See Barry (1991). The pre-1926 data is unreliable.

On the basis of the poor data available [O'Malley (1989, p. 101-104)], it appears that productivity growth in "traditional" industry (i.e. Irish indigenous industry plus the foreign industry that had been set up here under protectionism) between 1960 and 1973 was around 4.5% per annum, while that in new foreign industry was only 2% per annum. This seems to reflect the competitive shock that traditional trade theory predicts, rather then the diminution in potential that the newer theories propose.

After this period, however, the rate of productivity growth in the new multinational sector, which ran at 7% per annum for the 1976-1985 period, overtook that of "traditional industry",

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[10] For more on the policies followed during these three phases see Barry (1991).

which had a growth rate of 5.3%, and that situation has continued up to the present[11].

Overall, then, there appears to be no evidence that productivity growth in indigenous industry has declined under free trade, and this conclusion holds <u>a fortiori</u> when the whole of industry is considered.

Research and Development[12]

An analysis of the Irish evidence also provides no support for the hypothesis that R&D expenditures declined as a result of the opening up of the economy. Unfortunately there are few figures available for R&D spending in the protectionist era. A report on <u>Science and Irish Economic Development</u> (1966), however, found that in this period industrial research was "relatively non-existent", and most of what was done was "plant and process adaptation development and barely merited the title research and development".

In the period from 1971 to 1979 real R&D expenditures by all businesses in Ireland increased by 3.7% per annum , which jumped to a rate of 12.8% per annum for the 1979-1984 period. Although this would have been concentrated in foreign firms (which accounted for 67% of manufacturing R&D by 1984 although they had less than 40% of manufacturing employment), it is thought likely to reflect some increase in R&D intensity in indigenous industry also.

To conclude, while R&D expenditure in Ireland remains low by international standards, it appears to have grown more rapidly, not just in foreign firms but in indigenous firms as well, under free trade than under protection. Even if this increase is attributed to state incentives R&D expenditures could hardly have been lower than the virtually non-existent levels prevailing under protectionism.

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[11] Productivity growth in traditional industry may be thought to be artificially high during this period, as productivity in this sector is countercyclical while productivity in the more modern sector of the economy, as in core economies in general, is procyclical [Barry, Bradley, Kennedy and O'Donnell (1994)].

[12] This section of the paper relies heavily on O'Malley (1989), pps. 125-127.

Human Capital

Again we have no evidence on the return to human capital formation under protection, and we are forced to rely on a comparison of the situation in the early free trade period with that prevailing later. Walsh (1993) notes that "a comparison of the effects of education on earnings in 1972 with those estimated for 1987 shows no reduction in the return to additional years of education over this interval, which contrasts with the fall in education differentials documented by Davis (1992) for several countries".

This data, therefore, also suggests that the view proposed by the endogenous growth literature is misleading.

Industrial Structure and Free Trade

We now turn to look at how the structure of Irish industry has changed over the course of the free-trade period to gain insights both into and from the economic geography models.

A difficulty that bedevils this task is the necessity of disentangling the structural transformation of the economy wrought by free trade from the influences exerted by technological and global developments and the major swings in fiscal policy of the last two decades.

Movements in the share of intra-industry trade:

In the new trade theory, cf. Helpman and Krugman (1985), a high share of intra-industry trade is associated with the presence of increasing returns sectors, since these are the sectors in which highly differentiated products are likely to appear (as a competitive response to domination by high-output low-cost producers). An indirect test of the predictions of the economic geography models may therefore be to look at movements in the share of intra-industry trade in Ireland's total foreign trade.

McAleese (1979) showed that there was a pronounced increase in the share of intra-industry trade in total trade (IIT) between 1964 and 1977. This would indicate that adjustment was occurring primarily through the development of export market niches for existing Irish products rather than through the industrial restructuring and specialisation that traditional

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theory implies. This would indicate, in turn, that Ireland was expanding rather than contracting its increasing-returns sectors.

NESC (1989) showed, however, in contrast to the evidence presented for most OECD economies in the equivalent period[13], that IIT fell in Ireland between 1977 and 1986, and Brulhart and McAleese (1994) confirm that this trend has continued up to 1990 at least. They show that most of the increased trade between 1985 and 1990 (the period they analyse) was of the inter-industry variety, and that during this period (and by extension since the late 1970s) Ireland was specialising into high-productivity less-labour-intensive sectors, and was being specialised out of low-productivity labour-intensive industries.

Further evidence on this is provided by Neven (1990), who finds that Ireland's revealed comparative advantage is in natural resources (i.e. the food industry) and in human capital, which stands in stark contrast to the other relatively labour-abundant economies of the EU periphery.

These findings cannot necessarily, however, be divorced from the collapse in the domestic market in the 1980s occasioned by fiscal mismanagement operating in rigid labour-market conditions. Barry (1991b) hypothesises that "inter-industry adjustment in the earlier period may have been held in check by the buoyant domestic demand which served to prop up traditional firms ..The greater inter-industry adjustment in the later period may be due to the collapse of this sector alongside the growth of a new (multinational) sector in new branches of industry[14]".

The collapse of this (largely non-tradeable) sector, occasioned by weak domestic demand and by its becoming more tradeable over time (without the resultant increases in competitiveness required for survival) is given added support by the fact that the sectors Ireland specialised into are much more highly traded than the sectors the

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[13] OECD (1987).

[14] Krugman (1987) presents a model in which temporary swings in macroeconomic policy can have permanent effects on the sectoral structure of production.

country was being specialised out of [according to Brulhart and McAleese's data (1994;p17), which uses intra-EC trade volumes].

Performance of the Increasing-Returns Sectors:

A more direct route is to try to identify those sectors that are characterised by increasing returns to scale (IRS), and to study how they have performed over the free trade period. O'Malley (1992) has recently done just this. Using data from Pratten (1988) on the extent to which individual sectors are characterised by increasing returns, he concluded that only those sectors listed later in Table 8 could be so classified. Table 5 presents data from the *IDA Employment Survey showing the change in employment in indigenous and multinational* industry in these sectors. While we would ideally like a data series running from the early 1960s, this is not available and we must content ourselves with an analysis of the post-1973 period.

Table 5: Developments in IRS industries

	1973	1980	1993
Indigenous employment	25,209	27,440	22,565
Share of total manufacturing	12.46%	11.86%	11.64%
Multinational employment	32.735	50,114	59,055
Share of total manufacturing	16.18%	21.67%	30.46%

Table 5 reveals that the share of IRS-sector indigenous employment in total manufacturing employment fell consistently from 1973 to 1993[15]. This might seem to imply that the process identified by Krugman and Venables (1990) is in operation. Over the same time period, however, the share of IRS-sector multinational employment in total manufacturing employment has risen much more substantially. Summing the two we find the share of IRS sectors in total manufacturing employment has risen from 28.64% in 1973 to 33.53% by 1980, rising further to 42.1% by 1993. While this is still small relative to the equivalent

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[15] IRS-sector indigenous employment refers to the sectors in Table 8 **less** Nace 36 which as O'Malley points out is largely state-sponsored and is not therefore subject to the same market pressures as other sectors.

share in the core EU countries (see Table 8 below), it has been increasing over time as a result of free trade rather than decreasing.

Does this mean then that Ireland since 1973 has been on the left-hand side of the Krugman-Venables U curve? It does, but there are several important elements to the story that their analysis ignores: firstly, the factors attracting multinational investment to this location are arguably quite different from those posited in the Krugman-Venables (1990) model, and secondly their model tells us nothing about why multinational companies are so dominant relative to indigenous firms in this sector, as the table above clearly reveals.

To take the first point, some part, and perhaps a considerable proportion, of the inflow of multinational investment into the EU occurs in order to surmount the trade barriers that the EU imposes on imports from abroad[16,17]. When a peripheral region joins a trade block such as the EU therefore, it becomes, because of its low wage levels, an attractive location for such investment. This occurs, of course, only if the costs of exporting from the periphery to the core are relatively low, i.e. if the periphery is on the left hand side of the U curve.

The other point somewhat at odds with the Krugman-Venables analysis is the process by which multinationals have replaced indigenous firms. In the formal analysis the loss or lack of IRS firms holds down wages and, for sufficiently low transport costs, this ultimately provides a counterbalance to the positive externalities associated with a core location. In the Irish case, however, the IRS-firms lost were indigenous, and the IRS-firms gained were multinational. The indigenous firms may have lost out because they were too small in scale,

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[16] Schoenberger (1990) studies this issue and finds that firms producing more standardized price-sensitive products are likely to be influenced in their location decisions by tariff barriers. [On this issue see also Culem (1988)]. For firms producing more specialized products, particularly production goods, the main reason for US direct investment in Europe is to ensure reliability of service and facilitate interactions with customers (so that these goods are developing characteristics associated with non-tradeables).

[17] Neary and Ruane (1988) present a model in which capital inflows worsen the welfare losses from trade barriers; crucially however, theirs is a full-employment model.

[which is associated with peripherality, as in Krugman and Venables (1993)][18], while the multinationals were attracted precisely because of the country's peripherality (in the sense of relatively low wages). This is the "barriers to entry" argument associated in Ireland particularly with O'Malley (1989).

Developments in Indigenous and in Foreign Industry:
"Barriers to Entry" or "Dutch disease"?

O'Malley (1989) sets out to explain the catastrophic fall in indigenous employment that occurred alongside the more moderate increase in multinational employment in the free trade era. These developments are graphed in Figure 1. His argument is that indigenous firms were squeezed into the non-traded sector because of the barriers to entry they faced in the international marketplace, while their place in increasing-returns sectors was taken over by multinationals which did not face those barriers.

Both he and the NESC (1989) draw important distinctions between the response of indigenous (Irish-owned) and foreign firms to the opening up of the economy. The basic premise is that the strongest performance of indigenous industry occurred in activities which are not subject to the entry barriers that increasing returns industries typically entail. These categories of activities are (a) low-value added processing of local primary products, (b) non-traded industries which enjoy a degree of natural protection in home markets, and (c) the few exceptional industries which have been long established on a sufficiently large scale that they do not have to surmount entry barriers **as newcomers.**

Details given in NESC (1989) and O'Malley (1989) confirm this view for the 1973-80 period[19]:

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[18] This contradicts Neven's (1990) optimistic view of the potential for indigenous IRS sectors in peripheral regions.

[19] In much of what follows the success or failure of a sector is classified in terms of what happened sectoral employment. Although this is somewhat unsatisfactory, the output data distinguishing between indigenous and multinational performance is available only in much more aggregate detail. An extremely important question, on which some tentative answers will be suggested later, is why slow productivity growth in indigenous industry has reduced employment, while rapid productivity growth in the multinational sector has been consistent with expanded employment there.

Figure 1: Manuf. Employment
(000s)

Legend: —•— Indigenous   —+— Foreign
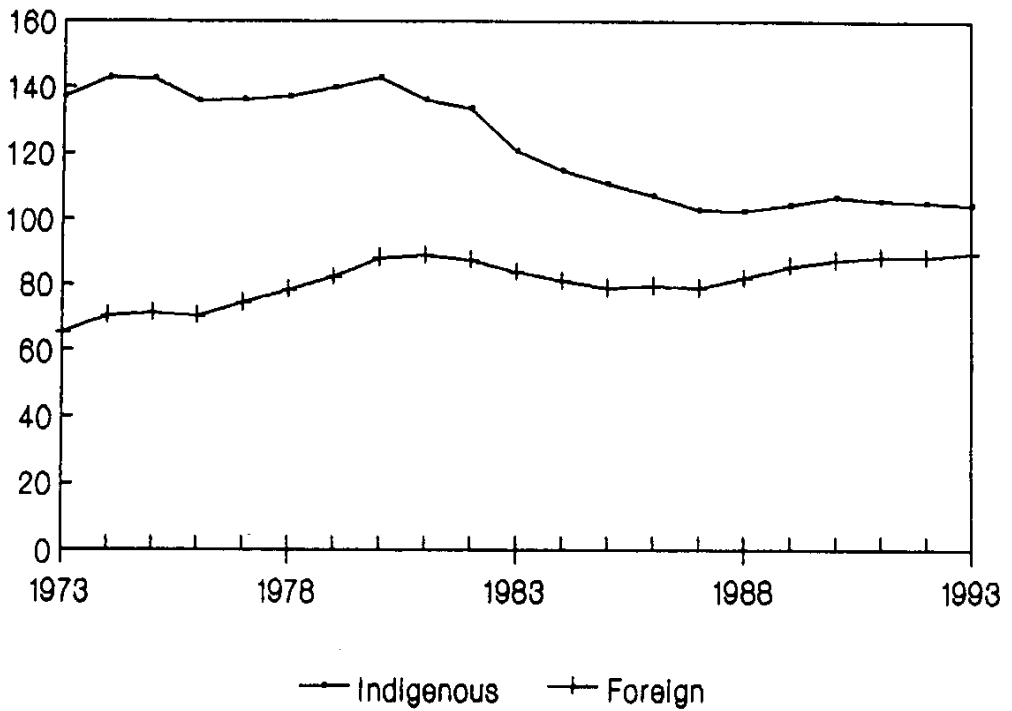
(i) Amongst the most successful indigenous sectors, in terms both of resistance to import penetration and employment creation in this period were the essentially non-traded sectors of Clay, Glass and Cement, and Paper and Printing[20], the primary-processing Food sector and the long-established export sector comprising Drink and Tobacco. In these sectors the size structure of both indigenous and foreign firms remained largely constant; i.e. they were affected only to a small extent by progressively freer trade.

(ii) Other relatively successful sectors, according to the same criteria, included Other Manufacturing, Wood and Furniture and Metals and Engineering. Indigenous industry in these sectors decreased in scale, arguably reflecting a retreat into non-traded activities such as carpentry, metal fabrication and plastic moulding, where customised service is important. The increasingly free trade of the 1960s to the 1980s had little effect, on the other hand, on the size structure of multinational establishments in Ireland, reflecting their ability to overcome barriers to entry.

(iii) The indigenous sectors performing worst, actually shedding substantial amounts of labour even in the relative buoyant labour market conditions of the 1970s were the highly exposed sectors such as Chemicals, Clothing and Footwear, and Textiles. Again, indigenous industry decreased in scale, with the decline in IIT in the 1980s revealing that the process was not one of intra-industry adjustment into market niches but rather, again, indigenous industry becoming confined to the declining non-traded segments of the market. Free trade had little effect on the size structure of multinational establishments in Ireland in these sectors, which again may suggest an ability on their part to surmount the entry barriers that inhibit the development of indigenous industry.

Irish indigenous firms were therefore squeezed out of easily-entered low-wage sectors such as Textiles, Clothing and Footwear, and out of sectors where economies of scale are

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[20] They can be thought of as non-traded sectors because resistance to import penetration has not been combined with export success.

important. Multinational firms were clearly not barred from the latter sectors[21]. Thus, rather than the economy losing its IRS industries, indigenous firms in these sectors - which had catered almost exclusively to the protected home market - were replaced by multinational firms, which were almost exclusively export-oriented.

With the benefit of more recent data we can see that further elements need to be added to the story told by O'Malley and the NESC. Taking the whole 1973-93 period, there was cyclical growth in Metals and Engineering and in Paper and Printing (viewing the 1973-80 period as one of relatively buoyant demand in Ireland, 1980-87 as one of general recession, and 1987-93 as another relatively buoyant period). Employment in many other of the initially well-performing indigenous sectors such as Wood and Furniture, and in Food, began to flatten out, while in Clay, Glass and Cement, Mining, Quarrying and Turf, and Drink and Tobacco, sectors which were initially cyclical, employment has deteriorated steadily since 1980[22].

Of particular interest with respect to the Economic Geography models are sectors which O'Malley (1989), looking at data as recent as from 1980, classified as non-tradeable. Employment is these sectors such as Clay and Cement (241-246), Bread and Cakes (419), and Soft Drinks (428), is now in long-term decline.

This suggests that the initial classification of non-traded sectors has been changing, and in an obvious way. Sectors for which natural protection comprised the importance of customised service (Metals and Engineering and Paper and Printing) have remained cyclical and therefore can continue to be thought of as non-tradeables, while those whose non-traded status relied upon high bulk relative to value ratios have become increasingly tradeable. This suggests that the reduction in trading and transport costs over the period under discussion has shifted one whole category of items from the non-tradeable to the tradeable category, while leaving the

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[21] Nor, interestingly, did MNC's suffer employment losses in Textiles, while in Clothing and Footwear employment was maintained from 1973-80, and dropped 50% between then and 1993.

[22] There is a tradition in Irish analysis of including in the category of "indigenous industry" those firms which have been bought out by foreign firms. This practice is not followed here as one can argue that takeover by foreign firms is one possible way around the entry barriers that indigenous firms may face.

other category relatively untouched.

Of these sectors which have switched categories, however, only Clay and Cement are classified by O'Malley (1992) as subject to increasing returns, so their long term decline, while it could be delayed if they remained non-tradeable, could hardly be caused by the types of factors identified in the Economic Geography literature.

This suggests that a lack of competitiveness may have been responsible, and indeed it is hard to imagine that the unemployment levels the country has suffered in recent times could persist without severe labour market rigidities. This suggests an alternative view of the conjunction of multinational sector employment increases and indigenous employment losses: the two events may be connected in a "Dutch disease" type process, as suggested in Barry, Bradley, Kennedy and O'Donnell (1994)[23].

Table 6 below presents some prima facie evidence on this. It reveals the very rapid productivity growth that has occurred in the Irish economy, primarily driven by the influx of multinational investment. It also shows that Ireland's relative wages and salaries per worker have kept pace with this measure of productivity. This has clearly priced out many low productivity activities, during which time unemployment has risen dramatically[24].

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[23] Indeed one of the seminal papers on the Dutch disease, Corden and Neary (1982) suggested that their analysis could apply to cases "such as the displacement of older industry by technologically more advanced activities in Ireland" and elsewhere.

[24] This in turn has required the claw back in taxation of a significant part of the gain in relative wages, resulting in a fall in relative living standards. If the latter can be measured by private consumption per capita, with consumption accorded its own specific purchasing power parity, the figure has gone from 67% of the EU average in 1973 to 62% in 1991. (Eurostat National Accounts 1970-1991). I am grateful to Kieran Kennedy for pointing this.

Table 6: Irish Data as % of EU average

	Ireland	EU
GDP(GNP)/Cap.		
1973	56 (56)	
1991	70 (63)	
GDP(GNP)/Worker		
1973	66 (66)	
1991	90 (81)	
Wages & Salaries/ Worker		
1973	72	
1991	94	
Unemployment Rate	Ireland	EU
1973	6.2	2.6
1992	17.8	9.5

Source: Mainly from Eurostat, *National Accounts 1970-1991*, and EC Annual Economic Report 1993.

This might be considered an example of a particular type of "Dutch disease", in which an otherwise beneficial shock to an economy combines with labour market distortions to generate undesirable outcomes[25].

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[25] This issue is highly controversial since Irish wage determination is particularly difficult to model. Wage rates are broadly similar to those prevailing in the UK while Irish unemployment is very much higher; the extent to which this wage convergence is driven by migration, by public sector union behaviour, or by the inflow of multinational companies remains unsettled. An alternative explanation of Ireland's somewhat warped industrial structure is that generous capital grants were funded by labour taxes, yielding relative factor

The Dutch disease model represents a process of interaction between two or more sectors. If wage growth is unduly influenced by the sector with rapid productivity growth then the sector with slower productivity growth will gradually get squeezed out. This of course is a characteristic of structural change everywhere, though the maintenance of full employment requires either that average wage growth not be too high or else that sectoral wage differentials grow. [cf. Lawrence and Slaughter (1993)]. The latter has clearly not been happening in Ireland.

Baker (1988) presents strong evidence on this for the 1980-87 period. He divides manufacturing industry into two groups: Modern and Traditional (based on productivity growth and net output per head). The modern sector comprises Pharmaceuticals, Office and Data Processing Machinery, Electrical and Instrument Engineering and a group of Foods. In 1980 net output per head in the modern sector was more than double than in the traditional sector, notwithstanding which it grew by 130% over the period compared to a much more modest growth of 39% in traditional industry. Average weekly earnings, however, grew almost identically in the two sectors; by 111% in the modern sector and by 99% in traditional industry. Table 7 below updates the Baker study to 1992, showing that the differential productivity growth has continued alongside very similar growth rates of average weekly earnings.

In the whole 1980 to 1992 period employment in the modern sector, where productivity growth far outstripped wage growth, grew 54% (to a level of 51,900), while employment in the traditional sector, where wage growth outstripped productivity growth, declined by 27% (to a level of 140,200).

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prices that reduced labour intensity [Barry (1989)].

Table 7: Output per head and average weekly earnings (1980=100)

	1982	1986	1992
Modern			
Output per head	113.3	187.5	334.2
Average earnings	132.2	201.2	250.6
Employment	112.7	119.3	153.9
Traditional			
Output per head	106.0	133.4	167.4
Average earnings	131.3	188.6	247.0
Employment	91.4	75.1	72.6

What is the connection between these categories and the multinational/indigenous distinction? In the 1980-87 period some 34% of multinational employment was in the modern sector, and this proportion has now risen to 41%. By contrast only 7% of indigenous employment was in these modern sectors, and the figure currently stands at only 11%. (i.e. there has been an increase in MNC employment in these sectors of around 6,000 between 1983 and 1993, while in indigenous industry the increase has comprised less than 3,000 jobs). This confinement of indigenous firms to the slow-productivity-growth sectors, and the data on employment shares in the IRS sectors to be discussed below, would suggest that there are elements of both the "Dutch disease" and the "barriers to entry" problems present.

Increasing-Returns Industries: the current situation

In a paper on the likely impact of the Single European Market and the Structural Funds on the Irish economy, O'Malley (1992) looks at the increasing-returns issue to analyse whether or not there are residual dangers of the kind identified by Krugman and Venables (1990) to be faced. To do so, he explores the extent to which indigenous and foreign firms in Ireland are currently located in increasing-returns sectors. These sectors he identifies as those included in Table 8 below[26].

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[26] These are the sectors that the economic geography models are concerned with. Only a subset of these, ones in which human capital and R&D are important, are relevant to the

Table 8: Increasing Returns Sectors

Nace Code	Industry	% of total indig. manuf. empl.	% of foreign owned manuf. empl.	% of total manuf.empl in EC 9
35 (352*)	Vehicles	.8	.9	8.1
36	Other transport	3.6	.3	3.8
25 (255*)	chemicals	2.7	10.3	7.2
26	Man-made fibres	.03	1.5	.2
22 (223*)	Metals	.7	.02	4.1
33	Office mach.	.9	8.3	1.2
32	Mech. Eng.	3.1	4.7	11.0
34	Elec. Eng.	3.4	16.6	12.7
37	Inst. Eng.	.6	7.9	1.6
471	Pulp, paper	.5	.3	.8
241	Clay prod.	.8	.2	.3
242	Cement etc.	.5	0	.4
247	Glass, g.wear	3.0	.7	1.1
481	Rubber prod.	.1	2.3	1.6
427	Brewing	.2	3.7	.7
429	Tobacco	.6	1.2	.5
421	Cocoa, choc.	.5	2.3	.8
423	Other foods	1.5	1.9	.7
Total (%)		23.4	63.1	56.8
Total jobs		26,648	51,076	

Note: a * beside a sector denotes that it has been excluded.

These data are very revealing. They show, firstly, that a much higher proportion of foreign firms operating in Ireland are located in increasing-returns sectors than is the case for indigenous industry (which provides further evidence for the thesis discussed earlier that indigenous firms face greater barriers to entry than do foreign firms). In fact O'Malley (1992) goes on to argue that many of the jobs in the indigenous increasing returns sector are located in non-traded activities within this broad category.

The five categories in which there is a higher proportion of indigenous employment than is the case for the European average include (i) Constructional Clay Products (mainly bricks)

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endogenous growth literature.

and Cement, Lime and Plaster, which are to a large extent non-tradeables, (ii) Glass and Glassware, where indigenous industry mainly produces ornamental glassware and glass bottles, rather than flat glass which is the increasing returns activity, and (iii) Tobacco, where the one dominant Irish firm is long-established and so did not have to enter this large-scale industry as a latecomer.

Of the 23% of indigenous employment in increasing returns industries, O'Malley argues that some 10.5 percentage points are in sheltered industries, and so do not need to fear further European market integration[27].

Turning now to foreign-owned industry in Ireland, we see that there are roughly similar proportions of employment in the increasing returns categories in these firms and in Europe overall. Since these firms are almost completely export-oriented they can have nothing to fear from further European market integration, unless they are amongst the least efficient firms and are thus ultimately the ones who will be wiped out in the rationalisation process. Even if this were so, however, their place would presumably be taken by branches of the successful firms, unless it was their location in the periphery that led to their being less efficient. There seems little reason to believe this to be the case, though, as is evidenced by the growth in OECD market share of foreign-owned industry in Ireland[28].

It appears then, on the basis of the 1973 data onwards, that the dangers analysed by Krugman and Venables (1990) have been dominated by the ability of the economy to attract multinational investment.

5. Conclusions

According to the models of economic geography and endogenous growth theory surveyed

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[27] Our analysis above of the changing nature of many of these formerly non-tradeable sectors suggests that O'Malley (1992) may be overoptimistic about the ability of certain segments of indigenous employment to withstand the effects of market integration and the developments in transportation infrastructure associated with the Structural Funds.

[28] NESC (1983),pps. 73-74.

above, the integration of a small economy into a larger and more highly-developed trading entity may well cause divergence. The Single Market process (and European-funded development of transportation infrastructure) could possibly threaten Ireland's increasing returns industries, and the free trade process could reduce (or may have reduced) output- and productivity-growth rates (although consumer welfare in almost all the models is deemed likely to increase). Furthermore, freer trade may reduce the incentive to fund R&D and to accumulate human capital.

This paper argues that the Irish experience of free trade provides no evidence for the hypotheses emerging from the endogenous growth literature. The Irish economy under autarky was too small to generate sufficient competition in increasing- returns industries to banish X-inefficiencies and to promote R&D.

Since "the division of labour is limited by the extent of the market", the domestic market in many peripheral regions is likely to be too small to allow more than one or a small number of firms to reap the benefits of scale economies[29], and so X-inefficiencies and rent-seeking behaviour are more likely to dominate the Schumpeterian processes that Grossman and Helpman (1991) focus upon[30]. Thus productivity growth improved, not just in overall manufacturing but in "traditional" manufacturing as well, when Ireland moved to free trade.

While these criticisms can be levelled against even the endogenous growth models that allow international diffusion of knowledge, the role played by multinational companies in the Irish adjustment to free trade suggests that the assumption frequently made of no international

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[29] The size of the domestic market began to bite particularly heavily during the 1950s. During this period fiscal policy was tightened in order to rein in the balance of payments deficit caused by the failure of domestic firms to expand into export markets.

[30] Bloch (1974), for example, showed that tariff protection increased the price charged by concentrated Canadian producers relative to their US competitors, but their profit margins did not increase, which suggests that protectionism nourished inefficiency. Caves and Krepps (1993) provide other references on this also.

diffusion is inappropriate[31].

Because they are more conditional, the conclusions of the economic geography models are not contradicted by the evidence. The evidence merely suggests that since 1973 at least Ireland has been on the left-hand-side of the U-curve. Several important aspects of the Irish experience are not captured by these models however. These include the following:

(i) Notwithstanding low wage costs in the periphery, the inflow of multinational investment might not have occurred in the absence of the common external tariff of the EU[32]. This suggests that even if the peripheral market is too small to be able to attract inward investment by imposing tariff barriers, it might be in its interest if the common market it joins maintains tariff barriers.

(ii) The models ignore the important distinctions between multinational and indigenous firms, such as the extent of profit repatriation that takes place and the linkages developed with the rest of the economy. We have seen that there is evidence for the existence of entry barriers facing indigenous firms, and these could profitably be modelled. The importance of the distinction may be argued as follows: since entry barriers typically entail pure profits, and since multinational profits tend to be repatriated, the presence of these industries does not benefit the domestic economy as much as it would if they were indigenously owned. Thus we enter the realm of strategic trade theory (and policy).

(iii) Furthermore, the MNC's, although located in IRS sectors, tend to locate only the constant returns processes (the "non-complex factor cost" aspects of business) in the host country [NESC (1982)]. While the point made above about X-inefficiencies and rent seeking suggests that the right-hand side of the U curve (as a measure of relative wages) will be flatter than Krugman and Venables (1990) assume, this point and the preceding one suggest that the left-hand side will also be flatter.

(iv) We have seen evidence that the inflow of multinational investment may have

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[31] Coe and Helpman (1993), noting that most imports are of intermediate goods or of capital equipment, model the diffusion process as dependent on the amount, and origin, of imports. In the Irish case changes in the origin of imports are related to changes in the origin of foreign direct investment, so these data may be consistent with Romer's (1993) argument that FDI flows are an important mechanism through which countries raise the efficiency of their production techniques and business methods.

[32] See Culem (1988) on this issue.

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interacted with labour-market rigidities (of the kind embedded in the Scandinavian model[33])
to crowd out the labour-intensive slower-productivity-growth sector. While if might be
countered that the economic geography models are long-run in orientation much of the writing
on EU integration to which they contribute is concerned with medium-term adjustment
problems[34].

(v) Finally it should be noted that these models also generally assume free entry and so
miss out on some of the inefficiencies typically associated with monopoly power. Why IRS
industries are important to an economy is because their presence raises average productivity.
Helpman and Krugman (1985) show that countries gain from trade as long as average
productivity and product variety do not decline. Clearly product variety is generally
enhanced very considerably by the opening up of trade. And what of average productivity?
Even leaving aside the inflow of multinational investment the competitive pressures of trade
forced traditional firms in Ireland into raising their productivity substantially. The small size
of the domestic market spawned inefficiencies in those companies that serviced it and thus
some of the potential benefits of possessing those industries were never realised.

This suggests that O'Malley (1989,1992) may be overly pessimistic about the loss of
indigenous firms in the IRS sectors. Martin and Rogers (1994) also appear overly
pessimistic. They argue that since regional GDP per head is not correlated with transport
infrastructure, the concentration of EC transfers on this category of infrastructure is
excessive[35]. The lack of correlation may perhaps be a function of the U curve; Ireland,

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[33] Cf. Calmfors and Viotti (1982).

[34] Note for example Krugman's (1987b) warning, with respect to the Southern periphery's
accession to the EU, that because of their labour abundance "the trade expansion produced
by EC enlargement is simply not likely to be as painless as the trade expansion produced by
the formation of the Community and earlier enlargement. There will certainly be income
distribution problems created by the changes, and also quite possibly some real costs in terms
of unemployment".

[35] According to their data, Ireland by 1985/86 had a better transportation infrastructure
than the EU average, while lagging behind in telecommunications, energy and education.
Despite this, 21.5% of the 1989-93 Structural Funds allocation was spent on transport
infrastructure, while only 19.7% went to human resources, 0.7% to telecommunications and
0.4% to energy. Not only their analysis but also their data can be criticised, however, as they
focus on road surface area rather than quality [Cf. Durkan and Reynolds (1992)].

however, certainly seems to be on the left-hand segment. The threat to indigenous increasing-returns sectors appears minor compared to the benefits to be reaped by the foreign sector and the rest of indigenous industry, within which almost 90% of manufacturing employment is now located.

Finally it should be mentioned that neither strand of the new literature deals with the finding that convergence is more likely during a booming world economy, and that the possibility of convergence recedes during periods of stagnation [CEC (1990), p. 216]. This certainly seems to leave some room for an integration of Keynesian elements into the analysis.

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