

# Export platform FDI and dualistic development\*

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There is increasing growth in export platform foreign direct investment globally, reflecting both the international fragmentation of production associated with globalization and the adoption of policies to promote this type of investment as part of the “export-led growth” strategies of developing economies. This article explores the relationship between transnational corporations and local enterprises over the long term, using data on Singapore and Ireland – two of the world’s most active and persistent promoters of foreign direct investment. Our analysis finds evidence of a more dualistic relationship between transnational corporations and local enterprises in Ireland, as evidenced by the combination of relatively higher transnational corporations and lower local enterprises export ratios, and a greater and persistent disparity between transnational corporations and local enterprises labour productivities. In Singapore, these differences are smaller and declining. We suggest that the contrast between the two countries reflects the greater success of Singapore in building globally competitive local enterprises and in creating linkages between transnational corporations and local enterprises.

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## Introduction

There is increasing growth in “export platform” foreign direct investment (FDI), i.e. where foreign affiliates of transnational corporations (TNCs) export most of their output so that the local market in the host country is of no significance to the TNC’s location decision. This type of export-platform FDI (EPFDI) may have a home-country orientation (output exported back to the home country), a third-country orientation (output exported to destinations other than the home country) or a global orientation (output exported to home and third countries).<sup>1</sup>

The increasing importance of EPFDI reflects two distinct phenomena – the international fragmentation of production associated with globalization/new technologies and the promotion of this type of investment by certain economies as part of their economic development strategies. The former phenomenon is particularly prevalent in the case of products that have high value-added relative to weight.<sup>2</sup> Many of these products are in high-tech industries such as the electronics and pharmaceuticals industry. In such cases, transportation costs are low relative to output values and technology is such that production can be fragmented and hence benefit from differences in factor costs across economies. (Arndt and Kierzkowski, 2001). The latter phenomenon of promoting EPFDI is most often found in countries that see their economic growth as being “export-led”. Typically, these are economies that seek access to international technology, have small domestic markets and have a resource mix that makes them highly dependent on imports to provide balanced consumption possibilities. In effect, their small domestic markets provide little attraction for a potentially

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<sup>1</sup> Here we follow the nomenclature in Ekholm, Forslid and Markusen (2003).

<sup>2</sup> Quah’s (1999) so-called “weightless products”.

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locating TNC. Furthermore, the lack of scale in these small domestic markets makes it difficult for local enterprises to develop the scale necessary to become successful exporters.

Governments in some of these countries have, for several decades now, promoted their economies as international production/distribution bases for TNCs, without any emphasis on their local markets as an attraction. In such instances, little or no attempt is made to force such foreign companies to become involved in local joint ventures or even local content agreements, although in many cases linkages are facilitated with local enterprises, and joint ventures are encouraged.

In cases in which countries systematically promote export platform FDI over a long period of time, a question that naturally arises is whether this policy generates a Lewis-type dualism in the economy, with little relationship/interdependence between TNCs and local enterprises and each developing according to its own pattern. Such dualism is most likely to occur when there are neither backward/forward linkages between TNCs and local enterprises, nor spillovers occurring through product/factor market connections. One would expect such dualism to be reflected in differences in the types of industries in which TNCs and local enterprises are active. For example, TNCs might operate in modern/high-tech industries while local enterprises are active in the traditional ones.<sup>3</sup> Where TNC and local enterprise activities co-exist in the same industry, dualism would be reflected in the global perspectives of the enterprises (such as their export intensity patterns), in their productivities and in their factor payments. For example, exceptionally high export ratios by TNCs would suggest little interdependence with other entities within an economy, even among clusters of TNCs.<sup>4</sup> The interpretation of correspondingly low export ratios by local enterprises is complex. They may be low because they have: (a)

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<sup>3</sup> This would accord strongly with the concept of dualism developed by Arthur Lewis (Lewis, 1954).

<sup>4</sup> In many countries, EPFDI is associated with clusters of TNCs in the same industry.

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strong sub-supply relationships with TNCs (i.e. TNC backward linkages); (b) highly profitable local domestic markets; or (c) no capacity to compete on international markets. To focus on dualism, we ask whether, in industries in which TNC export ratios are high, one finds that local enterprises export ratios are also high. In industries in which TNCs have high labour productivity, the question is whether local enterprises also have high labour productivity. Do TNCs and local enterprises pay similar wages when they operate in the same industry? And do such differences persist or diminish over time?

In this article, we address the issue of dualism by looking at sectoral data for two countries (Ireland and Singapore) that have very proactively built up their economies as export platforms for manufacturing production over the past 35 years.<sup>5</sup> These countries were first movers in the development of export platforms and, as such, they provide an interesting study of what happens when TNCs and local enterprises exist side by side over time. The extent of TNC activity is evident in the fact that 50% of manufacturing employment in both countries is accounted for by TNCs.<sup>6</sup> In the case of both countries, the possibility of dualism as between TNC and local enterprise activities has been recognized for some time. Among others, J. Stewart (1975) noted this duality in the Irish manufacturing sector in the early 1950s, together with the lack of linkages between local enterprises and TNCs. More recently, L. Low (1993, p. 342) noted that one of the potential difficulties with Singapore's strategy is that it may not be wise "to have a dualistic structure where what remains in Singapore are more likely the high technology, high-value added multinational corporations (MNCs) while indigenous enterprises

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<sup>5</sup> The co-existence of TNC and local enterprise activities over the long term raises other issues, such as whether the presence of TNCs supports the development of local enterprises or leads to crowding out of local enterprises by TNCs. The consideration of such issues lies beyond the scope of the present article.

<sup>6</sup> It is difficult to establish how exceptional Singapore and Ireland are as data on the employment share of TNCs are only gradually emerging as more countries are beginning to look systematically at the ownership composition of their industrial and service sectors.

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find themselves more compatible with other production bases and markets in ASEAN, China, Indochina and South Asia”.

In section 1 of the article we discuss briefly the theoretical and empirical literature on the relationship between trade, FDI and economic growth. Section 2 reviews the strategies that Ireland and Singapore have adopted to promote EPFDI. In section 3, we outline the differences and similarities in the performance of the two economies over the past 40 years, by examining trends in growth, trade, employment and FDI. In section 4, we analyse the manufacturing sectors in both countries since the early 1980s to establish whether either or both economies exhibit the type of duality that might be expected from export-focused FDI. Specifically, we look at whether local enterprise and TNC export-intensity ratios are correlated by sector, and at differences in levels and trends of labour productivities and average wages in local enterprises and TNCs. Finally, in section 5, we make some concluding comments.

### **Trade, FDI and economic growth**

It is widely accepted among economists that economic growth is a complex process, which depends on many variables and the interactions between them. The “new” growth theory (endogenous growth theory) has postulated several important dynamic factors, such as human capital accumulation and technological advance through R&D activities, which can influence growth. It has also been suggested that technology diffusion plays an important role in economic development and, in this context, trade and FDI have been shown to be among the most important channels for developing countries in accessing advanced technologies.<sup>7</sup>

The general importance of trade in determining rates of economic growth features strongly in the endogenous growth theory literature emanating from P. Romer (1986). G. Grossman and E. Helpman (1991) identify international trade in

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<sup>7</sup> See Barro (1999) for a review.

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intermediate goods and capital equipment as one of the major sources of technology diffusion, and hence economic growth. In a recent survey on international technology diffusion, W. Keller (2003) argues that the use of foreign intermediate goods in final output production can give enterprises access to new technology in embodied form; he also makes a case that trade in specialized inputs might enhance growth by facilitating learning about the products and imitation of the technologies developed in other countries.

It is also argued that economic growth can be enhanced through export-oriented policies, as well as, unsurprisingly, by a strategy of promoting growth through the expansion of exports has long been advocated in the policy literature. P. Krugman (1987) and O. Havrylyshyn (1990) outline the main benefits arising from export-promoting policies as: increased real output through an increase in demand for a country's output via exports; promotion of specialization in the production of export goods which can increase the productivity level and general skill levels; and loosening of foreign exchange constraints, which in turn can make it easier to import inputs and allow output expansion. According to its advocates, exports can perform as an "engine of growth" in an economy (Krueger, 1997). The experience of the so-called Asian Tigers (Hong Kong (China), Taiwan Province of China, Singapore, the Republic of Korea) is well documented in the literature as an example of export-led growth (e.g. World Bank, 1993).<sup>8</sup>

FDI by TNCs is considered to be a major channel through which developing countries can gain access to advanced technologies, since TNCs account for a substantial part of the world's R&D investment. R. Findlay (1978) postulates that FDI increases the rate of technical progress in the host country through diffusion of more advanced technology, management practices, etc. used by foreign affiliates. J. Y. Wang (1990) incorporates this idea into a model more in line with the neoclassical growth framework, and shows that FDI can increase

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<sup>8</sup> Also see Giles and Williams (2000a, b) for a review of the empirical literature.

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the knowledge applied to production in host countries. Adopting the endogenous growth theory framework, Romer (1993) argues that there are important “idea gaps” between rich and poor countries and that FDI can ease the transfer of technological and business know-how to poorer countries. These transfers may have substantial spillover effects for the entire economy, so that FDI may boost the productivity of all enterprises, and not just those receiving foreign capital. During the past decade, a number of macroeconomic studies using aggregate FDI flows for a broad cross-section of countries on the role of FDI in stimulating economic growth has appeared. In a survey, L. R. de Mello (1997) identifies two main channels through which FDI may enhance growth. Firstly, FDI can encourage the adoption of new technology in the production process through capital spillovers; secondly, FDI may stimulate knowledge transfers, both in terms of labour training and skill acquisition and by introducing alternative management practices and better organizational arrangements. However, for such knowledge transfers to occur, there must be some interdependency between TNCs and local enterprises.

E. Borensztein *et al.* (1998) test for the effect of FDI on economic growth using data on 69 developing countries and find that FDI is an important vehicle for the transfer of technology, contributing to growth in a larger measure than domestic investment. However, they argue that the growth impact of FDI may depend on other characteristics of the developing country in which FDI takes place. For example, they find that FDI raises growth only in countries in which the labour force has achieved a certain minimum level of education. By contrast, M. Blomstrom, R. Lipsey and M. Zejan (1994) find no evidence that education is critical, but they argue that FDI has a positive growth-effect when the country has a relatively high per capita income. In turn, L. Alfaro *et al.* (2004) find that FDI promotes economic growth in economies with sufficiently developed financial markets, while V. N. Balasubramanyam, M. Salisu and David Sapsford (1996) stress that trade openness is crucial for obtaining the growth-effects of FDI. An OECD study (2002) concludes that developing countries must offer a supportive business environment and must have reached a minimum level

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of economic development before they can capture the growth enhancing effects of FDI.

Another strand of literature examining the impact of FDI on growth is based on micro studies at sectoral and enterprise levels. In this literature, the main focus has been on the potential benefits to indigenous enterprises through spillovers with the entry and activities of TNCs in host countries. Magnus Blomström and Ari Kokko (1998) argue that the most important reason behind many countries' efforts to attract more FDI today is a desire to acquire modern technology. They and others suggest that the investments of TNCs generate important positive externalities or spillovers that enhance the productivity of indigenous enterprises in an economy. These spillovers arise because TNCs in general bring with them some sort of enterprise-specific assets such as technological know-how and management skills. (For a review, see John H. Dunning (1993) and Richard Caves (1996)).

There are different mechanisms through which FDI could generate positive production externalities and improve the productivity of domestic enterprises. Firstly, the entry of TNCs can lead to increased competition in host country markets and force domestic enterprises to improve their productivity. Secondly, the presence of foreign affiliates in a host economy may lead to diffusion of information on new technology and production process to the local enterprises. Thirdly, TNCs can enhance the development of local enterprises through creating backward and forward linkages: TNCs can help local enterprises to reduce costs by increasing the scale of production. Also, through forward linkages, with cheaper intermediate products, final goods producers can decrease their cost base and hence increase productivity. (For a detailed analysis see A. Rodriguez-Clare (1996) and J. R. Markusen and A. J. Venables (1997)).<sup>9</sup> Finally, spillovers from TNCs to local enterprises can occur through labour mobility. A. Fosuri et al. (2001) show that local

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<sup>9</sup> Rodriguez-Clare (1996) also argues that TNCs could generate a negative backward-linkage effect if they behave as enclaves, by importing all their inputs and restricting their local activities to hiring labour.

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workers who get training in foreign affiliates can later join local enterprises or set up their own companies, bringing with them technological, managerial or marketing knowledge that they previously acquired.

However, it is also suggested in the literature that foreign presence can reduce the productivity of domestic enterprises, i.e. generate “negative productivity spillovers”, especially if foreign enterprises are producing for the local market. For example, Brian J. Aitken and Ann E. Harrison (1999) show that foreign entry, by disturbing the existing market equilibrium in the host country, could force domestic enterprises to reduce output and hence lower the productivity of these enterprises as their scale of production declines. If this negative productivity effect is large enough, net domestic productivity of local enterprises can decline despite the technology transfer from foreign affiliates.

The general approach in the literature to examining the productivity spillovers from foreign to local enterprises has been to relate the productivity of domestic enterprises to some measure of foreign presence, while controlling for industry and firm characteristics. This approach dates back to the articles by Richard Caves (1974), Steve Globerman (1979), and M. Blomström and H. Persson (1983), which focus on horizontal spillovers using cross-section industry level data. These early studies have found positive productivity spillovers from activities of TNCs in host countries.

One drawback of these early studies was their use of cross section data sets at the sectoral level, which made it impossible to control for firm characteristics in different industries. Hence this initial approach has been refined and extended to use firm level panel data. Early empirical studies using firm level panel data, such as Mona Haddad and Ann E. Harrison (1993), Aitken and Harrison (1999), have found negative or no spillover effects of FDI and attribute this to market stealing or crowding out effects of FDI. Blomström et al. (1998) further argue that positive FDI spillovers are less likely in countries/industries in which

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the gap between the technologies of domestic and foreign enterprises is large, and the absorptive capacity of local enterprises is low. A further explanation for the lack of evidence for spillovers from TNCs to local enterprises in these studies was that they only explore horizontal/intra-industry spillovers. (See Holger Görg and David Greenaway (2004) for a recent review of empirical studies in this literature.)

More recently, it has been argued that if TNCs were to generate spillovers, they are more likely to be vertical rather than horizontal in nature since TNCs have the incentive to minimize technology leakages to competitors while improving the productivity of suppliers by transferring knowledge to them. Using firm level panel data for Lithuania from 1996 through 2000, B. S. Javorcik (2003) examines whether the productivity of domestic firms is correlated with the presence of TNCs in downstream industries and finds evidence of productivity externalities from FDI taking place in upstream industries where local suppliers are in contact with TNCs. Similarly, using a panel dataset of Indonesian manufacturing establishments, G. Blalock and P. Gertler (2003) also find evidence of positive vertical externalities.

Overall, one conclusion that emerges from the empirical literature is that it is difficult to find robust evidence of positive productivity spillovers from TNCs to local enterprises in the same industry. In fact, many studies for developing countries have actually found evidence of negative horizontal spillovers arising from TNC activity while confirming the existence of positive spillovers from TNCs to local enterprises in upstream industries. The contrast between the findings of earlier cross-section and panel data studies and the later ones shows the importance of interconnectivity and linkages between transnational and local enterprises for any spillovers effects to occur in host countries. In this regard, by its nature export-platform FDI may create dualism in host countries whereby TNCs operate in enclaves, thus limiting any benefits that can flow to local enterprises through their activities.

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## **EPFDI strategies: Ireland and Singapore**

In this section, we outline briefly how Ireland and Singapore have come to establish themselves as two of the world's major FDI export platforms. Though the time frames are different, the two countries have followed strikingly similar paths.

### *At independence*

Both Singapore and Ireland are former British colonies. A shared consequence of this colonial past is that English is spoken and many of the characteristics of United Kingdom public service prevailed in both following independence. Ireland was among the first colonies to become independent in the 20<sup>th</sup> century, separating from the United Kingdom in the early 1920s when it obtained dominion status within the Commonwealth; it subsequently became a Republic in 1949. Prior to its independence, Ireland had completely free trade within the Commonwealth, and its major trading partner was the United Kingdom. Its exports to the United Kingdom were primarily agricultural produce and its imports were industrial goods and coal. Given its climate and land availability, Ireland operated like a region of the United Kingdom, supplying food to feed the much larger and more densely populated neighbouring island. At independence, the agricultural sector accounted for 54 % of all employment in Ireland, and over 80% of its exports.

Singapore was among the earliest of the countries that received independence in the late 1950s/early 1960s. Prior to independence, Singapore operated as a major port and military base for the British Empire in Asia. In the interests of developing it as a major centre, the British operated the colony as a free trade island, and built a centre that was attractive for entrepôt trade because of the absence of tariffs and quotas. In contrast to Ireland, Singapore did not have an agricultural sector of any significance at independence.

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## *Protectionist trade policy*

Free trade with the United Kingdom continued for almost a decade following Irish independence but came to a sudden and dramatic end when political disagreement between the two countries resulted in very high rates of tariffs being levied on goods traded between the two countries (McAleese, 1971). Tariffs were imposed in 1932 and remained at exceptionally high levels until the 1960s.<sup>10</sup> Part of the reason for this lengthy period of protection was a belief in the “infant industry argument” – the idea that, if Ireland was to build up an industrial sector, this sector needed protection at its fledgling stage (Haughton, 1995). An indigenous manufacturing sector did develop behind the tariff walls,<sup>11</sup> though it became stagnant and X-inefficient as the years of protection continued into the 1950s. Part of the problem, over and above the tariffs leading to rent-seeking behaviour on the part of indigenous industry, was that the local market was too small to realize the economies of scale that were possible with the new technologies of the post-war period. A further unique aspect of Irish policy was that, at the time protection was introduced, the Government enacted the *Control of Manufacturers Acts*, which ensured that it was not possible for new foreign affiliates to establish behind Ireland’s protective tariffs. This had the effect of reducing competition behind the tariff barriers, so that Ireland’s price and cost structures were very high. Thus the foreign-owned sector in the early 1960s comprised mainly United Kingdom enterprises that had been established before independence, and consequently this sector had few of the characteristics we normally associate with FDI. There was little enthusiasm in the Government to remove tariffs because of the potential loss of revenue, the risk to the balance of payments of a flood of imports and the possibility of increased unemployment as sectoral adjustment occurred.

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<sup>10</sup> In the context of the world recession following the Wall Street crash in 1929, the decision to impose tariffs was not unique – but what became unique about Ireland in a European context was that these tariffs lasted so long.

<sup>11</sup> Industrial output rose by 40% between 1931 and 1936. See Haughton (1995).

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Singapore also adopted protectionist policies at the time of independence in line with the prevailing policy orthodoxy for newly independent developing countries (Hughes, 1995). It provided protection to its “pioneer industries” and began to encourage FDI to flow into those industries, which again was a common strategy in most developing countries. However, in contrast with many developing countries and with Ireland, Singapore’s protectionist period lasted little more than half a decade. Once the possibility of a Malaysian Federation disappeared, the Government realized quickly that an economy with a small local market would not be large enough to provide the scale necessary for an import substitution growth strategy. By the mid-1960s, Singapore had introduced export-promotion strategies, based on attracting FDI into industries that would employ low-cost labour and make full use of the port and network facilities established during the British colonial period. As the second most developed country in Asia (after Japan) in the 1960s, and without the huge agrarian populations of other developing countries to manage, Singapore was in a unique position to benefit from this strategy.

### *Outward trade and FDI policies*

In contrast to Singapore’s swift change of strategy, the change in Ireland from a protectionist, anti-FDI strategy to an export-led growth, pro-FDI strategy took place over 15-20 years. While major balance-of-payments crises and massive outward migration in the mid-1950s led to a realization that protectionism could not achieve growth, the philosophy of “self-sufficiency” was deeply engrained in the political system. Furthermore, the *Control of Manufactures Acts* were still in place. The transition from protectionism to free trade occurred in a series of slow but steady steps. Starting in the early 1950s, policies were introduced to provide capital grants to newly-established export-orientated plants that located in the depressed areas of the country; these were areas where the decline in agriculture had led to the highest levels of unemployment and emigration. Gradually, these capital grants became available to exporting plants throughout the country but at lower rates than applied in the more depressed

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areas. Rather than beginning the process of tariff reduction, very generous tax holidays were given from the mid-1950s onwards to profits associated with incremental exports in order to reduce the anti-export bias implicit in the tariff policy.<sup>12</sup> As a separate policy, the *Control of Manufactures Acts* were repealed in the late 1950s and early 1960s, on the basis that they were no longer necessary or appropriate. The new foreign affiliates that were established were eligible for the same financial and fiscal incentives as indigenous enterprises, i.e. they received capital grants and tax holidays as long as they exported all of their output. Not surprisingly, this policy led to the location of FDI in Ireland that was completely export-driven in its orientation. A strong political and social consensus has underpinned the content and implementation of this development strategy, with the Industrial Development Authority (IDA) as a “one-stop shop” agency assisting enterprises in making investment decisions.

Singapore used very similar types of incentives to encourage FDI plants to locate with an export-orientation, even ahead of the abolition of its protectionist strategy. As in the case of Ireland, it took a proactive approach, with the Economic Development Board (EDB) playing a role similar to that of the IDA in Ireland. Policy towards FDI has been consistently positive since the early 1960s, and this has been possible since there has been only one party in power since then – the People’s Action Party. Indeed, since the mid-1970s, the broad trade and FDI policies of the two economies have been very similar, as have the industrial policies, which have consistently promoted high-tech, high value-added activities. In particular, both countries have promoted the electronics industry, as will be discussed further in section 4. A final strong similarity between the two countries in recent times is the use of macro management policies to support the industrial development strategy. In both countries the labour market is managed in a rather centralized way – in Ireland it rests on social partnership agreements between

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<sup>12</sup> This tax break was intended to encourage existing producers to switch from rent-seeking behaviour behind tariff walls to seeking out new markets and hence generating the scale of production required for survival.

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the Government, employers and unions, while in Singapore similar tripartite arrangements are underpinned by the single-party political system. A consequence of this is that wage rate increase in both countries is managed in a centralized system.<sup>13</sup>

There are some significant differences between the two economies. Firstly, Singapore has promoted joint-venture investment between the State and foreign affiliates, whereas Ireland's foreign affiliates are virtually entirely 100% foreign-owned. This difference may be significant as these joint-ventures provide Singapore with greater potential for integrating foreign and indigenous enterprises and, in effect, reducing duality within sectors. It also means that the differences between domestic and foreign companies are likely to be more marked in Ireland, as there are few enterprises that combine foreign and domestic ownership. A second significant difference is that Singapore has had a more focussed FDI development strategy with concentration on certain industries (electronic products in particular) only, whereas Ireland's development strategy has combined a special focus on electronics and pharmaceuticals with broad support for FDI in all industries.<sup>14</sup> This reflected the major focus in Ireland's development strategy on job creation, while Singapore has been close to full employment for decades and immigration is needed to meet its labour market demands. The third significant difference is that, for some time, Singapore has promoted actively and openly the development of local enterprises to grow into Singaporean TNCs as a counterbalance to the strong presence of foreign-owned TNCs in Singapore. Ireland has some major domestic TNCs at this point, but these have been developed outside of Government policy for the most part, and the role played by the State in supporting this development is relatively small and certainly does not appear to play a major part of Government policy as it does in Singapore (Ruane, 2001).

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<sup>13</sup> See Honohan and Walsh (2002) on Ireland and Pebbles and Wilson (2002) on Singapore.

<sup>14</sup> For example, Ireland supported FDI into the clothing industry as late as the early 1990s. Most of this industry has subsequently closed down.

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## Economic performance, 1960-2000

Table 1 provides a picture of the demographics of Singapore and Ireland. Both, at around 4 million people, are small countries in terms of population. In historic terms, the growth in Ireland's population, while much lower than Singapore's, has been considerable, following over 100 years of population decline. During this period, there was still considerable out-migration from Ireland, and only in the most recent period (since the mid-1990s) has there been very substantial immigration. By contrast, Singapore has enjoyed a much higher rate of population growth throughout the period, much of which has been due to a consistent inflow of migrants (Peebles and Wilson, 2002).

Table 2 presents annual average growth rates of GDP for both countries and shows that Singapore has experienced nearly double the growth rates of Ireland in terms of GDP during the period 1960-1990. This pattern persisted into the early 1990s; but in the latter part of the 1990s, Irish growth far exceeded that of Singapore. In terms of per capita GDP, the recent differences are even more marked, with Irish growth per capita being double that of Singapore. This performance explains how Ireland came to be described as a Celtic Tiger during that period.

Next we turn to examine the changes in the structural composition of the two economies over the period 1980-2000.

**Table 1. Population in Ireland and Singapore, 1960-2000**

Year	Population levels		Annual percentage population growth		
	Ireland	Singapore		Ireland	Singapore
1960	2,832,000	1,646,000	1960-1970	0.4	2.1
1970	2,950,000	2,075,000	1970-1980	1.3	1.4
1980	3,401,000	2,414,000	1980-1990	0.3	2.1
1990	3,505,800	3,047,000	1990-2000	0.7	2.5
2000	3,794,000	4,018,000	1960-2000	0.7	2.2
1960-2000	33%	59%			

*Source:* World Development Indicators 2002 CD-ROM, World Bank.

**Table 2. Annual growth rates in GDP and GDP per capita in Ireland and Singapore**  
(Constant 1995 \$ prices)

Year	GDP		GDP per capita	
	Ireland	Singapore	Ireland	Singapore
1960-1970	3.7	8.5	3.4	6.4
1970-1980	4.2	7.8	2.9	6.5
1980-1990	3.2	6.4	3.0	4.3
1990-2000	6.3	6.8	5.5	4.2
1990-1995	3.8	7.3	3.3	4.8
1995-2000	7.7	5.1	6.8	3.0

*Source:* World Development Indicators 2002 CD-ROM, World Bank.

In both countries, the share of total employment accounted for by industry has decreased – from 32% and 35% in Ireland and Singapore, respectively, to around 28% in both. Table 3 shows that, even in 1980, Singapore’s agriculture sector was insignificant in employment terms and since 1990 it has been less than 3%. As recently as 1980, employment in the Irish agricultural sector accounted for 18% of total employment, which was an exceptionally high proportion by European

**Table 3. Sectoral shares in total employment in Ireland and Singapore, 1980-2000**

Country/Sector	Year				
	1980	1985	1990	1995	2000
<b>Ireland</b>					
Agriculture	18.3	15.6	15.1	11.7	7.9
Industry	32.5	28.4	28.1	28.3	28.6
Services	48.5	55.6	56.4	59.6	63.5
<b>Singapore</b>					
Agriculture	1.3	0.7	0.3	0.2	0.3
Industry	35.7	35.7	35.2	31.0	28.5
Services	62.6	63.7	64.4	67.9	71.1

*Source:* World Development Indicators 2002 CD-ROM, World Bank.

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standards at that time. Over the past 20 years, employment in agriculture has dropped by over 50% and continues to fall, as European agricultural policy promotes the consolidation of agricultural holdings and employers in that sector have to compete for labour with employers from other sectors. A further contrast between the two economies is that in 1980 Singapore had a much more significant services sector, accounting for over 62% of total employment, and reflecting its important trading role in South East Asia.

Singapore's trading role is also reflected in table 4, which shows data on trade intensity for the two economies, where trade intensity is defined as the ratio of average exports and imports to GDP. The ratio is significantly higher in Singapore. While the gap has narrowed very considerably over the two past decades, the rate in Singapore in 2000 was close to twice that in Ireland. Part of this difference is undoubtedly explained by the large amount of *entrepôt* trade that is still significant in Singapore, as an extension of its traditional trading role. On a world scale, both would be considered to be very open economies. Ireland and Singapore rank first and second, respectively, in the A.T. Kearney/ Foreign Policy Magazine Globalization Index (2004).

The scale of inward FDI into Singapore is evident in table 4, which shows, for various years from 1974, that the ratio of FDI inflow to GDP in Singapore was almost 10 times that received by Ireland up to the 1990s. Ireland's success in winning increased FDI is attributed by many to the completion of the EU single market and there has been a rapid growth in the ratio over the 1990s. Table 4 shows the ratio as an extraordinary 28% in 2000, which is in part due to exceptional clustering of investment in that year. A more accurate view would be that found in F. Ruane and J. Sutherland (2002), who found that ratio averaged 8 in the five years 1995-2000.

In summary, both economies have experienced rapid growth in population, income, trade and FDI over 40 years, with Singapore expanding at a more rapid pace throughout the period.

**Table 4. Economic openness in Ireland and Singapore, 1974-2000**

Year	Trade intensity		FDI intensity	
	Ireland	Singapore	Ireland	Singapore
1974	43.2	126.0	0.6	6.3
1980	48.5	174.5	1.6	10.3
1985	51.3	129.5	0.6	5.7
1990	45.1	144.7	1.3	14.5
1995	56.7	142.9	2.0	13.7
2000	81.1	146.8	28.1 <sup>a</sup>	13.7

*Source:* International Financial Statistics, IMF.

*Notes.* Trade intensity is defined as the ratio of average exports and imports of goods to GDP. FDI intensity is defined as the ratio of inward FDI to GDP

<sup>a</sup> The average ratio for 1995-2000 was 8.1%, which gives a more accurate reflection of the true picture.

The exceptional performance of the Irish economy is, in effect, a 1990s phenomenon. Both countries now have similarly proportioned industrial sectors, with over 28% of employment in that sector. In the next section, we look in detail at the manufacturing sector which has been central to the development strategies of both economies over the past four decades.

### **Export platform development and manufacturing performance, 1983-1999**

In this section, we draw comparisons between the manufacturing sectors of Ireland and Singapore using 2-digit industry level data. The data for Singapore come from the Economic Development Board, while the Irish data come from the Central Statistics Office, Ireland.<sup>15</sup> In both countries, foreign affiliates refer to companies with more than 50% foreign equity. In the case of Irish manufacturing, most FDI during the period has been in the form of greenfield investment projects that are

<sup>15</sup> The EDB is the official source for Singaporean data which decomposes manufacturing data by nationality of ownership.

exclusively foreign-owned. In Singapore, on the other hand, there have been significant numbers of joint ventures with both majority and minority foreign equity participation. Such joint ventures have been actively promoted by policy.

Table 5 shows the overall picture for the manufacturing sectors in terms of numbers of establishments, employment, gross output and exports for the two countries for three years, 1983, 1991 and 1999. (The choice of 1991 reflects an appropriate mid-point in the data series available to us and also the approximate structural break in the series.) Ireland has a consistently larger number of manufacturing establishments but with a manufacturing workforce that is less than three quarters the size of the Singaporean workforce. Consequently, average enterprise size in Ireland is significantly smaller than in

**Table 5. Manufacturing sector performance, 1983, 1991, 1999**

Item	1983		1991		1999	
	Total	Foreign share	Total	Foreign share	Total	Foreign share
<b>Ireland</b>						
Number of establishments	5002	13	4,546	16	4,794	14
Employment	208,168	32	196,878	44	248,971	49
Output	14,733,628	41	33,758,154	53	79,789,205	76
Exports	10,568,268 <sup>a</sup>	75 <sup>a</sup>	20,980,907	74	61,810,068	90
Item	1983		1991		1999	
	Total	Foreign share	Total	Foreign share	Total	Foreign share
<b>Singapore</b>						
Number of establishments	3,616	22	3,785	23	3,928	21
Employment	271,106	52	358,274	58	338,885	50
Output	17,258,610	73	44,732,787	74	78,811,344	78
Exports	10,344,860	83	27,153,001	84	50,362,714	87

Source: Own calculations from CSO and EDB. Value figures are in dollars.

<sup>a</sup> Refers to 1986 figures (earliest date for computing these figures).

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Singapore. Irish gross output and manufacturing exports (measured in dollars) have risen rapidly over the period, surpassing those of Singapore during the 1990s. Table 5 also shows the importance of the foreign-owned segment of the manufacturing sectors in the two countries. On every measure, with the exception of exports in 1999, the foreign share in Singaporean manufacturing matches or exceeds that of the foreign share in Ireland. This result is not surprising in the light of the enormous inflow of FDI into Singapore shown in table 4.<sup>16</sup>

One striking difference between the two economies is in the pattern of employment growth across TNC- and locally-owned enterprises during periods of cyclical growth and contraction in manufacturing employment. During the 1980s, as manufacturing employment in Singapore grew by over 30%, the share of employment accounted for by foreign affiliates expanded by 15%, whereas in the 1990s the fall in Singapore's manufacturing employment of 5% was accompanied by a foreign share decline of almost three times that rate. This may reflect the impact of policy in Singapore to seek FDI that is more capital-, technology- and skill-intensive than the FDI secured in previous decades (Low, 1993, chapter 3). In Ireland, by contrast, the share of employment in foreign affiliates continued to rise in both periods – by 35 % in the 1980s, when total manufacturing employment fell by 5%, and over 10% in the 1990s, when it expanded by over 25%.

In order to look at the extent and nature of structural changes in the two economies over the period, we calculated Hirschman-Herfindahl (H-H) indices based on employment in each 2-digit manufacturing industry for the period 1983-1999.<sup>17</sup> These indices are charted in figure 1. They show that the manufacturing sector in Singapore is much more concentrated than in Ireland and that this concentration has increased over

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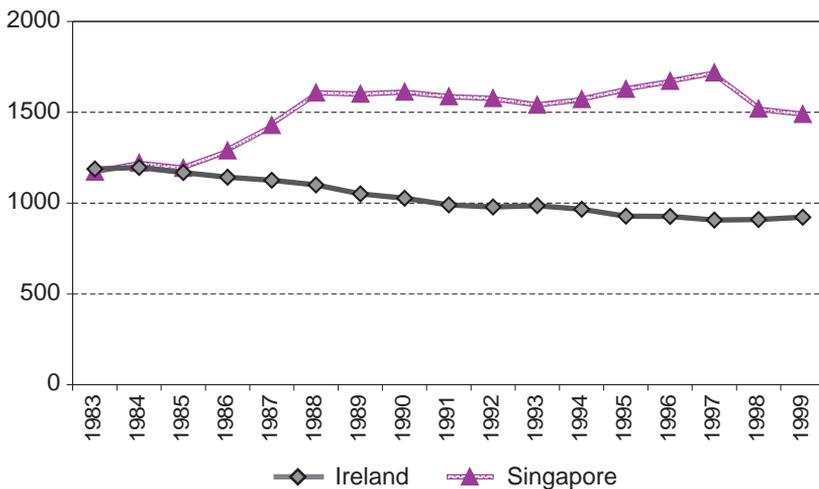
<sup>16</sup> The comparison is not straightforward as the data in table 4 cover all sectors and not just manufacturing.

<sup>17</sup> The HH index is given by  $\sum s_j^2$  where  $s_j$  is the share of employment in sector  $j$  in total employment.

the 16 years while concentration in Irish manufacturing has decreased. Table A1 in the appendix, which shows employment shares by sector for 1983, 1991 and 1999, indicates that the increased sectoral concentration in Singapore came mainly through the expansion of modern industries (electronic products, medical, precision and optical, chemicals). In the Irish case, there has been increased concentration in modern industries, but this has been offset by the significant decrease in the share of the largest industry in 1983, namely food and drink.

What about foreign ownership? In 1999, foreign affiliates accounted for around half of employment in the manufacturing sectors of both countries, but over the previous 16 years they rose by 17 percentage points in Ireland whereas in Singapore they were virtually unchanged. As Ireland had a significant pool of unemployment for most of the period as well as net outward migration, and because of the absence of competition on the domestic market, it is unlikely that this expansion of TNC employment led to a “crowding out” effect, especially as much

**Figure 1. HH index: sectoral concentration of total employment, 1983-1999**



Source: Own calculations from CSO and EDB. Value figures are in dollars.

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of the expansion in TNC employment occurred in modern industries while the contraction in local enterprise employment occurred in traditional ones.

To examine the changing pattern of employment in more detail, we calculate H-H indices for the shares of total employment by sector accounted for by foreign and domestic enterprises, respectively for the period 1983-1999.<sup>18</sup> These indices (figure 2) show that sectoral concentration is consistently much higher in TNCs than in local enterprises in Singapore and there is no evidence of any convergence between the two indices. The high H-H indices for TNCs reflect the strong sectoral focus of Singapore's industrial policy. In Ireland, by contrast, the difference in concentration levels between foreign and domestic enterprises in manufacturing industries is much less marked and declined over the whole period. Furthermore, the H-H index has been higher for local enterprises than for TNCs for most of the period, which may be due to the significance of legacy enterprises among Ireland's TNCs (dating back to the pre-Independence period). However, it undoubtedly also reflects the less sectorally-focussed strategy in Ireland compared to Singapore during the 1960s and 1970s.

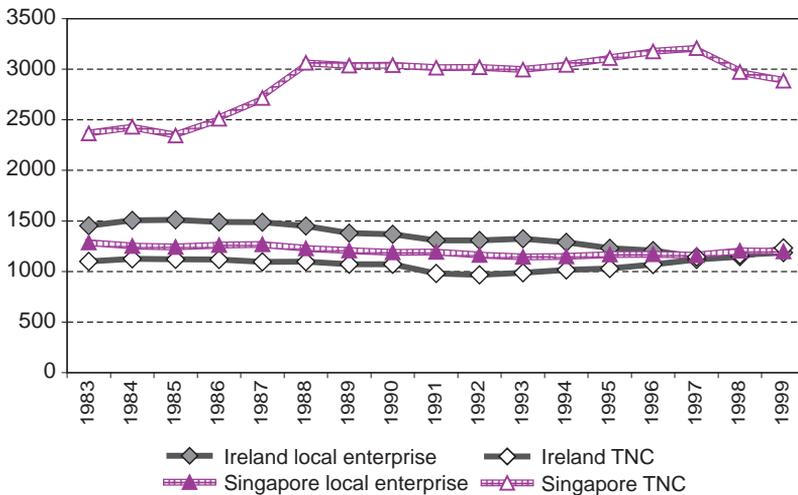
Table A1 shows the dominance of TNCs in employment in modern industries – chemicals, electronic products and medical, precision and optical – in both countries. Chemicals have expanded relatively, propelled particularly by TNCs whose shares have increased. The scale of electronic products has increased in both countries, but the extent of specialization in Singapore is far greater, reflecting its strong policy focus on this industry. Noteworthy is the growing local enterprise share in electronic products, where employment rose fourfold over the period, while it grew by under 25% in Ireland. This suggests that local enterprises in this industry in Singapore may have reached a level of sustainability not yet achieved in Ireland.<sup>19</sup>

<sup>18</sup> The HH index is given by  $\sum s_{nj}^2$  where  $s_{nj}$  is the share of foreign (domestic) employment in sector  $j$  in total foreign (domestic) employment.

<sup>19</sup> For all these comparisons, a similar pattern emerges when we look at sectoral and foreign shares measured in terms of gross output.

Since FDI in both countries is export platform in orientation, we would expect the export intensity of TNCs (share of total output exported) to be very high relative to that of local enterprises, and that a relatively lower TNC export intensity ratio would indicate greater linkages into the domestic market in the case of intermediate products. Unfortunately, the data do not allow us to dichotomize the products into final and intermediates, but we can compute average export intensity ratios by industry for TNCs and local enterprises for the period 1985-1999. Figure 3 shows that Irish TNCs have generally higher average export ratios than their counterparts in Singaporean manufacturing industry, while the reverse is the case for local enterprises. The high export intensity ratios of Singapore's local enterprises suggests that its more "hands on" policies have been more successful than those in Ireland in promoting the development

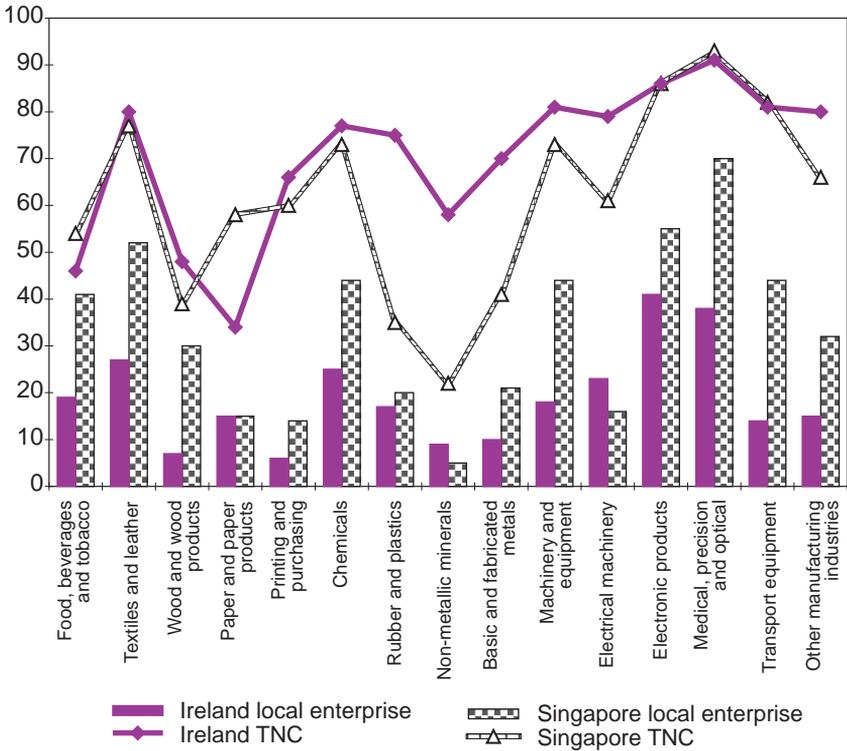
**Figure 2. HH index: sectoral concentration of employment in TNCs and local enterprises , 1983-1999**



Source: Own calculations from CSO and EDB. Value figures are in dollars.

<sup>20</sup> Ruane and Sutherland (2004a), using micro data on Irish manufacturing, find that a high proportion of local enterprises does not export and that those local enterprises that export do not show improved performance, as measured by stronger enterprise characteristics, over time.

**Figure 3. Export intensity in Singaporean and Irish manufacturing industries,**



Source: Own calculations from CSO and EDB. Value figures are in dollars.

of its local enterprises.<sup>20</sup> The targeting of indigenous Irish manufacturing in developing its export markets is seen as one of the outstanding challenges facing policy makers in Ireland (see Enterprise Strategy Group, 2004).

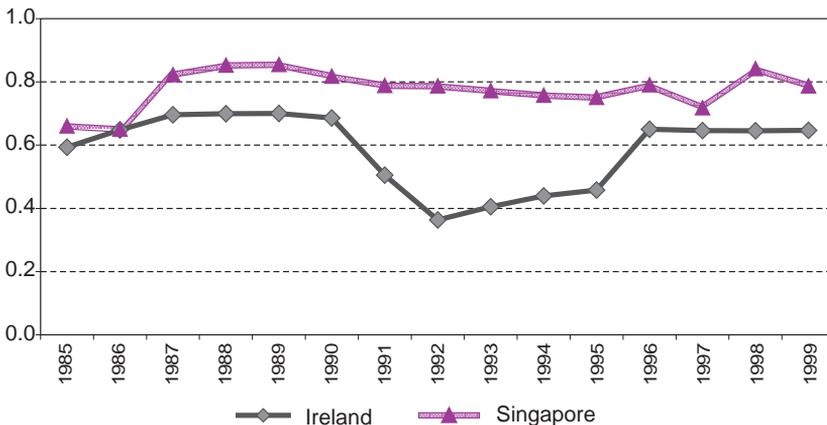
To consider whether EPFDI may have an impact on the export behaviour of local enterprises, we calculate correlation coefficients between the sectoral export intensity of local enterprises with that of TNCs. A large positive coefficient would imply that the share of output exported by local enterprises within a sector is likely to be greater when the export share of TNCs is higher. Figure 4 shows that the correlation coefficients in both countries are positive, but significantly lower in Ireland. This result for Ireland is consistent with research at enterprise level

in Ireland which does not find significant export spillovers from TNCs to local enterprises, where TNC influence is measured through export-intensity ratios (Ruane and Sutherland, 2004b).

Next, we turn to examine foreign- and domestically-owned enterprises within individual manufacturing industries in Singapore and Ireland, using data on labour productivity and wages paid by TNCs and local enterprises. We look at two issues relevant to dualism. Do TNCs have higher labour productivity than local enterprises and is that productivity difference increasing or diminishing over time? Do TNCs and local enterprises pay similar wages when they operate in the same industry and, if different, is there evidence that the differences are narrowing or widening over time? Large and persistent differences between productivity levels of TNCs and local enterprises in the same industries would suggest some degree of dualism, while a narrowing of these differences over time would suggest that linkages and spillovers may be beginning to reduce that dualism.

We undertake our analysis for all industries in the first instance and then for “all excluding chemicals”, since this

**Figure 4. Correlation between local enterprises and TNC export ratios, 1983-1999**



Source: Own calculations from CSO and EDB. Value figures are in dollars.

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industry is one characterized by exceptionally high productivity growth.<sup>21</sup> We use a basic regression framework in order to examine the convergence between TNCs and local enterprises in both economies using productivity and wage performance measures, utilising the following regression equation:

$$Y_{it} = a + T_t + T_t^2 + f_i + \epsilon_{it} \quad (1)$$

where  $i$  and  $t$  represent industry and year, respectively,  $Y_{it}$  is the ratio of TNC productivity (wages) in industry  $i$  to local enterprise productivity (wages) in the same industry,  $a$  is the intercept term and  $T$  is a time trend. We also include  $T_t^2$  to capture any non-linear relationship in the time trend. The coefficient  $f$  in the equation captures the time invariant industry-specific effect, estimated as fixed effect, while  $\epsilon$  denotes a random noise term. If the coefficient of the time dummy is negative and significant, we interpret this as evidence of convergence.

Table 6 shows the results of the regression analysis examining labour productivity differences between TNCs and local enterprises in Irish and Singaporean manufacturing industries. Columns 1 and 3 include all industries, while columns 2 and 4 exclude “chemicals” from our analysis. The coefficient of the intercept terms indicates that, on average, labour productivity in TNCs is significantly higher than in local enterprises in both countries, suggesting some degree of dualism; this result is especially marked in the Irish case. Turning to look at convergence/divergence, we see that in Singapore there is evidence of convergence taking place at decelerating rates when “chemicals” are excluded from the data set. This implies that the productivity gap between TNCs and local enterprises is narrowing outside “chemicals”, suggesting that through linkages or spillovers, the productivity of local enterprises is rising towards that of TNCs. On the other hand, there is no statistically significant evidence of convergence or divergence over time in the Irish case; in other words, the degree of dualism that is

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<sup>21</sup> Throughout we excluded “petroleum refining” because of its unique role in development.

**Table 6. Productivity convergence between TNCs and local enterprises in Irish and Singaporean manufacturing industries**

	Ireland		Singapore	
	(1)	(2)	(3)	(4)
Constant	1.63**** (8.04)	1.62*** (7.79)	1.44*** (13.33)	1.51*** (11.47)
T	0.002 (0.75)	-0.02 (-0.41)	-0.006 (-0.24)	-0.03** (-1.85)
T <sup>2</sup>	0.003 (1.16)	0.001 (0.54)	0.002 (1.35)	0.002*** (2.39)
No of observations	255	238	221	204
R <sup>2</sup>	0.09	0.06	0.08	0.05
Prob. F	0.00	0.00	0.00	0.00

*Source:* Authors' calculation.

*Notes:* t-values are in brackets.

\*\*\* 1%, \*\* 5%, \* 1% statistical significance.

evident in the intercept constant has not changed over the period. This result is not surprising given that Ruane and (2004a) found no evidence of spillovers in their analysis of TNC/ local enterprise productivities using plant level data for the Irish manufacturing sector.

Table 7 examines average wages paid by TNCs and local enterprises. The regression results show that in both countries wages paid by TNCs are higher on average than those paid by local enterprises. However, the extent of the difference is much less for average wages than for labour productivity, which must in part reflect that wage setting behaviour is influenced by labour market conditions. While the wage differences between TNCs and local enterprises in Singapore are higher, they are converging at a decreasing rate over the period; this evidence is significantly stronger when we exclude “chemicals”. The narrowing of wage differentials may reflect spillover and linkage effects associated with the narrowing of labour productivity differentials in table 6. In Irish manufacturing, the wage gap is less marked, which

**Table 7. Wage convergence between TNCs and local enterprises in Irish and Singaporean manufacturing industries**

	Ireland		Singapore	
	(1)	(2)	(3)	(4)
Constant	1.10*** (7.02)	1.11*** (4.55)	1.20*** (7.80)	1.21*** (4.23)
T	0.03*** (4.89)	0.02*** (4.60)	-0.01* (-1.72)	-0.02*** (-2.68)
T2	-0.001*** (-3.92)	-0.001*** (-3.76)	0.001*** (2.20)	0.001*** (2.76)
No of observations	255	238	221	204
R <sup>2</sup>	0.13	0.12	0.08	0.06
Prob. F	0.00	0.00	0.00	0.00

*Source:* Authors' calculation.

*Notes:* t-values are in brackets.

\*\*\* 1%, \*\* 5%, \* 1% statistical significance.

may reflect in part the greater centralization in the system of wage setting in Ireland compared with Singapore.<sup>22</sup> It may also reflect a relatively more similar skill composition across the two sets of employers in the same industries in Ireland. The positive and significant sign of the time trend variable and the negative sign on the squared term indicates that the divergence between TNC and local enterprises average wages increased, albeit at a diminishing rate, over the period 1983-1999. This is consistent with increasing labour market pressures over the period and the ability of TNCs to pay higher wages in this context. It is also in line with the findings by Ruane and (2004b) of no evidence of wage spillovers in the Irish manufacturing sector in the period 1991-1999.

<sup>22</sup> Centralized wage setting in Singapore has always been flexible to take account of industry and enterprise situations; such flexibility has only recently been part of the Irish system. TNCs in Ireland typically do not have unionized labour and the smaller difference may also reflect the ability of the MNEs to bargain strongly and with reference to prevailing rates in the unionized local enterprise sector.

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## Conclusions

In the introduction we raised the issue of how TNCs and local enterprises relate over a prolonged period when the TNCs have located in an export platform economy. The focus of the article is on whether in such circumstances the relationship between TNCs and local enterprises develops a persistent dualistic nature, with little interaction between them. This dualism would be evident in industrial segmentation and in lower linkages and spillovers between TNCs and local enterprises in the same industry, so that differences in productivities and factor payments would persist. To consider whether this type of FDI induces dualism between the activities of local enterprises and TNCs, we focused on four questions which we now revisit.

### *Are there differences in the types of industries in which TNCs and local enterprises are active?*

Our analysis showed that, in terms of employment, Singaporean manufacturing industry has become more sectorally-concentrated (figure 1), driven by the increased importance of TNCs whose H-H index is more than twice that of its local enterprises (figure 2).<sup>23</sup> In Irish manufacturing, by contrast, we found that levels of concentration were actually lower for TNCs than for local enterprises, with the difference between them narrowing over the period.<sup>24</sup> As noted in section 4, these differences undoubtedly reflect the less strategic focus of Ireland's FDI promotional policy compared to Singapore's. Thus, while both countries have half of their manufacturing employment in companies with over 50% foreign ownership, in

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<sup>23</sup> For example, in 1999, over one third of its total manufacturing employment was in electronic products and over 80% of that employment was in TNCs.

<sup>24</sup> This reflected the increased importance of some of the high-tech industries (especially electronic products) among TNCs at a time the importance of some of the main traditional local enterprises industries (e.g. food and beverages) declined, with a net negative effect on the degree of sectoral concentration overall.

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the Singaporean case the greater sectoral concentration has facilitated the development of critical mass, making possible the growth of clusters and networks in these industries.<sup>25</sup>

The differences in the H-H indices may also be a sign of the different position of each country in its geographic region. Singapore has been among the highest per capita income countries in South-East Asia for several decades, while Ireland has only recently moved from being one of the lower to one of the higher income countries in Western Europe. Until recently, FDI projects were attracted to Ireland because of its relatively low labour costs (from a European perspective) and its plentiful supply of relatively skilled labour. Singapore, in contrast, has had full employment for decades, and labour costs have been moderated by immigration of labour (both skilled and unskilled) to meet the needs of new establishing enterprises. In effect, the differences in sectoral segmentation are completely consistent with the differences in the FDI strategies pursued by both countries.

*Do TNCs and local enterprises have similar export patterns, i.e. where TNC export ratios are high, are local enterprises export ratios also high?*

The contrast between export intensities for Irish and Singaporean local enterprises is strong and raises issues for other countries which seek to attract EPFDI on a large scale. As noted above, the Irish results are consistent with the micro data results from existing research by Ruane and Sutherland (2004a) and Ruane and Sutherland (2004b). The availability of similar micro-data for Singapore would provide a fruitful research opportunity to explore what underpins the differences in export intensities of local enterprises in the two countries. The higher export ratios of Singaporean local enterprise plants may in part be due to their larger scale (in terms of employees per plant), allowing more of

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<sup>25</sup> Ireland is very concerned to build such clusters but has a limited base on which to try to build them. It has had virtually no success outside electronics, which was the target of policy towards linkages and clusters over the 1990s.

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them to export and those who export to achieve higher export intensity. The higher correlation between export intensities of local enterprises and TNCs across industries points to the less dualistic nature of Singaporean development compared to Ireland's development.

***Where TNCs have high labour productivity, do local enterprises have high labour productivity also and are any differences on a divergent or convergent course?***

Our analysis of productivity levels between TNCs and local enterprises shows that TNCs have higher productivity levels than local enterprises in both countries, a result that is in line with experience elsewhere.<sup>26</sup> There is evidence of convergence between productivity levels of TNCs and local enterprises in Singaporean manufacturing, whereas in Ireland the differences persist. This is consistent with the greater pro-activity of Singaporean policy in terms of developing local enterprises and their relationships with TNCs. Research using micro data would be needed to establish evidence of linkages and spillovers in Singapore.

***Do TNCs and local enterprises pay similar wages when they operate in the same industry? And if they pay different wages, do these differences show a tendency to persist or are they diminishing or increasing over time?***

In both Singapore and Ireland TNCs pay higher wages than local enterprises – and this is perhaps not surprising given that the TNCs in both countries have higher productivity levels. However, the patterns in the two countries again are rather different – average wages in TNCs and local enterprises in Singapore are converging, indicating a reducing degree of dualism whereas there is evidence of increasing dualism in the growing wage gap in the Irish manufacturing sector.

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<sup>26</sup> The sheer scale of TNC presence in these two countries might lead one to suspect that the differences would be lower due to factor market effects.

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In summary, while both Ireland and Singapore have adopted broadly similar strategies in promoting EPFDI, with more than half their manufacturing workforces employed in foreign affiliates, we see greater evidence of dualism in Ireland than in Singapore. This result points to the greater success of Singapore in integrating TNCs into the economy (and hence generating more linkages and spillovers) and in developing local enterprises that are global players. The differences between TNCs and local enterprises may, however, also reflect the promotion of joint ventures in Singapore, so that the smaller differences in Singapore reflect the greater presence of these hybrid entities. A comparative study of Ireland and Singapore using enterprise level data would allow these differences to be explored in more depth.

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**Table A1. Significance of TNCs in terms of employment in Irish and Singaporean manufacturing industries, 1983, 1991, 1999**  
(Per cent)

Industry	Singapore						Ireland					
	Industry as % of total			TNCs as % of industry share			Industry as % of total			TNCs as % of industryshare		
	1983	1991	1999	1983	1991	1999	1983	1991	1999	1983	1991	1999
Food, beverages and tobacco	5	4	4	28	32	27	25	23	19	22	28	26
Textiles and leather	13	9	3	18	17	9	16	11	5	25	44	34
Wood and wood products	2	1	0	29	7	0	4	2	2	4	11	19
Article and article products	1	1	1	25	32	28	2	2	2	24	26	19
Printing and publishing	5	5	5	9	18	14	5	6	8	5	18	34
Refined petroleum	1	n.a	n.a	100	n.a	n.a	n.a	n.a	n.a	n.a	n.a	n.a
Chemicals	3	3	5	63	76	83	6	7	9	65	77	80
Rubber and plastics	4	5	6	24	38	28	4	4	4	35	54	40
Non-metallic minerals	3	2	2	37	35	35	6	5	4	21	18	15
Basic and fabricated metals	7	9	11	33	32	26	8	7	6	19	28	24
Machinery and equipment	10	8	11	65	67	46	4	6	6	46	57	46
Electrical machinery	5	5	3	85	88	69	6	5	6	78	76	70
Electronic products	24	34	31	92	89	81	4	7	13	69	84	89
Medical, precision and optical	2	3	3	85	85	84	4	5	7	91	92	85
Transport equipment	10	8	10	27	24	19	5	5	4	8	18	54
Other manufacturing industries	5	5	4	44	49	32	2	5	4	44	0	27
Total manufacturing	100	100	100	52	58	50	100	100	100	32	44	49
Total manufacturing, levels	271,106	358,274	338,885	208,168	196,878	248,971						

Source: Own calculations from CSO and EDB. Value figures are in dollars.