The Flexible Developmental State: Globalization, Information Technology, and the "Celtic Tiger"

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REMAKING THE DEVELOPMENTAL STATE

For a number of years, commentators have looked to the "developmental states" of East Asia as a counterweight against the forces of economic globalization. These states have been seen as cause for hope that nations could promote economic development, even from a subordinate position in the international division of labor. Until the 1990s, this developmental state presided over one of the most spectacular economic success stories of this century, while other economies (e.g., in Latin America and the European periphery) languished, often as little more than export platforms.[1]

In the 1990s, however, the developmental state seemed to have had its day in the sun. The Japanese and Korean states appeared too inflexible to cope with rapidly changing informational industries and decentralized "post-Fordist" industrial structures. Korean and Japanese firms ran into increasing difficulties through the 1990s in rapidly changing high-technology markets. The developmental states also appeared too weak to manage the increasingly internationalized economies over which they presided, as evidenced in the financial crisis of 1997 and 1998.[2] The emergence of flexible regional economies and dispersed transnational networks of technology and finance appeared to have simultaneously undermined the developmental state from below and from above.

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However, a different set of countries has emerged in the 1990s that appear likely candidates for mobility in the hierarchy of the international economy. The Republic of Ireland is among those economies that have begun to change their relation to the global economy based on growing strengths in information technology (IT) industries. Economic growth rates in Ireland[3] have improved dramatically since the economically and socially disastrous 1980s and have been among the most rapid in the world in the mid-1990s. There has been a significant improvement in export performance, and domestic demand has increased since 1994 after the mass unemployment and emigration of the 1980s and the caution of the early 1990s. Consumer prices, despite some inflationary pressures in recent years, have risen slowly. All of the above indicators compare favorably with the performance of other leading economies in the Organization for Economic Cooperation and Development (OECD), including even comparatively "successful" economies such as the United States, the Netherlands, and even the Asian Tigers in the 1990s.[4] Furthermore, the "jobless growth" of earlier decades has been replaced by the highest rate of employment growth and the highest proportion of the population employed in the history of the state. The mass emigration of the 1980s has given way to a substantial net inflow of migrants, largely consisting of emigrants returning to Ireland but also including non-Irish-born immigrants. Unemployment has fallen more slowly but has recently reached its lowest level in seventeen years.

Growth in Ireland is driven not just by foreign investment but by two relatively distinct modes of integration into the global economy—the partial local embedding of global corporate networks and the increasingly successful integration of local networks of indigenous firms into global business and technology networks. These two globalizations are further embedded within a set of national neocorporatist institutions that have managed the relation to the global economy of both the macro economy and of unionized workers. Since 1987, a series of national "social partnership" agreements have negotiated wage restraint, public spending limits, and some efforts to bridge social exclusion at the local level.

The most effective developmental states of the 1990s have been transformed from the bureaucratic models that characterized the East Asian economies to the flexible versions we find in economies such as Ireland and Israel. The flexible developmental state (FDS) is defined by its ability to nurture post-Fordist networks of production and innovation, to attract international investment, and to link these local and global technology and business networks together in ways that promote development. This ability is sustained by the multiple embeddedness of the state in professional-led networks of innovation and in international capital, and by the state's flexible organizational structure that enables the effective management of this multiplicity. This uneasy structure of multiple alliances is threatened, however, by the difficulties of a fragmented state structure in handling

the tensions arising from uneven internationalization of society and growing inequality.

The Irish software industry is an informative case study through which to analyze the key characteristics of this emerging development strategy.[5] The industry has grown rapidly, is one of the most dynamic software industries outside the United States, and is divided relatively equally in employment terms between foreign and Irish-owned firms. It occupies an increasingly significant role in the Irish economy. Software is a significant employer in its own right, behind only electronic equipment, food, and chemicals as industrial employers in 1997. It is also growing more quickly in terms of employment than any manufacturing sector.[6] The industry accounted for 12 percent of Irish exports in 1998 and, perhaps more important, was rapidly becoming a model for industrial policy in other sectors of the economy.

The article begins by critiquing accounts that overemphasize either local or global processes through an analysis of the dynamics of recent industrial and economic development in Ireland. I then develop the concept of the FDS in some detail as an alternative theoretical approach to understanding the central features of Irish economic development. The remainder of the article describes the structure of the software industry in Ireland and applies the three dimensions of the theory to explain the development and dilemmas of the Irish software industry—how the state intervened in the process of globalization itself, the social and institutional conditions of this state role, and the threat posed to development by social inequality. Finally, some issues concerning the sustainability and generalizability of the model are considered.

NATIONAL DEVELOPMENT AND THE GLOBALIZATIONS OF IRELAND

For some authors, the success of the Irish economy since the early 1990s is based on its mastery of localized flexible production and innovation. Charles Sabel argues that Irish success is based on the ability of Irish firms to learn the lessons of decentralized post-Fordist production and create local alliances that support learning, efficiency, and innovation.[7] Local strength becomes the basis of global competitiveness. However, a variety of commentators from different ends of the political spectrum emphasize Ireland's location within the process of globalization as the critical feature of this turnaround. A persistence with export orientation, free trade, and foreign investment appears to be the key to Irish development in the 1990s, for better or worse. Denis O'Hearn explains the emergence of the Celtic Tiger in the following terms:

> American corporations made major moves to increase their presence in the European market; they tended to agglomerate their new projects to take advantage of the flexibility this allowed; and Ireland was fortunate enough to receive a major share of American-owned electronics projects in Europe because they agglomerated around other major firms such as Intel.[8]

The similarities in the causal explanations provided by a more conservative analyst, Paul Krugman, are striking (although their evaluations of the process differ markedly):

> Thanks in part to luck, in part to policies . . ., Ireland got a head start over other European locations in attracting what became a surge of inward foreign direct investment; the early investments both generated a cascade through informational effects and, eventually, created external economies that further reinforced Ireland's advantages.[9]

In fact, it will prove necessary to combine these "local" and "global" theories to provide a full account of the multiple ways in which local and global processes shape different modes of integration into the global economy and how they are sustained by particular institutions. Irish industry is characterized by two such broad modes of integration into the global economy, combining local and global networks in different ways. The first is based on attracting foreign investment and attempting to embed it in the local economy, and the second and more recent model is based on the growth of indigenous Irish-owned firms that compete internationally and are increasingly closely integrated into international technology and business networks.[10]

Employment in foreign-owned industry grew 24.8 percent in manufacturing and 384.5 percent in financial and internally traded services (including software) between 1989 and 1998.[11] Denis O'Hearn provides a cogent critique of reliance on such transnational corporation (TNC) investment as a model of economic development.[12] He argues that Irish economic growth is largely an illusion as it is dominated by investment by TNCs, and economic statistics are grossly inflated by the exports of a very narrow band of economic sectors and even key firms within those sectors—such as Intel in computers and Microsoft in software. Indeed, foreign profits dominate the Irish economy to such an extent that the gross domestic product (GDP) overstates the size of the Irish economy by some 13 percent, as it does not account for the repatriation of transnationals' profits. This is further aggravated by the presence of certain sectors (including software duplication) that are essentially "entrepôt" sectors, sectors that account for approximately 10 percent of manufacturing employment but around 30 percent of output.[13]

While foreign investment is certainly open to a wide range of criticisms, there are some indications that at least pockets of more sophisticated work have emerged among TNCs in Ireland. Intramural spending on research and development (R&D) among foreign-owned companies increased from £180m in 1993 to £256m in 1995 and from 2.1 percent of sales in 1993 to 2.5 percent in 1995.[14] TNC sales are certainly inflated by transfer pricing[15] and various other forms of creative accounting, but this, in turn, may obscure some of the resources they generate within the economy. In particular, statistics based on percentages of TNC sales are likely to understate the sophistication of their operations, given the inflation of these sales figures. The Irish economy expenditures of TNCs declined as a percentage of (artificially inflated) sales between 1990 and 1996 (from 37.9 percent

to 35.2 percent), but the absolute spending of TNCs in the Irish economy rose 55.3 percent during that period.[16] There is some evidence therefore of a local upgrading and embedding of some TNC operations, although this is limited, as O'Hearn rightly points out.

Nonetheless, O'Hearn is too quick to reduce the dynamics of Irish development to a TNC-led "entrepôt" model, dominated by companies such as Microsoft, Intel, and Dell. This cannot explain the existence of some relatively sophisticated TNC operations. Nor is the growth of indigenous industry simply derivative of TNC investment, as evidenced by the data on the relatively limited local linkages of TNCs. Critics of Ireland's reliance on foreign investment cannot have it both ways. Given the legitimate aspects of the critique of the developmental impact of foreign investment, it then cannot be argued that Irish development has derived almost completely from key investments such as Intel and Microsoft. Even within the TNC sector, these firms remain relatively isolated and have little to do with the more interesting TNCs such as Ericsson, Digital, and so on. Their disproportionate impact on Irish export and growth figures should not blind us to their relative lack of contribution to the very real transformation of production and innovation capabilities within parts of the Irish economy. Finally, the neocorporatist "social partnership" arrangements in place since 1987 cannot be explained by O'Hearn's model as they are only of tangential relevance to most of the TNCs. Most TNCs are nonunion employers for whom wage costs are a relatively low priority, and they have generally paid well above the terms of the national wage agreements.

The spectacular growth in the output of TNCs can obscure the impressive performance of Irish indigenous industry in which employment grew 10.4 percent in manufacturing and 197.7 percent in internationally traded services. This indigenous industry performance is very impressive in comparative terms, all the more so since it is currently on a very rapid growth trajectory as most of the employment growth has occurred since 1994. Furthermore, this is not growth that is dependent on links to TNCs in Ireland (which are generally weak)—exports of Irish-owned manufacturing firms grew faster than both output and employment between 1990 and 1996.[17] Industrial R&D in the whole economy increased to 1.02 percent of GDP from 0.48 percent in 1986 and 0.53 percent in 1990. This was achieved through a per annum real rate of growth of R&D spending of 15 percent among foreign firms and 16 percent among Irish-owned firms.[18]

The claims of authors such as Charles Sabel that the unexpected success of industry in Ireland is due to an ability to master flexible production contains an element of truth. Indigenous firms tend to be small and medium sized with at least some evidence of networking among firms.[19] There is at least some evidence of significant diffusion of teamwork at the level of the organization of production, although not sufficient to warrant the more enthusiastic claims made on Irish industry's behalf.[20] The picture that emerges of indigenous industry is of an over-

all upgrading in the organization of production and of management and marketing capabilities, resulting in growth spread across a range of sectors. Investment, although clearly not the driver of development, has picked up significantly, particularly in the most dynamic sectors.[21]

There are a number of sectors, in particular financial services and IT, that exhibit a combination of buoyant investment, high levels of R&D, significant levels of "collaborative production," and "clustering" or dense networking and that are the most dynamic in the Irish economy.[22] The software industry is clearly located at this "post-Fordist leading edge" of the indigenous sector, within a context of overall upgrading of capabilities across a broad range of industries.

Industrial growth has translated into a much improved employment performance. Between 1986 and 1995, full-time employment increased by 2.5 percent among men and 21.2 percent among women, while part-time employment increased by 24.4 percent among men and 36.6 percent among women. The Irish economy has indeed been creating part-time jobs rapidly, but it has also created significant numbers of full-time jobs, even more so in recent years. Furthermore, the jobs created have not simply been "bad" jobs. In fact, employment growth has been characterized by an overall upgrading of the occupational structure combined with a significant polarization of occupations and wages. The most rapidly expanding occupational categories between 1981 and 1995 include catering, personal services, sales workers, and security workers—which added 59,000 employees to their numbers during these years (an increase of 35.5 percent). However, by 1995, there were also 94,000 more managers, professionals, and associate professionals—an even bigger increase of 44 percent. Meanwhile, more classically "Fordist" occupations such as clerks, typists, operatives, transport workers, and skilled and craft workers added only 7,000 extra jobs, and farmers and laborers decreased in number by 68,000 or 27.3 percent.[23]

Inequality has been rising rapidly within the Irish economy, in terms both of the share of national income going to capital rather than labor[24] and of wage inequality. Ireland has seen what is probably the most rapid rise in wage inequality within the OECD, despite being second only to the United States in inequality in the 1980s.[25] Private consumption's share of GDP has decreased from a relatively stable figure of around 59 percent from 1985 to 1992 to 55.4 percent in 1996.[26] Furthermore, the bottom half of the income distribution has seen its share of national household consumption reduced from 28.7 percent to 27.2 percent. Although GDP has grown rapidly during that period and absolute consumption has increased in real terms for all deciles of the income distribution, the increases have been meager indeed for the poorest 40 percent, a trend reflected in the continuing poverty (even by relatively restrictive definitions) of 15 percent to 16 percent of the Irish population between 1987 and 1994.[27] Nonetheless, while the Irish economy has undoubtedly created many "bad" jobs, it is also creating a significant number of "good" jobs.

The software industry has generated a disproportionate number of these "good" jobs and is one of the leading sectors within both foreign and indigenous industry. Before turning to a detailed investigation of the development of the industry, I will develop the central concept applied in that analysis—the flexible developmental state.

BUREAUCRATIC AND FLEXIBLE DEVELOPMENTAL STATES

"Local" and "global" perspectives on industrial development are one-dimensional and insufficiently dynamic in their analyses. Combining these perspectives to investigate the multiple ways in which local and global processes shape one another over time allows us to identify spaces and opportunities for development strategies, even within an increasingly integrated global economy. Choices remain as to how best to integrate into global flows and networks. The state remains a central actor in the process of shaping these choices, building better or worse development paths out of these fragments of local and global networks. However, the ways in which the state mediates between local and global networks and the institutional foundations of this role in Ireland are different in a number of significant respects from the East Asian bureaucratic developmental states.

It is necessary then to explain the emergence of each set of global connections that characterize the Irish economy and its software industry, and their surprising ability to coexist. Furthermore, we need to provide a comprehensive theoretical framework that can explain both the positive experiences of economic growth and occupational and industrial upgrading and the disturbing massive social polarization that accompanies them.

It is to address these theoretical weaknesses and to accomplish these analytical goals that I develop the concept of the *flexible developmental state* that is applied to the software industry case through the rest of this article. The most influential analyses of the role of the state in development have analyzed the success of the Asian Tiger economies such as Japan and Korea. Developmental states are the most likely candidates for boosting an economy beyond the narrow logic of private investment and thereby improving its position in the international division of labor. They achieve their goals in the contemporary era not by taking on the tasks of development themselves but by shaping the capabilities of society and the market to do so. Researchers have moved from an emphasis on an authoritarian directive style of state intervention to an understanding of how the state pokes and prods domestic firms to compete in the global economy and to constantly upgrade their organizational and technical capabilities to that end. The state assists in the birth and growth of domestic, national firms through its role as "midwife" of new firms and sectors and by tending to the "husbandry" of these growing industries.[28] Through policies such as selective and strategic use of protectionism, the provision of industrial subsidies, and programs tied to performance, as well as the cre-

ation of close ties between financial capital, industrial capital, and the state, economies such as Japan, Korea, and Taiwan were able to industrialize rapidly based on improved productivity in manufacturing and "industrialization by learning."[29]

However, the state cannot achieve these ends in isolation; in fact, it depends on its relation to society for its success. In particular, developmental states are characterized by what Peter Evans calls "embedded autonomy." Such states are embedded in local capital through the close social ties between state bureaucrats and domestic business owners and managers. While an educated labor force organized for learning is critical, labor is excluded from the key institutions of the bureaucratic developmental state.[30] These states retain their autonomy due to the presence of a classic Weberian bureaucracy—based on meritocratic recruitment and promotion and norms of objective, procedural rationality.[31] While embeddedness allows the state to gather information and mobilize resources, autonomy safeguarded by bureaucracy guarantees that national development goals remain central to state action.[32] For this reason, I label the developmental states of East Asia *bureaucratic developmental states* (BDSs).[33]

But success can bring its own dilemmas. The developmental state promotes local firms and encourages them to compete globally. In becoming global firms, however, their alliances with the state are undermined as they become more and more closely aligned with the interests of their international partners. In the late 1990s, the Asian development project's basis in the domestic alliance between state and capital was undermined as Asian firms internationalized, became more integrated into international financial markets, and ran into a massive debt crisis as Asian and U.S. capitalist institutions clashed, undermining the high debt financing of the Asian corporations. The much-admired coherence of the bureaucracy now became a liability as its responsiveness to changing local and global conditions proved to be poor.

The theory of the developmental state has been a valuable one that has shed a great deal of light on the conditions of effective national development strategies. Nevertheless, the theory is relatively weak in explaining the role of the state in newly emerging economies such as Ireland and Israel, as well as in what Evans describes as "intermediate cases" such as India and Brazil.[34] Therefore, it must be extended along its three underlying dimensions—state intervention in the globalization process, conditions of embedded autonomy, and threats to state intervention that emerge dynamically during the development process—to develop a conception of a "remade" FDS.

Table 1 outlines the differences between BDSs and FDSs along each of these three dimensions. First, BDS theorists analyze state intervention in the economy largely as a process of the creation of new domestic capabilities that can then be brought to bear in global markets. The global economy is theorized largely as a context in which states and national capitals can compete. However, under the globalization project, transnational firms, networks and flows of money, informa-

Table 1
Bureaucratic and Flexible Developmental States

	Bureaucratic Developmental State	Flexible Developmental State
Shaping globalization	Managing dependency – Strategic use of protectionism – Industrial subsidies – Domestic banking system	Mediating global connections – Building local networks around global capital – Taking local innovation networks global
Sources of embedded autonomy	Coherence of state bureaucracy Embedded in – Domestic capital	Flexibility of state structure Embedded in – Professional labor – Foreign capital
Threat to sustainability	Internationalization of capital Rigidity of state bureaucracy	Internationalization of society Fragmentation of state

tion, and resources have deeply penetrated the most successful localities and nations. Therefore, the role of the state is increasingly to mediate between the global and the local, to connect them, and to shape the nature of the relationship between them. The state may also be involved in creating the very actors that it hopes will participate in these global-local connections and the development project more generally. While the BDS also promoted the creation of economic actors, it focused on hierarchical business groups as "national champions" instead of transnationally integrated local networks.[35] This is the first extension of BDS theory—the understanding of the role of the developmental state as mediating local and global connections.

The FDS is defined precisely by its ability to create and animate post-Fordist networks of production and innovation and international networks of capital, and to link them together in ways that promote local and national development. The FDS can attempt to do this in two primary ways. It can connect to existing flows of capital by attracting foreign direct investment (FDI) and then building local networks of production (typically subsupply) and innovation (much more rarely) around this "imported" industrial organization. It can also attempt to foster indigenous networks of innovation and then encourage them to internationalize, but from a position of relative strength. In either case, the state development strategy is to connect the local to the global economy in such a way that local industrial transformation, accumulation, and development can take place. The FDS plays a key role in fostering "better" connections to the global.

The Irish state, in fact, played a critical role in "scaling up" social networks within local technical communities into an innovative and growing industry. These efforts were organized largely through a variety of industrial development agencies that promoted an indigenous development alternative to reliance on for-

eign investment. The role of the state went well beyond merely gathering information and upgrading infrastructure. The state agencies were the major providers of funding to the industry until 1998 when venture capital flooded the industry. However, agencies also used their connections to firms, established through this funding role, to become educators and guides of the industry. By linking grants to product exporting, R&D, management development, and so on, the state agencies helped to define the nature of the software industry in Ireland and provided a constant pressure on firms to upgrade their capabilities while also directing them to the resources that could make this possible. The agencies networked firms together through these contacts and were instrumental in the formation of a dense network of industry associations, innovation centers, technology programs, and other forums that promoted social networking within the industry. Negotiating with lead firms about specific strategies, as in the East Asian BDSs, is not feasible in decentralized industries such as software. The Irish FDS therefore concentrated its efforts on shaping the organizational culture and capacities of firms by channeling support to the industry through schemes that emphasized training, R&D, and so on. The goal of state action was to shape the character and development path of the industry rather than to influence specific business or technology decisions.

Second, these multiple connections to local and global suggest that the social and institutional foundations of the FDS are quite different from those of the BDS. Evans analyzes state-society relations almost exclusively in terms of the relations between key state bureaucrats and domestic entrepreneurs and executives. However, the state may be embedded in numerous other social groups and be formed by its multiple "embedded autonomies." The FDS is based on a double embeddedness in foreign capital and local, particularly professional, networks of innovation.

The organizational structure of the FDS consists of a range of embedded autonomies of the state, linking specific agencies with particular organizational cultures and capacities to particular social groups. In Ireland, for example, Industrial Development Agency (IDA) Ireland is the agency with the closest ties to foreign capital, Enterprise Ireland has a diverse set of connections to indigenous networks of innovation, and general issues of policy and coordination are dealt with by an umbrella body, Forfás. The Departments of Enterprise, Trade and Employment and of the Taoiseach[36] have close ties to national employer and labor organizations. The agencies have significant internal flexibility in their dealings with their constituencies. The state structure is also characterized by a high degree of flexibility in the relation between the units of the state apparatus diffusing the significant conflict that remains. Furthermore, each agency is connected in different ways to different parts of the European Union (EU) political apparatus. Rather than a cohesive and relatively insulated national state apparatus, the FDS consists of a state apparatus that is deeply embedded in a "network polity," forging

sociopolitical alliances out of constantly shifting local, national, and global components.[37] In transforming itself to operate within a locally and globally networked economy and polity, state governance itself is "rescaled" as the prior privileged role of the national level gives way to a "glocal" form of state.[38]

Furthermore, coherent state bureaucracies may not be the only organizational structures that may promote embedded autonomy. Embedded autonomy in the FDS is not guaranteed by a coherent bureaucracy but by the flexibility of the state structure. Whereas the BDS has a "tightly coupled" organizational structure, the FDS is built around a "loosely coupled" organizational model.[39] The decentralization of state agencies enables them to become deeply embedded in their clients/constituencies, even though they are often dealing with a wide range of individuals and organizations across widely dispersed networks. The agencies also retain a certain autonomy despite their close relations to their constituencies as there tends to be a relatively regular change in the goals, composition, and even existence of the agencies as development needs change. The agencies are made accountable by the setting of performance requirements and constant informal monitoring by their social constituencies and by formal evaluations from within the state bureaucracy.[40] With a decentralized, flexible structure, change in any one part of the state apparatus is much easier to carry out than in a more highly integrated bureaucratic structure. Of course, these sources of embedded autonomy may be combined with more classic Weberian bureaucratic conditions, as these agencies' locations within the state give them an essential degree of legitimacy and cohesiveness. They remain potentially accountable to national goals, and bureaucratic norms and processes continue to provide valuable standards of accountability and professionalism.

Does the FDS therefore present a solution to the dilemmas of developmental states in an era of globalization, the third dimension of the theory of the developmental state? Unfortunately, there are no such "easy" answers, as the FDS is itself threatened by its own limitations. The FDS's strength is its ability to connect networked and fragmented labor to networks of international capital. However, this internationalization of capital does not seem to undermine local accumulation as territorialized innovation and production networks form a transnational circuit of autocentric development.[41] Nonetheless, this process does result in a very uneven internationalization of society, as some sections of labor connect to the global directly while others are left largely servicing these groups' local needs. Spiraling national and international inequality, even as local accumulation proceeds apace, becomes the dilemma of the FDS development model. This, in turn, creates political dilemmas for the FDS as the flexibility that enables the state to connect local and global in a variety of ways becomes a liability. The flip side of this flexibility is the fragmentation of the state, making it all the more difficult for the state to sustain a national development coalition around these uneven and unequal local-global connections.

IRISH SOFTWARE AND THE FDS

This theory of the FDS is part of a broader effort to theorize a global networked economy and polity, an effort that has spread across the social sciences. It attempts to locate state development strategies within a new international order, one that is dominated by a neoliberal globalization project but still contains the economic and political space in which to create development strategies out of combinations of the local, national, and global. The rest of this article applies this theoretical framework to an understanding of the development of the software industry in the Republic of Ireland, using the case study to demonstrate the viability (and the limits) of such a strategy. The next section describes the two globalizations of the Irish software industry. The following three sections deal with each dimension of the flexible state in turn—how the state shaped the globalization of Irish software, the institutional foundations of this effort, and the threats and dilemmas that emerge as part of this ongoing process. At the end of the article, I turn briefly to questions of this model's sustainability and generalizability.

The Two Globalizations of the Irish Software Industry

The two dominant, and distinct, modes of integration of the Irish software industry into the global economy reflect the broader structure of Irish industry. The first of these "globalizations" is dominated by foreign TNCs and their suppliers, who carry out relatively low-level functions within their operations and have relatively few links to the local economy. This foreign investment is, however, significantly more embedded in the local economy than electronics investment has been historically.[42] The second globalization is that of indigenous software firms that are increasingly active in selling into global markets and in developing alliances with international IT firms. Many of these firms carry out sophisticated development of software products for export.

Table 2 shows that the industry is divided relatively equally in employment terms between foreign and Irish-owned firms. The foreign and indigenous firms correspond for the most part to the two globalizations of Irish software. The revenues (and exports) of the foreign-owned firms are much higher than those of the Irish firms. However, the revenue figures for the foreign-owned sector are inflated due to the presence of high-visibility packaged software firms such as Microsoft, Novell, Symantec, and so on who carry out a great deal of disk duplication, packaging, and software localization[43] work in Ireland, mainly for the European market. These companies generate huge sales from their Irish operations but relatively little value is added in the Irish operation, as most of the core software development takes place at the U.S. headquarters.

The TNC-led sector of the Irish industry is almost completely export oriented with 93 percent of revenues in 1998 coming from exports. It is a particularly important node in U.S. software companies' global operations, which have been expanding rapidly. Although official statistical sources are not strictly compara-

Table 2
Number of Companies, Employment, and Revenues of Foreign and Irish Ownership in the Irish Software Industry, 1987-97

	Foreign Owned			Irish Owned		
Year	Firms	Employment	Revenue ($ m.)	Firms	Employment	Revenue ($ m.)
	(percentage growth in previous two years)					
1987	25	600	NA	140	1,230	65
1991	74	3,992	2,465	291	3,801	234
1993	81	4,448	2,739	336	4,495	368
	(9%)	(11%)	(11%)	(15%)	(18%)	(57%)
1995	93	6,011	4,125	390	5,773	610
	(15%)	(35%)	(51%)	(16%)	(28%)	(66%)
1997	108	9,100	6,214	571	9,200	834
	(16%)	(51%)	(51%)	(46%)	(59%)	(37%)

Source: National Software Directorate, *1995 Software Industry Survey Results* (Dublin: Forbairt, 1995); National Software Directorate, *1997 Software Industry Survey Results* (Dublin: Forbairt, 1997); An Córas Tráchtála, *The Irish Software Industry* (Dublin: An Córas Tráchtála, 1987).

ble, a conservative estimate would suggest that the exports of U.S. software firms from Ireland come to at least half of their exports from the United States and may be as high as three-quarters of the U.S. figure.[44] These proportions would be even higher were we to consider only exports into Europe. Microsoft and Lotus set up software manufacturing operations in Dublin in 1985, and IDA Ireland—the agency charged with attracting foreign investment—claims to have secured 40 percent of all the mobile U.S. electronics' inward investment in Europe since 1988. Ireland therefore represents a critical node in the operations of the leading U.S. software firms. The presence of large numbers of prominent foreign-owned software companies in Ireland may, however, distract attention from the indigenous industry that has emerged as one of the most promising software industries among newly industrializing countries, comparing favorably with other emerging software industries such as India and Israel.[45]

There are clear differences between Irish and TNC companies.[46] The TNCs are significantly more likely to be involved in the "low-end" activities of localization, porting, assembly/packaging, and logistics/distribution (and testing to a lesser extent). Irish firms have a more well-rounded business model and are significantly more likely to be involved in technical support and business solutions consulting, alongside a full set of software development and test functions. Irish companies are much less likely to be involved in the more mundane localization and test work, are marginally more likely to be involved in development and research (and interviews suggest that the difference is larger than survey results reveal), and are much more likely to have technical support and business solutions operations. In short, Irish companies tend to have a more fully developed software development business model, while the TNC firms show greater specialization in the lower end

of the software development life cycle—although there are also a number of TNCs carrying out relatively sophisticated work.

The TNCs largely carry out lower-level tasks, while the main development tasks remain in the company's home country, despite some upgrading in the activities of foreign companies. The Irish companies, although small, generally compete in technically sophisticated global niche markets and are increasingly integrated into international technology and business networks. Nonetheless, even though 11 percent of their workforce in 1995 was overseas,[47] the core corporate and development functions of most indigenous firms remain in Ireland. The indigenous industry, in fact, consists of a large network of smaller firms (less than twenty employees) and a number of star performers that have developed significant strengths in international markets. Companies such as Iona Technologies, Trintech, Baltimore, and CBT Systems have become important international figures in their particular areas of specialization.

However, internal firm capabilities and strategies are only part of the story, as many firms marshal such skills and resources outside of the company. These interfirm networks are an increasingly important part of global commodity chains and production networks.[48] Most companies have some alliance with other firms—only 14.1 percent of Irish firms and 17.2 percent of TNCs have no alliances at all. TNCs, however, are very weakly networked with other firms in Ireland, both with other TNCs and with Irish firms. Their local networks are largely centered on contracting labor from Irish companies to provide them with flexibility in their staffing and their relatively extensive contracting with both Irish and TNC companies for localization, manufacturing, and distribution services. Based almost totally on the demand of the software TNCs, printing companies invested heavily in new technology and the industry grew from $9 million to $135 million in five years, while turnkey services grew from $0 to $150 million in the same period.[49] However, apart from these low-end activities, there is little connection between the Irish and TNC sector, as 82 percent of Irish software companies and 75 percent of software TNCs have no alliance of any kind with other TNCs in Ireland.

There are significant levels of contracting of labor and programming services among indigenous firms themselves. However, there is also cooperation in more advanced relationships such as codevelopment and sharing of technology and comarketing and joint ventures. This dimension of local networking distinguishes the Irish firms from the TNCs. Irish firms rely on international networks more than local alliances in these "advanced" business and technical areas (especially in developing technology and comarketing), while, as Table 3 shows, local networks are more important for labor and services contracting. Table 3 actually understates the extent of the difference between TNCs and indigenous firms, as breaking down these categories by individual types of networks shows that

Table 3
Percentage of Companies Having Any Alliance with Other Companies in Each of Four Broad Categories

	Percentage of Firms Having an Alliance in This Category	
	Irish Companies	TNC Companies
Technology/business alliances with Irish firms	39	13
Technology/business alliances with international firms	47	59
Contracting alliances with Irish firms	51	34
Contracting alliances with international firms	35	36

Note: TNC = transnational corporation.

indigenous firms tend to have much more dense and diverse networks with other firms.

These interfirm networks are complemented by employee networks, as technical professionals have tended to form close personal ties with others throughout the industry. As one project manager put it,

> It's a very small community, everybody knows everybody. There is a constant flow of people, they bring their experience with them. The Irish network is very strong in software. My wife is German, she can't believe it, she says, "It's the original Internet!". I eat lunch more with people from different companies than from this one, I keep up with friends in the industry.

This informal communication, structured by customers/users and technologies, is part of the taken-for-granted structure of everyday life in the industry.

This technical community has relatively clear limits, as software firms and employees have a tangential relationship to the national wage agreements that have been centrally negotiated since 1987. The sector itself is almost completely nonunion and the employment relations of technical workers were rarely directly affected by the agreements. However, industries such as software benefited indirectly from the national social-partnership agreements. The recovery in the public finances allowed an increase in the funds made available for educational and telecommunications investment, industrial policy, and the software sector specifically. A stable macroeconomic and financial regime also helped attract foreign investment. This relationship to the national wage agreements is true of many of the expanding, globalized sectors that contain large numbers of professional employees and nonunion firms.[50]

To provide an understanding of the dynamics, institutional conditions, and contradictions of the Irish software industry's development, the next three sections apply each dimension of the FDS theory to the history of the industry.

States and Globalizations

Protectionist measures were eased after the 1950s for foreign investors in the Republic of Ireland and were removed entirely in 1964. The state became the key actor in attracting foreign investment, and attracting mobile investment became a dominant policy goal for the following forty years. Among the critical elements of Ireland's locational advantage were very generous tax incentives and grants, as well as a transnational-friendly environment including no restrictions on the repatriation of profits. After providing a low- or no-tax environment since the 1950s, a new policy in 1978 provided 10 percent corporation tax for all manufacturing from 1981 to 2000 inclusive. This was extended to firms in the internationally traded services sector (including software and data processing) in 1981 and guaranteed until 2010 the same year. Recently a 12.5 percent corporate tax rate has been guaranteed until 2025.

In later years, a world-class telecommunications system and, in particular, a young and cooperative labor force have arguably been as or more important. However, the state's greatest efforts were dedicated to the mobilization and restructuring of local society through the creation and shaping of a "suitable" labor force. A state-led reorientation of the education system toward technical education was reinforced over time by the increasing influence of the new colleges focused on technology, whose success put pressure on the existing universities to change their orientation to technical and scientific education and to fostering links with industry.[51]

The state was placed at center stage in industrial policy by its efforts to continually upgrade these "factors of production." It took on the role of "midwife" to foreign investment.[52] These policy and institutional changes had the desired effect of attracting extensive amounts of foreign investment, including such software firms as Microsoft, Lotus, Novell, and Corel. There has been some local embedding of these firms in a territorial complex around the Dublin region based on a subsupplier base in turnkey services and software manual printing.

The state has played a central role in supporting the growth of these subsupplier industries, particularly by providing finance and advice to the entrepreneurs in these newly minted sectors and by coordinating relations among Irish-born managers of TNCs and these emerging firms. Printing firms, for example, received significant funding from the IDA for the expensive new Web print technologies required for software manual printing.[53]

Furthermore, the IDA began to target hardware companies in the early 1980s, encouraging them to expand their software operations. Some TNC subsidiaries have been able to develop such operations. This is particularly the case in more general IT and telecommunications companies such as Digital, Amdahl, IBM, Siemens Nixdorf, Phillips, Ericsson, or ATT/Lucent Technologies. As the manager of one of these operations said, "We have got more than the Microsoft and Lotus subsidiaries. The diversity of our parent company helps us a lot in that."

Many policymakers did indeed hope that the TNCs attracted to Ireland would in time spin off a range of Irish-owned firms. This has happened to a limited extent in the software industry, although it provides only one piece of the puzzle of the industry's growth. One-third of the respondents in a study of thirty-six indigenous software entrepreneurs had worked in a TNC directly before starting their own company—either in TNCs in the IT sector or in the IT sections of TNCs in other sectors. Two-thirds of indigenous entrepreneurs had worked for a TNC in Ireland at some stage of their careers, half had worked abroad in software or a related sector, and half had worked in a sector that was now a customer of their firm.[54] Direct spin-offs of software firms from software TNCs are relatively rare, however. While this international and customer experience might be expected given the dominance of TNCs in the Irish economy and the mass emigration of the 1980s, it has been a valuable source of experience for many technical entrepreneurs.

Nevertheless, these figures alone cannot explain why these individuals did indeed ultimately leave the TNCs and start out on the path of indigenous entrepreneurship rather than taking the more common routes until the early 1990s of emigration or long-term TNC employment. Return emigration did not become a significant factor until after the growth dynamic of Irish software was well under way, although it was clearly important in sustaining that growth. Nor can it explain the internal growth dynamic of the indigenous industry—the most significant part of the indigenous story. The same study showed that another third or so had come directly from indigenous software firms, while the final third had come from indigenous firms in other sectors, most notably software distribution and computer hardware. Therefore, the dynamic of generating new companies is strongest in the indigenous sector and especially within the software industry itself.

So how did the indigenous software industry emerge from the vicious circle of TNC dependence and professional emigration? The state, through its heavy investment in education, had created a new class basis for an indigenous technology promotion and business expansion agenda. The danger here was, of course, a massive brain drain that did indeed take place. However, of those who stayed, a number started their own companies and combined with a trickle of people from the foreign-owned sector and from user organizations to form a constituency that could support state agencies promoting indigenous development. What did the state agencies do to support the development of this new constituency?

The first element of the agencies' approach was to define the orientation of the Irish software industry. In its strategic review of 1992, the National Software Directorate (NSD) identified software products clearly as the major focus of the Irish industry, making official what had been the attitude of the state agencies for some time.[55] Furthermore, the NSD identified the need of software product firms to export early in their development, due to the small size of the Irish domestic market, as a critically important issue for the Irish industry. The state agencies

focused then on encouraging firms with software products for export, being much more receptive to such firms in their grant applications and designing some state supports (especially in the area of marketing) so that they were oriented mainly to the problems of product exporting.

Industrial policy also began to shift through the 1980s toward a greater focus on indigenous industry and a greater selectivity in grant giving.[56] However, the state agencies ultimately focused not only on "picking winners," which they did to some extent, but also on a more generalized strategy of "making winners" out of the many firms they dealt with by upgrading the capabilities of the industry as a whole. Total grant payments by state agencies to indigenous software companies increased from IR£ 3 to 3½ million per annum between 1988 and 1990, up to 5.4 million in 1991, and 5.66 million in 1992.[57] Forbairt, the primary agency dealing with indigenous firms at the time, also became more demanding of the indigenous companies presenting proposals to them. As one Irish emigrant stockbroker in Silicon Valley put it to me: "I think Forbairt have been great. There's a lot of money for companies, but you have to be good; you almost have to be selling in Britain or Europe before you get the grants. Forbairt are very tough." This level of financing of the indigenous software industry was very significant in the context of a severe shortage of other capital sources for the industry. In fact, much of the early venture capital that did become available to the industry was induced into the industry by state actions.

Forbairt, now part of Enterprise Ireland, ties the finance it provides to firms to various aspects of company development—in particular, R&D, marketing, and management development. A striking aspect of R&D funding is the critical importance of state and EU funding in the earlier period—accounting for almost 30 percent of funding directly and, since many of these funds were provided on a matching-funds basis, for around half of all R&D funding in the indigenous software companies in 1993. These governmental policies, therefore, were critical in stimulating R&D in the earlier stages of the industry's development. An executive in Forbairt working closely with software companies told me that Forbairt attempts to provide for each stage of the development of a company—feasibility grants as seed capital for start-ups, employment grants for the early growth phase, and then funding for R&D, training, and management development for the company development phase.

The impact of this approach on firms seems to have been positive. While many firms complain about the administrative demands of filling out grant applications, analysis of grant-aided and non-grant-aided firms shows that through the early 1990s, at least grant-aided firms significantly outperformed non-grant-aided firms—both in the software industry and in the economy as a whole.[58] Furthermore, many firms themselves say that they have found state support helpful, which is impressive given many managers' skepticism of state action.[59] Therefore, the agencies are clearly taking a self-consciously developmental approach to

companies as well as to the industry as a whole, even though this approach is often couched in the more neoliberal language of *enterprise*.[60]

The Irish development agencies learned how to upgrade the capabilities of firms within a decentralized industry, a skill quite different from those of the BDS bureaucrats. However, they also went beyond this role and played a significant part in fostering and developing the social networks and associational life underpinning innovation in the industry. They have instituted "softer" supports such as the mentoring scheme, where small companies are put in touch with experienced industry figures who for a relatively small sum become a "guide, philosopher, and friend" to the company, sometimes ultimately becoming company directors. The agencies also used the grant-aid process as an opportunity to informally stimulate connections among firms within the industry, drawing on their detailed knowledge of other firms accumulated through the grant-aid process. The same Forbairt executive mentioned above argued that

> the development agencies learned that the lone ranger approach doesn't work. A company needs partners, the mentoring program helped with that. The agencies also played an informal role in introducing people. That's something we would have pushed, the partnerships. The other thing the agencies pushed was the capital issue, Forbairt has been priming venture capital funds. . . . Our role is not picking winners but "helping to make winners." It's too difficult to predict winners to pick them, otherwise we wouldn't need to be working! A lot of our discussions with companies are not regarding the money but regarding business issues. . . . There is a lot of company capability development work; we were less proactive than that in the days of COPS [an indigenous company that went bust in 1990]. The agencies have gone from being funding agencies to doing company development.

Furthermore, a network of industry and trade associations, universities, innovation and technology centers, and other forums and groups have been created that provide an associational infrastructure for information sharing, cooperation, and innovation in Irish software. While these bodies are outside the state or semiautonomous from it, in most cases they have been founded through state initiatives and underwritten by state guarantees and funding. Typically, they are located in universities and have representatives from the state, business, and education on their boards.

Some brief examples should illustrate the key role of these institutions. The National Microelectronics Application Centre (MAC) was founded in the early 1980s and was charged with bringing electronics to Irish industry. Based in the University of Limerick, it provides technical advice and houses up-to-date equipment for industry use and is reported by interviewees to have had close relations with many software firms. The director of MAC told me the following:

> Our core skill is the development cycle, rather than any particular technical area. We spend a lot of time talking with entrepreneurs—90 percent may decide that their idea is not on, usually because the idea is out there already or they are too soon or too late vis-à-vis the

technology curve. We get a lot of business from the remaining 10 percent. Typically, the people we are dealing with, it's their first time through the cycle, they get upset at any shocks.

The critical point here is that there is an educational return to the industry in terms of the 90 percent who do not pursue a doomed project, even though MAC does not receive any payment from these companies. Indeed, the primary role of MAC is a more specialized educational contribution than the development agencies can provide:

We can lay out the potential of smart products for the entrepreneurs. We've helped in that regard, we have an education role, we can guide entrepreneurs, we push them on first-class global standards, let them know what is expected.

In the late 1980s, the Programme in Advanced Technologies (PAT) was established, including software. The software PAT consisted of three centers initially. Perhaps the center with the most impact on the software industry itself has been the Centre for Software Engineering (CSE), located at Dublin City University. Although the initial PAT proposal called for a certain amount of research within the PATs, the CSE's role has been mainly promotional and informational. In particular, it has promoted quality in software production and the ISO 9000 quality standard and has had a major impact on the software industry through its courses and various forms of information dissemination.[61] In this it was no doubt helped by its good relationship with Dublin City University, where it is located and where it had actually been founded in 1989 before being brought into the software PAT in 1990. Furthermore, there are close relations with industry as the CSE board spans academia, industry, and state agencies. The other two PAT centers—Multimedia Technologies Ireland and the National Institute for Management Technology—ran into more difficulties. Both of these centers were more focused on smaller constituencies, the small multimedia industry, and executives in business outside of high tech, respectively, and this made their relation to the software PAT somewhat problematic. Within these constituencies, however, they were reasonably well evaluated.[62] In general, in fact, most of the PAT schemes have received favorable evaluations, no matter what sector they are in. Nonetheless, both of these centers were closed or sold in a reorganization of the PAT scheme in 1997.

The state has also been instrumental in establishing industry associations. One such innovation center and industry association is the Localization Resources Centre (LRC), established at University College Dublin (UCD) under the technology centers scheme. The LRC promotes quality and resource sharing in the localization sector of the software industry and has been instrumental in setting up the successful industry forum, the Software Localization Interest Group (SLIG). This is not the only industry association set up by a state agency—the Multimedia Technology Institute (MTI) helped to start the Irish Interactive Multimedia Association, which persists after the demise of MTI, while the NSD has a close rela-

tionship with the Irish Software Association (although that body has been in existence since the 1970s).

Another agency funded by the EU but playing a somewhat different role is the NSD. The NSD was established within the IDA, although it moved to become part of Forbairt when the agencies were reorganized in 1994. Its role, while somewhat unclear at first, has evolved so that it has become a central focal point within the state agencies for dealings with software. Although the everyday work of grant assessment is carried out by the International Services Programme within Forbairt, the NSD is represented on grant-giving committees. It also fulfills many of the educational and networking roles discussed above in relation to the state agencies. However, the NSD is primarily a strategic link between the industry and the state development agencies. Furthermore, the NSD constantly monitors and reviews the key issues for the software industry and the operation of the institutions and infrastructure supporting the industry. It has been a prime mover in refocusing the activities of the PATs and in the debates over a growing pressure on skills and the issue of access to capital.

There is therefore a network of institutions providing technical and business information of various kinds and degrees of specialization to different sectors within the software industry. These institutions provide a way in which the state can provide an everyday impetus toward world-class technical, business, and quality standards without involving itself directly in regulating the firms—a measure that would be deeply unpopular. The staff of these centers become the everyday teachers and advisers of the industry. However, they also gather a great deal of up-to-the-minute information from the industry and can be a valuable source of information for the central state agencies when they need to make rapid shifts or adjustments in policy. They are largely staffed by people with backgrounds in industry themselves who sometimes maintain that involvement on a part-time basis.[63]

Various state agencies have played critical roles in developing the Irish software industry. IDA Ireland has been very effective in attracting foreign investment and somewhat successful in promoting the upgrading of TNC activities and development of subsuppliers. Other state agencies have played key roles in developing a high value-added indigenous software sector. In particular, state actions have been able to steer Irish technical professionals away from the temptations of TNC employment or emigration and into the perils, and potentially lucrative rewards, of small-firm entrepreneurship. The state has also been able to shape the capacities and culture of the industry through its emphasis on promoting innovation, business development, and networking across the industry.

The two modes of integration into the global economy of the Irish software industry are only tangentially linked to one another. However, the state has been critical to the emergence of each globalization of Irish software. How was it possible for the state to play this role for each of these globalizations, and how has it

been possible for them to be pursued simultaneously without one overwhelming the other? Here we turn to our understanding of the multiple embedded autonomies within the Irish state and the flexible organizational structure that reconciles them within the state itself.

Embedded Autonomy through Flexibility

The state agency most closely linked to TNCs is the IDA, restructured as IDA Ireland since 1994. The IDA was founded in 1949, took on a more central role in attracting foreign investment in the early 1960s, and by the late 1960s had become the central agency in formulating and implementing industrial policy.

It has developed close ties with many TNCs—abroad and in Ireland. These ties are first formed through the IDA's international offices. The project officers in these four European, six U.S., and five Asia-Pacific offices establish an early relationship with many companies in their area and ultimately hand the companies off to their counterparts in Ireland. The IDA also plays a critical role in providing for these firms' needs once they are established in Ireland, providing a "one-stop shop" of sorts for them within the Irish political economy. As one longtime TNC manager said, "We're a little cut off out here but we have a good relationship with the IDA officers. I can always ring Kieran [McGowan—then CEO of IDA Ireland] anyway." These close ties to local managers of TNCs are important to what efforts are made to pressure the TNC subsidiaries to continue to make efforts to upgrade their operations. Often these local and international ties are combined to good effect. For example, ties to a TNC head office might be useful in developing a closer relationship between an Irish supplier firm and the parent firm in the United States—as one IDA officer told me: "Sometimes we have to use our contact with the U.S. to get around the local TNC manager who's trying to get all the credit for himself and won't tell head office about this supplier in Ireland."

The IDA is a quasi-independent state agency, although it receives its funding from, and must report to, the Department of Enterprise, Trade and Employment and the cabinet minister in that department. In 1969, the IDA became an agency outside of the civil service structure and it has become increasingly independent, until recent years, of the rest of the state economic development regime. Until the early 1990s, most of the initiatives in industrial policy were developed through the IDA. Although its board membership changes, its executive leadership has been very stable and the IDA has developed a strong corporate identity of its own. Its place outside the conventional civil service gives it a flexibility in internal organization and a freedom of maneuvering that is unusual for state agencies. With strong internal promotion patterns and little mobility out of the IDA, it forms a very cohesive unit within the Irish state with a strong focus on its given objectives of attracting FDI. It has also been able to build up significant skills internally in terms of knowledge of international markets and the politics and economics of industrial location. The IDA is embedded in the TNCs and autonomous from the

rest of the state, indicating the difficulties of attempting to shape the actions of TNCs.

The embedded autonomy of the state agencies promoting the indigenous industry is quite different, and these agencies have always had a difficult relationship with the IDA and its dominant position within the state. The IDA's autonomy within the Irish state institutionalized an industrial policy focus on attracting foreign investment. Such institutionalization appears to be a crucial element of the effectiveness in the medium to long term of any policy agenda, as it allows the accumulation of resources, skills, and political legitimacy and alliances. However, this also means that an existing agenda is likely to "crowd out" other agendas, unless they themselves can create "safe" institutional spaces where they can avoid an attack from the existing regime. Such spaces did not emerge for the promotion of indigenous industry until the 1980s.

Nonetheless, there had always been elements within the Irish state that had concerned themselves with indigenous development. Within the IDA itself, programs were pursued in the 1970s relating to indigenous industry, although attracting FDI dominated the organizational objectives, culture, and skills of the IDA. There were, however, a series of other state bodies that carved out some space around the agenda of promoting science, technology, and innovation and that were largely oriented toward indigenous industry. These state institutions relied heavily on EU funds for their activities, and many of their programs were funded in large part by European Structural Funds. These funds were designated for Ireland as part of an effort to develop the peripheral regions of the EU in the face of the upcoming Single European Market in 1992. Many commentators have attributed Ireland's growth to this influx of EU capital. However, the significance of the Structural Funds was that they were the means by which a variety of new, sometimes experimental, measures could be taken without having to fight the rest of the state agencies for funding. The new development regime could develop alongside the old and did not have to challenge the old development model directly for funds and priority, except in rare cases. Such are the opportunities within a "networked polity"[64] for local and national and transnational actors for forging new coalitions that bypass existing national power structures—even, as in cases such as this, where the ultimate goal is national economic transformation.

Agencies such as the National Board for Science and Technology (NBST) and the NSD were embedded in the emerging technical professional class through personal and associational networks. Key individuals pursued careers that spanned private, public, and semipublic organizations, making the boundaries between these different spheres porous and fostering increased interaction across those organizational boundaries. This, in turn, improved the agencies' capacity to make and implement effective policy. The first director of the NSD,[65] Barry Murphy, had been the managing director of Insight Software—an Irish company sold to Hoskyns from the United Kingdom in 1988. Director of the NSD until

1996, he moved on to work with the Cullinane Group Ireland (CGI), an organization founded by U.S. software industry veteran John Cullinane to invest in Irish software companies but that also carries out research on the software industry and boosts Irish high-tech. Murphy was also involved in writing the strategy document published by the Irish Software Association in March 1998. The second director of NSD, Jennifer Condon, came from the industry to work on the marketing side of the National Software Centre (a state-sponsored center supporting industry development and carrying out research) in the mid-1980s. She was then managing director of ICL's IT Centre in Dublin from 1988 until 1996, when she joined the NSD.

The post of director of the NSD is itself a temporary one that ensures that the director ultimately returns to the industry in some guise. The staff of the NSD consist of the director and three other staff members—two of whom are from within the state development agencies and a third with a background in the industry. This also ensures a combination of embeddedness in the industry and a certain autonomy of focus and objectives. There also is a group of prominent software managers who have been involved in policy initiatives within the industry, either through the industry trade association, the Irish Software Association, or as participants in policy consultation groups such as the Software Industry Working Group in 1989 or the Software Consultative Committee at the present time. Furthermore, there is a significant overlap with the educational sector, as prominent computer science and engineering academics have liaised closely with industry and the state in a variety of forums.

Autonomy from their business constituency is maintained by the performance requirements placed on the various agencies, centers, and programs. These requirements are given a cutting edge by the regular evaluation of programs—and publication of those evaluations.[66] Furthermore, poor evaluations can result in closure, sale, or reorganization of such programs. For example, as part of this process of constant shifting and experimentation with state and semistate agencies, the National Institute of Management Technology was sold, MTI restructured, and the Centre for Software Engineering given new responsibilities. This can occur at the level of reorganization of the agencies themselves. These included the National Science Council, founded in the late 1960s, and its successor, the NBST founded in 1977. In the mid-1980s, science and technology policies were reorganized significantly with a new Office of Science and Technology being formed under a minister of state (a junior cabinet minister) in what was then the Department of Industry and Commerce. The NBST was merged with the Institute for Industrial Research and Standards in 1987 to form Eolas, a new science and technology agency. Around the same time, various agencies were consolidated into one agency to deal with active labor market policy (FÁS) and into another to deal with export marketing (An Bord Tráchtála). In 1994, Forbairt, an agency focused solely on indigenous industry, was created incorporating most of the staff and

functions of Eolas and the Irish Industry section of the IDA. In 1998, An Bord Tráchtála was merged into Forbairt, although under some protest from local firms, which feared a loss of marketing assistance. Finally, these various agencies were folded into Enterprise Ireland, which consolidated these agencies under one institutional roof.

This experimentation can also operate within an existing agency that changes its focus over time. Due to the requirements of the EU funders, centers such as LRC, CSE, and NSD are subject to significant and detailed external evaluation. They are also ultimately subject to the control of the state and will therefore also reflect broad policy concerns. For example, the CSE has been setting targets for the uptake of quality procedures within the industry as a whole. In 1997, the CSE, at the request of the NSD, instigated programs aimed at diffusing quality procedures into small software firms, based on its prior success at diffusing such procedures among the larger firms.

This loosely coupled and flexible organizational structure has not emerged without ongoing tensions. In particular, the IDA was peculiarly powerful within the Irish state, and this helps to explain the weakness of the institutions supporting indigenous industry until the late 1980s. It took the massive social and economic crisis of the 1980s to delegitimate the IDA's role as the sole bearer of the task of Irish industrial transformation. It was into this restricted institutional space that the alliance of Irish technical professionals and the previously marginalized "science and technology" state agencies stepped to support indigenous industry, in the process creating the delicate compromise at the heart of the FDS.

Inequality, Fragmentation, and Sustainability

Despite the relatively successful adaptation of state structures to the multiple globalizations of Irish industry, and software in particular, this is not a story without its own tensions and darker sides. These globalizations have occurred within the context of a macroeconomic stabilization secured since 1987 by a national neocorporatist "social partnership" compromise. Rising inequality has created significant tensions between the institutionalized globalizations of software (and similar industries) and the institutions of national neocorporatism.

Wage inequality has increased drastically in Ireland since the late 1980s, at which point it was already one of the most unequal OECD nations in any case. The major component of that increase in inequality has been a growing gap between the middle and the top of the income distribution. While the average income of the top 10 percent was 195 percent of the median income in 1987, by 1994, that percentage had grown to 224 percent. Although the supply of skilled labor has increased rapidly, it has still been outstripped by demand, and increasing returns to education account for a sizeable proportion of this growth in wage inequality.[67]

The Irish case is clearly an exception to the tendency internationally for neocorporatism to lessen wage inequality. This is explained, as far as can be told

from the incomplete evidence available, by precisely the multiple and fragmented structure that is the flip side of the FDS. Neocorporatist wage bargaining in Ireland, particularly in the later agreements, contained provisions for special local bargains that would exceed the terms of the national agreements. Furthermore, there was widespread departure from the terms of the agreement in later years, particularly in industries such as software that had difficulty holding on to labor that had a variety of local and global opportunities. Evidence for 1991-97 shows that in that period, 51 percent of respondents said that pay awards at their workplace adhered to the terms of the national agreement, 44 percent said that awards exceeded the agreement, and 5 percent said that awards were less than the terms of the agreement.[68]

Looking at union versus nonunion workplaces, 70 per cent of union firms said their awards did not differ from the national agreement while 25 per cent said they exceeded them. For non-union firms however—which would include significant numbers of multinational firms—fully 63 per cent said that their awards exceeded those nationally agreed. In addition, 39 per cent of firms stated that one reason for exceeding the terms of the national agreement was to retain staff who were in short supply.[69]

The organization of the software workplace contributes to greater inequality at the national level in a number of ways. The individualistic model of industrial relations in software firms encourages such employee threats to "job-hop" as an employee bargaining strategy, intensifying wage inflation. The long hours that are typical and the pressure this places on the work/family nexus also contributes to inequality by promoting the expansion of low-wage personal services.[70] This pressure is all the more relevant given the trend toward dual-earner families with 32 percent of couples being dual earners in 1996, up from 16 percent in 1986.[71] There is also likely to be a link between the expansion noted earlier of professional and of low-wage service occupations we noted earlier, as such services emerge in large part to solve the work/family dilemmas of these expanding professional classes. In 1994-95, 27.8 percent of household spending in the state on "services and other expenses" was by the top income decile, and another 18.6 percent was accounted for by the next decile—up from 27.0 percent and 17.9 percent, respectively, in 1987. The top two deciles accounted for 55 percent of spending on non-resident domestic service, 72 percent of spending on resident domestic service, and 60 percent of spending on child care (including baby-sitting).[72] As dual-earner professional couples grow as a proportion of the workforce, and in the absence of any meaningful policy efforts to better distribute work and family responsibilities, they are likely to stimulate the growth of personal service occupations alongside them. Although the fall in unemployment tends to reduce overall inequality, the polarization of occupational growth is contributing to rising wage inequality among the employed.

High professional wages pose a political dilemma for the Irish model of development. Unionized workers who have lived under wage restraint for thirteen years

and have seen others outstrip them at an increasingly rapid rate are becoming less and less willing to sacrifice their wages to keep inflation low for those accumulating high profits and high wages elsewhere in the economy.[73] Each pay agreement has been passed by a slimmer margin than the last, and there is a strong possibility that the current agreement may not be renewed.

Conflicts are therefore increasingly likely to emerge between the multiple globalizations of the Irish economy and the institutions and embedded autonomies of the state that have supported each of these globalizations during the past decade(s). Such tensions are already emerging around issues such as employer resistance to unionization, attempts to regulate the length of the workweek, public sector pay restraint, the rights of part-time workers, and so on.[74]

The rejuvenation of the Irish economy since the 1980s has been achieved through the uneasy coexistence of a number of institutional realms within the state, constituting a variety of embedded autonomies of state action. A self-confident professional class has emerged that is deeply integrated into local and global technology and business networks and negotiates individual career paths based on mobility through those networks. This class is increasingly divorced from the institutions that have been a powerful force shaping national-level industrial relations and wage bargaining since 1987—the unions and the organizations associated with neocorporatist social-partnership agreements.

There is therefore an increasing fragmentation within the national state, a fragmentation that is the dark side of the FDS. This model of development also turns out to be Janus-faced. Its success, based on a profound internationalization of social and economic life through flexible state institutions, turns out to be the major threat to its sustainability as these multiple globalizations generate an inequality and enormous political tensions that the decentralized state institutions have great difficulty containing. This is perhaps most obvious in the increasingly narrow margin within the unions themselves in favor of the national social-partnership agreements, agreements that have secured the macroeconomic conditions of industrial transformation.

THE POLITICS OF GLOBALIZATIONS

National economies are increasingly constituted out of three interacting but empirically distinct modes of integration into the global economy. The first, and most widely recognized, is built around attracting foreign investment and, to a limited degree, embedding it in the local economy. The global goes local. The second, and most surprising in the context of Irish economic history, is the emergence of a local network of indigenous firms that have become increasingly integrated into international business and technology flows and have been highly successful in international markets. The local goes global. Third, a series of national neocorporatist social partnership agreements since 1987 have created a stable macroeconomic and financial environment that has underpinned industrial trans-

formation, while mediating the relationship of unionized workers and welfare recipients to the global economy. The national level mediates local adjustment to the global. To conclude this analysis, I will briefly summarize how these globalizations interact in the case of Irish software, give examples of other states that balance these globalizations quite differently albeit within a FDS model, and discuss the importance of the politics of transnational regulation in shaping these different versions of the FDS model.

The software industry in Ireland represents one such set of interactions among globalizations. Clearly, foreign investment is a central element of the industry and of the Irish economy. However, we cannot reduce the emergence of indigenous industry and of national social partnership to the dominance of the foreign investment-led policy. Nor can we ignore significant improvements in R&D, indigenous exports, technological and business upgrading, employment expansion, the reversal of mass emigration, and occupational upgrading—alongside inequality and social polarization. There is more to the Irish economy than a foreign investment-led "bubble economy."

Foreign investment itself is varied in its character and impact. While Microsoft's software duplication and localization operation has little impact beyond a small number of subsupplier firms, other TNCs such as Digital and Ericsson have had important training and spin-off effects. These firms in many cases predate the arrival of Microsoft, Intel, and the other high-profile U.S. IT firms in Ireland, and their contribution cannot be reduced to an artifact of "buying" Microsoft and Intel.

Neither can foreign investment flows explain the emergence of the export-oriented indigenous firms that have clearly developed a significant base within the Irish economy. Foreign investment cannot explain their existence, which suggests that we must turn to a different set of factors—factors that I identify as a synergy between particular science and technology–oriented state agencies and an emerging technical professional class. The state goes beyond merely upgrading infrastructure and gathering information, moving well beyond the role of the World Bank's "good state."[75] We have seen that, using grants and a variety of other mechanisms, the Irish state has been able to play a "husbandry" role, pushing indigenous firms and even some TNC subsidiaries to pursue more developmentally promising competitive strategies.

The institutions of neocorporatism also have a tangential relationship with both of these globalizations of industry in Ireland, as most of the employees in the high-technology sectors are not covered by these agreements in any significant way. Indeed, labor costs are not a significant part of the cost calculus of the software TNCs locating in Ireland, as shown by the continuing inflow of software investment in the face of annual wage raises in recent years among software developers of 10 percent to 15 percent. The limits of national corporatism and its failures in relation to social welfare provision, social housing, and bridging local

exclusion are also largely issues of domestic politics. There is therefore significant room to maneuver within these models and in the space between them. Globalization may be dominated by a neoliberal agenda, but significant room for political action and national development strategies remain.

Questions remain as to the sustainability of the FDS model, but these questions arise not so much from the extent of dependence on foreign investment as from the tendency toward institutional and political fragmentation and the threat posed by rising inequality to the FDS's ability to sustain the sociopolitical compromises underpinning Irish growth.[76] Although the Irish economy may be more dependent in terms of revenues on TNCs now than ten years ago (a dependence distorted by TNC creative accounting), it has also fundamentally lessened that dependence by creating an indigenous manufacturing and informational industry complex that is not directly dependent on the TNCs. Furthermore, this indigenous base has very deep roots in the local economy and society and has significantly upgraded its technical and business capabilities. The real threat to sustainability, therefore, is likely to be the lack of social solidarity reflected in, and exacerbated by, increasing income inequality—not dependence on foreign capital. However, there are significant actions that can be taken at the national level to ameliorate this inequality—precisely because foreign investment does not dominate the economy as totally as O'Hearn suggests. The legitimate critique of the overreliance on foreign investment may, if taken too far, result in letting domestic elites off the hook. The tendency of recent tax and other fiscal decisions to increase inequality has little or nothing to do with the desire to attract further foreign investment.

Nor is the Republic of Ireland, nor its software industry, a unique case of the FDS. The three modes of integration into the global economy identified as constitutive of the FDS might be generalized in a comparative analysis. Chris Ansell argues that the EU is characterized by two dominant regional development strategies—competition for mobile investment and regional networking strategies.[77] The literature on economic development is similarly split between an emphasis on the dominance of global production and an attention to localized "industrial districts." Furthermore, the impact of established national models of the political economy—for example, neoliberal, social democratic, socialist, and BDS institutions—remains significant in mediating the incorporation of the local into the global. It is the interaction of these three modes of management of the integration of local and global that maps out the possibilities and limits of development strategies in an era of globalization.

Some brief comparative examples can illustrate the generalizability and utility of this framework. The Netherlands has been one of the most successful economies in Europe in the 1990s. Attracting a significant amount of foreign investment, it has nonetheless combined this with a strong regional growth dynamic in the main metropolitan agglomeration, the Ranstad, and with a revitalization of national corporatist institutions, driven by learning in policy networks.[78] Interest-

ingly, increases in wage inequality have been minimal in the Netherlands, which suggests that there are likely to be more egalitarian, yet successful, globalizations than those pursued by the Republic of Ireland. Within the EU, we are thus likely to see varying efforts by national corporatist institutions to reconstruct national economic and social development on Neil Brenner's "glocalized" terrain.

The East Asian economies, despite the challenges to the BDS, are also pursuing a variety of relatively successful strategies. Giovanni Arrighi argues that there has been a shift within the region from a Japan-centered system toward a reemergence of the Chinese merchant diaspora.[79] Both China and Taiwan have built successful development projects around the integration of these transnational communities, and transnational investment, with local networks. In China's case, this has taken the form of a "local state corporatism," where local states have the autonomy to manage their economies, an autonomy that is politically possible, ironically, precisely because of the authority of the central state.[80] In Taiwan, the BDS has always presided over a more decentralized system than that of Korea and Japan. Its integration with U.S. business networks and weaker reliance on high-debt financing has enabled Taiwan to escape the worst of the Asian financial crisis. Meanwhile, the state has encouraged the integration of transnational and local networks in a way that promotes local innovation and accumulation.[81]

The concept of the FDS promises to be a useful one in analyzing such cases. Neither should the Irish case be taken as the "purest" expression of the approach. The development of IT in Israel and Taiwan, for example, seems to correspond to the FDS model but with a much greater emphasis on indigenous firms, a more selective attitude to foreign investment, and a greater capability to raise large amounts of capital. The case of the Netherlands discussed earlier suggests that the tensions around uneven internationalization and rising inequality can be managed better than the Irish state has done. However, the character of state intervention and its organizational and institutional underpinnings in each case remain close to the FDS model. From this perspective, perhaps the most interesting aspect of the Irish case in terms of policy lessons is the conditions under which it is possible for a state that has relied heavily and relatively uncritically on foreign investment to complement this approach with successful efforts to develop an indigenous industry.

Of course, the generalizability of the FDS model or any other model will depend on the politics of globalization itself. I argue that national development projects are now organized in the context of a networked economy and polity, and that states now create development projects not between the local and the global but out of the local and the global. As Neil Brenner points out, the state itself undergoes a process of "rescaling" as a "glocal" state emerges, integrated with local and global networks, and building a variety of development projects through those networks.

There is no doubt that a neoliberal globalization project dominates this "network polity" and is being enforced by transnational institutions.[82] However, to characterize globalization as simply a project of neoliberalism, within which transnational capital dominates to the extent that states are doomed to the status of "competition states,"[83] is to miss the political possibilities that exist within the current economy and polity. These possibilities are clear in the variety of local and national responses to the pressures of globalization. They are also present in the potential for transforming the project of globalization itself.

Fritz Scharpf argues that in the EU, where transnational governmental institutions are most developed, "negative integration" through eliminating barriers to trade has dominated over "positive integration" through the creation of new market-regulating institutions at the transnational level. This favors the dominance of regional development strategies through tax competition and other strategies for attracting mobile investment. However, an agenda of positive integration may come to favor regionalized networking strategies as a more developmentally sustainable alternative. The Irish software industry has connected to each side of the European polity—negotiating special tax status with the European Commission to attract investment while simultaneously funding indigenous research, business development, and industry support through European Structural Funds and other schemes. Supranational governance, although dominated by neoliberal approaches, may yet be steered in alternative directions, and the EU in particular may yet reflect the social democratic aspirations of many of its member states. Indeed, Scharpf suggests that the strengthening of the EU state bureaucracy's hand in promoting positive integration is the most likely strategy for successfully creating such a regulatory system.[84] Such a EU bureaucracy is itself likely to be very "loosely coupled" indeed. National strategies matter in terms of constructing the specific balance between the global-led, local-led, and nationally mediated modes of integration into the global economy. However, transnational regulation is critical in shaping the political struggles over such development paths.

Ireland has pursued all three modes of integration into the global economy with some degree of success, which explains its rapid growth in the 1990s. It has been possible to pursue each path successfully while reconciling the three modes of integraton within the same polity due to the emergence of an FDS. However, the internal contradictions of that strategy are now creating perhaps unmanageable tensions, brought on by the relative weakness of the solidaristic institutions of national corporatism. The challenge to the Irish economy may not be to the development process as much as to egalitarianism within the society and economy. The Irish FDS may be a better basis for such mobilizations than the Asian BDS, given its decentralized professional networks and union participation instead of hierarchical firms and union suppression. Such national egalitarian politics would have to be combined with efforts at the transnational level to advance a positive integra-

tion of national economies, limiting the destructive tendencies toward regulatory competition. Any such political project that does emerge is increasingly likely to wage its battles on the terrain currently staked out by the FDS.

NOTES

1. See Chalmers Johnson, *MITI and the Japanese Miracle* (Stanford, CA: Stanford University Press, 1982); Alice H. Amsden, *Asia's Next Giant: South Korea and Late Industrialization* (Oxford, UK: Oxford University Press, 1989); Robert Wade, *Governing the Market* (Princeton, NJ: Princeton University Press, 1990); Stephen Haggard, *Pathways from the Periphery: The Politics of Growth in the Newly Industrializing Countries* (Ithaca, NY: Cornell University Press, 1990); Richard Applebaum and Jeffrey Henderson, eds., *States and Development in the Asian Pacific Rim* (London: Sage, 1992); Peter Evans, *Embedded Autonomy* (Princeton, NJ: Princeton University Press, 1995); Meredith Woo-Cumings, ed., *The Developmental State* (Ithaca, NY: Cornell University Press, 1999).

2. See Jason Dedrick and Ken Kraemer, *Asia's Computer Challenge: Threat or Opportunity for the United States and the World?* (Oxford, UK: Oxford University Press, 1998) regarding competitive difficulties. For more on the debt crisis, see Nicole Biggart, "Deep Finance—The Organizational Bases of South Korea's Financial Collapse," *Journal of Management Inquiry* 7 (1998): 311-320; and a series of articles by Robert Wade, including "The Coming Fight over Capital Flows," *Foreign Policy* 113 (1998): 41-54; "The Asian Debt-and-Development Crisis of 1997-?: Causes and Consequences," *World Development* 26 (1998): 1535-53; "From 'Miracle' to 'Cronyism': Explaining the Great Asian Slump," *Cambridge Journal of Economics* 22 (1998); "The Asian Crisis and the Global Economy: Causes, Consequences, and Cure," *Current History* 97 (1998): 361-73; Robert Wade and Frank Veneroso, "The Asian Crisis: The High Debt Model versus the Wall Street-Treasury-IMF Complex," *New Left Review* 228 (1998): 3-24.

3. Ireland refers here to the twenty-six counties of the Republic of Ireland.

4. Paul Sweeney, *The Celtic Tiger* (Dublin: Oak Tree Press, 1998).

5. This article draws heavily on the analysis in Seán Ó Riain, "An Offshore Silicon Valley?" *Competition and Change* 2 (1997): 175-212; Seán Ó Riain, "Remaking the Developmental State: The Irish Software Industry in the Global Economy" (Ph.D. diss., Department of Sociology, University of California, Berkeley, 1999).

6. McIver Consulting, *Manpower, Education and Training Study of the Software Sector* (Dublin: Forás Áiseanna Saothair, 1998).

7. Charles Sabel, *Ireland: Local Partnerships and Social Innovation* (Paris: Organization for Economic Cooperation and Development, 1996).

8. Denis O'Hearn, *Inside the Celtic Tiger: The Irish Economy and the Asian Model* (London: Pluto, 1998), 153.

9. Paul Krugman, "Good News from Ireland: A Geographical Perspective," in Alan Gray, ed., *International Perspectives on the Irish Economy* (Dublin: Indecon, 1998), 51. See also chapters by Jeffrey Sachs and Kenneth Arrow in the same volume.

10. See Ó Riain, "An Offshore Silicon Valley?" for an account of how local and global processes shaped each other over time to create each of these two globalizations of the software industry.

11. Forfás, *Survey of Employment* (Dublin: Forfás, 1998).

12. O'Hearn, *Inside the Celtic Tiger*; Denis O'Hearn, "Globalization, 'New Tigers' and the End of the Developmental State? The Case of the Celtic Tiger," *Politics & Society* 28 (2000).

13. Patrick Honohan, Bertrand Maitre, and Charles Conroy, "Invisible Entrepôt Activity in Irish Manufacturing," *Irish Banking Review,* summer 1998.

14. Forfás, *Research and Development in the Business Sector: Findings from the 1993 Census of R&D Performing Enterprises in Ireland* (Dublin: Forfás, 1995); Forfás, *Survey of Product and Process Innovation in Irish Industry 1993-1995* (Dublin: Forfás, 1997).

15. Jim Stewart, "Transfer Pricing: Some Empirical Evidence from Ireland," *Journal of Economic Studies* 16 (1989): 40-56.

16. Central Statistics Office, *Census of Industrial Production 1990* (Dublin: Central Statistics Office, 1991); Central Statistics Office, *Census of Industrial Production 1996* (Cork, Ireland: Central Statistics Office, 1997).

17. Ibid.

18. Forfás, *Survey of Product and Process Innovation*, 30-32.

19. National Economic and Social Council, *Sustaining Competitive Advantage: Proceedings of NESC Seminar,* Research Series no. 4 (Dublin: National Economic and Social Council, March 1998).

20. John Geary, "The New Workplace: Change at Work in Ireland," *International Journal of Human Resource Management* 10 (1999): 879; William K. Roche and John Geary, " 'Collaborative Production' and the Irish Boom: Work Organization, Partnership and Direct Involvement in Irish Workplaces," *Economic and Social Review* (2000), forthcoming.

21. National Economic and Social Council, *Private Sector Investment in Ireland*, Report no. 103 (Dublin: National Economic and Social Council, February 1998), chap. 2.

22. On investment, see National Economic and Social Council, *Private Sector Investment*; on research and development (R&D) and indigenous industry more generally, see Mary O'Sullivan, "The Sustainability of Industrial Development in Ireland" (paper presented to Dublin Economics Workshop, Dublin, April 1999); on sectoral and other factors affecting collaborative production, see Geary, "The New Workplace," 879-86; on clustering, see National Economic and Social Council, *Sustaining Competitive Advantage*.

23. Figures on occupational change from Paul Tansey, *Ireland at Work: Economic Growth and the Labour Market 1987-1997* (Dublin: Oak Tree Press, 1998), 41.

24. O'Hearn, *Inside the Celtic Tiger,* 125.

25. Alan Barrett, Tim Callan, and Brian Nolan, "Rising Wage Inequality, Returns to Education and Labour Market institutions: Evidence from Ireland," *British Journal of Industrial Relations* 37 (1999): 77-100.

26. O'Hearn, *Inside the Celtic Tiger,* 126.

27. Tim Callan et al., *Poverty in the 1990s: Evidence from the Living in Ireland Survey* (Dublin: Oak Tree Press, 1996).

28. Evans, *Embedded Autonomy.*

29. Amsden, *Asia's Next Giant*.

30. Amsden, *Asia's Next Giant*; Fred Deyo, *Beneath the Miracle: Labor Subordination in the New Asian Industrialism* (Berkeley: University of California Press, 1989).

31. Evans, *Embedded Autonomy*; see Peter Evans and James Rauch, "Bureaucracy and Growth: A Cross-National Analysis of the Effects of 'Weberian' States Structures on Economic Growth," *American Sociological Review* 64 (1999): 748-765 for cross-national quantitative evidence regarding the beneficial growth effects of bureaucracy.

32. Evans, *Embedded Autonomy*; Sylvia Maxfield and Ben Schneider, eds., *Business and the State in Developing Countries* (Ithaca, NY: Cornell University Press, 1997).

33. For differences among the Asian Tiger economies, see Marco Orrù, Nicole Biggart, and Gary Hamilton, *The Economic Organization of East Asian Capitalism* (Thousand Oaks, CA: Sage, 1997). The Korean model has the most authoritarian state and corporate

structures, Japan combines "corporatism without labor" with "enterprise unionism," while Taiwan has a much less hierarchical political and corporate structure.

34. Erik Olin Wright, "Review of P. Evans 'Embedded Autonomy,'" *Contemporary Sociology* 25 (1996): 176-77.

35. For critiques of Peter Evans's inattention to the state's role in constituting economic actors as well as guiding their actions, see David Stark and Laszlo Bruszt, *Postsocialist Pathways: Transforming Politics and Property in East Central Europe* (Cambridge, UK: Cambridge University Press, 1998) and Nicole Biggart and Mauro Guillen, "Developing Difference: Social Organization and the Rise of the Auto Industries of South Korea, Taiwan, Spain, and Argentina," *American Sociological Review* 64 (1999): 722-47.

36. The position of prime minister.

37. Chris Ansell, "The Networked Polity: Regional Development in Western Europe" (Department of Political Science, University of California, Berkeley, 1999, mimeographed).

38. Neil Brenner, "Global Cities, Glocal States: Global City Formation and State Territorial Restructuring in Contemporary Europe," *Review of International Political Economy* 5 (1998): 1-37; "Beyond State-Centrism? Space, Territoriality and Geographical Scale in Globalization Studies," *Theory and Society* 28 (1999).

39. On loose coupling, see J. Douglas Orton and Karl E. Weick, "Loosely Coupled Systems: A Reconceptualization," *Academy of Management Review* 15 (1990): 203-23; Charles Perrow, *Complex Organizations* (New York: Random House, 1986), chap. 4.

40. On modes of control in decentralized organizational forms, see Wolf V. Heydebrand, "New Organizational Forms," *Work and Occupations* 16 (1989): 323-57.

41. On autocentric development, see Samir Amin, *Unequal Development* (New York: Monthly Review Press, 1976); Dieter Senghaas, *The European Experience: A Historical Critique of Development Theory* (Dover, NH: Berg, 1985).

42. Seán Ó Riain, "An Offshore Silicon Valley?"; Neil Coe, "US Transnationals and the Irish Software Industry," *European Urban and Regional Studies* 4 (1997): 211-30.

43. *Localization* of software refers to the process of customizing existing software packages for specific national and linguistic markets. The main activity is the translation of the text, but it may also involve changing date formats, letter formats, and other culture-specific aspects of the software. In U.S. software companies, the work of designing the software program so that it can be customized in this way is called *internationalization* and is generally carried out in the United States. The work of actually customizing the program for specific markets is called *localization*. This work is relatively uncomplicated. See Honohan, Maitre, and Conroy, "Invisible Entrepôt Activity," for an analysis of industrial statistics relating to these activities.

44. Ó Riain, *Remaking the Developmental State*, 81.

45. The Israeli software industry was estimated to earn approximately $700 million in exports in 1997 (including indigenous and transnational corporation [TNC] firms), while the value of Indian software industry exports rose to $1,750 in 1997-98. Exports of Irish indigenous firms came to $713 million and those of TNCs to (an inflated figure of) $5,615 million. Care should be taken in using these figures to compare the three industries as there are a number of differences in how the figures were calculated. However, it is clear that the Irish industry is of a similar order of magnitude as the industries in India and Israel. The Irish industry's export orientation is similar to that of the Indian industry, although the Indian industry's exports consist largely of offshore development and international labor contracting. See Balaji Parthasarathy, "Industrializing Countries and the Changing International Division of Labor in the Computer Software Industry: Lessons from the Indian Case 1977-1997" (paper presented to the Sloan Foundation Globalization Workshop, Duke University, Durham, NC, 26-28 April 1998). The Irish industry is closer to the Israeli

and indeed the U.S. industry in its greater focus on software products and avoidance of large-scale labor contracting. Furthermore, these are the leading international software industries outside the G-7 (the leading capitalist economies, which meet as a group on a regular basis). The other leading contenders such as Taiwan, Singapore, and Australia are well behind the "three I's" of global software. See Dedrick and Kraemer, *Asia's Computer Challenge*. Other emerging industries such as Hungary and China that are likely to prove significant in the long term are still relatively underdeveloped.

46. The data in this article come from 120 interviews carried out in Silicon Valley and in Ireland between October 1995 and September 1997, industry journals and other documentary sources, and a survey of software firms in Ireland carried out in June and July 1997. The response rate to the survey was an above-average 54.5 percent, the sample was reweighted to reflect the size and ownership of the survey population, and six companies were removed from the sample because they received more than 60 percent of their revenues from hardware.

47. National Software Directorate, *1995 Software Industry Survey Results* (Dublin: Forbairt, 1995).

48. Gary Gereffi, "The International Economy," in Neil Smelser and Richard Swedberg, eds., *The Handbook of Economic Sociology* (Princeton, NJ: Princeton University Press/Russell Sage Foundation, 1994); Bennett Harrison, *Lean and Mean* (New York: Basic Books, 1994).

49. David Jacobson and David O'Sullivan, "Analysing an Industry in Change: The Irish Software Manual Printing Industry," *New Technology, Work and Employment* 9 (1994): 103-14; "The Irish Software Manual Industry: Globalization through Local Supply?" (paper presented at "Ireland, Europe & the Global Information Society: A Conference for Social Scientists," Dublin, 24-25 April 1997); Industrial Development Authority, "The Irish Software Industry," information pamphlet, n.d.

50. Union density fell from 48.3 percent in 1992 to 43.5 percent in 1997. The only sector that increased union density is Public Administration and Defense, with a union density of 74.1 percent in 1997. By contrast, Commerce, Insurance, Finance and Business Services (including software) fell from 31.6 percent to 29.0 percent in 1997. Data generously provided by William K. Roche, Graduate School of Business, University College, Dublin.

51. Patrick Clancy, "The Evolution of Policy in Third-Level Education," in D. Mulcahy and D. O'Sullivan, eds., *Irish Educational Policy: Process and Substance* (Dublin: Institute of Public Administration, 1989); Robert Osborne, *Higher Education in Ireland: North and South* (London: Jessica Kingsley, 1996).

52. Evans, *Embedded Autonomy*; see O'Hearn, "Globalization, New Tigers and the End of the Developmental State" for application of the concept of the state as "midwife" to attraction of foreign investment.

53. Jacobson and O'Sullivan, "Analysing an Industry in Change."

54. Colm O'Gorman, Eoin O'Malley, and John Mooney, *Clusters in Ireland: The Irish Indigenous Software Industry: An Application of Porter's Cluster Analysis* (Dublin: National Economic and Social Council, 1997), 35.

55. National Software Directorate, *The Software Industry in Ireland: A Strategic Review* (Dublin: IDA Ireland, 1992).

56. Eoin O'Malley, "Developments in Irish Industrial Policy since the Mid-1980s" (paper presented at the special conference of the Political Studies Association of Ireland "The State of the Irish Political System," Cork, Ireland, 28-30 May 1992); Eoin O'Malley, Kieran A. Kennedy, and Rory O'Donnell, *Report to the Industrial Policy Review Group on the Impact of the Industrial Development Agencies* (Dublin: Stationery Office, 1992).

57. Ann Clarke, *Software Support Programme: Final Report* (Dublin: EU Structural Funds Operational Programme for Industrial Development Evaluation Unit, 1995). These are the latest years for which figures are available, although total state expenditure on business development has continued to increase.

58. On software, see Clarke, *Software Support Programme*. On all firms, see O'Malley, "Developments in Irish Industrial Policy," and O'Malley, Kennedy, and O'Donnell, *Report to the Industrial Policy Review Group*.

59. Clarke, *Software Support Programme*; O'Gorman, O'Malley, and Mooney, *Clusters in Ireland*.

60. Patricia Carr, "'Riding the Juggernaut': Selectivity and Entrepreneurship in Ireland," *Irish Journal of Sociology* 5 (1995): 67-88; "The Cultural Production of Enterprise: Understanding Selectivity as Cultural Policy," *Economic and Social Review* 29 (1998): 133-55.

61. Clarke, *Software Support Programme*, chap. 7.

62. Ibid., chaps. 8-9.

63. For a more complete analysis of these and other associations, agencies, and forums, see Ó Riain, *Remaking the Developmental State*, chap. 4.

64. Ansell, "The Networked Polity."

65. The head of the National Software Directorate, charged with developing policy for, and promoting, the software industry in Ireland, particularly indigenous firms.

66. See, for example, Clarke, *Software Support Programme*; give Forfás references.

67. Anthony Atkinson, Lee Rainwater, and Timothy Smeeding, *Income Distribution in OECD Countries: Evidence from the Luxembourg Income Study* (Paris: Organization for Economic Cooperation and Development, 1995); Barrett, Callan, and Nolan, "Rising Wage Inequality."

68. John Geary, "Initial Results from the National Survey of Employee Relations and Human Resource Practice in Ireland," working paper, Smurfit Business School, University College Dublin, 1998.

69. Summary quote from Barrett, Callan, and Nolan, "Rising Wage Inequality," 95. Neither have recent changes in tax and social welfare done anything to mitigate these inequalities. Although redistribution was significant between 1987 and 1994, tax and welfare changes from 1995 to 1998 resulted in the poorest 30 percent of the population making 2 percent less than if their income had increased at the same rate as the average increase in income for the population. During the same period, the top 10 percent of earners benefited from tax changes to the extent that they made 4 percent more than would have been the case if they had simply followed the average income increase. For the 1987-94 period, see Tim Callan and Brian Nolan, "Income Inequality in Ireland in the 1980s and 1990s," in Frank Barry, ed., *Understanding Ireland's Economic Growth* (London: Macmillan, 1999), 167-92. For the 1995-98 period, see Tim Callan, Brian Nolan, and John Walsh, "Income Tax and Social Welfare Policy," in T. Callan, D. Duffy, T. Fahey, B. Feeney, B. Nolan, P. O'Connell, S. Scott, and J. Walsh, eds., *Budget Perspectives* (Dublin: Economic and Social Research Institute/Oak Tree Press, 1998).

70. Seán Ó Riain, "Time-Space Intensification: Irish Software Developers in the Global Workplace," in M. Burawoy, J. Blum, S. George, Z. Gille, T. Gowan, L. Haney, M. Klawiter, S. Lopez, S. Ó Riain, and M. Thayer, *Global Ethnography* (Berkeley: University of California Press, forthcoming).

71. Pat O'Connor, *Emerging Voices: Women in Contemporary Irish Society* (Dublin: Institute of Public Administration, 1998).

72. Proportions calculated on basis of data in Central Statistics Office, *Household Budget Survey 1987* (Dublin: Central Statistics Office, 1988), 44-45, and Central Statistics

Office, *Household Budget Survey 1994* (Cork, Ireland: Central Statistics Office, 1997), 46-47.

73. This can only be aggravated by the growing inequality between the share of national income going to capital and to labor and the ability of owners of capital to shelter that income from tax through international financial instruments, as partially revealed in a series of recent financial and tax scandals.

74. For a detailed discussion of these issues, see Ó Riain, *Remaking the Developmental State*, chap. 8. On trends toward fragmentation in industrial relations, see William K. Roche, "Between Regime Fragmentation and Realignment: Irish Industrial Relations in the 1990s," *Industrial Relations Journal* 29 (1998): 112-25.

75. World Bank, *The East Asian Miracle* (Washington, DC: World Bank, 1993); O'Hearn, "Globalization, New Tigers and the End of the Developmental State?"

76. O' Hearn, "Globalization, New Tigers and the End of the Developmental State?"

77. Ansell, "The Networked Polity."

78. On Dutch regional policy, see Brenner, "Global Cities, Glocal States." On neocorporatism in the Netherlands, see Jelle Visser and Anton Hemerijck, *A Dutch Miracle?* (Amsterdam: Amsterdam University Press, 1997).

79. Giovanni Arrighi, *The Long Twentieth Century* (London: Verso, 1994).

80. On local state corporatism, see Jean Oi, *Rural China Takes Off* (Berkeley: University of California Press, 1999). On the central and local states in China, see Michael Burawoy, "The State and Economic Involution: Russia through a China Lens," in Peter Evans, ed., *State-Society Synergy: Government and Social Capital in Development* (Berkeley: International and Area Studies, University of California, Berkeley, 1997), 150-77.

81. On interfirm networks, see Dedrick and Kraemer, *Asia's Computer Challenge*. On transnational communities, see AnnaLee Saxenian, *Silicon Valley's New Immigrant Entrepreneurs* (San Francisco: Public Policy Institute of California, 1999). On corporate finance, see Biggart, "Deep Finance."

82. Philip McMichael, *Development and Social Change: A Global Perspective* (Thousand Oaks, CA: Pine Forge Press, 1996).

83. Philip Cerny, "Globalization and the Changing Logic of Collective Action," *International Organization* 49 (1995): 595-625.

84. Fritz Scharpf, *Governing in Europe* (Oxford, UK: Oxford University Press, 1999).