

The New International Division of Labour in ‘High-Tech Production’: The Genesis of Ireland’s Boom in the 1990s

Tomás Friedenthal and Guido Starosta

This chapter examines the foundations of Ireland’s rapid expansion during the 1990s and offers an alternative approach to those dominating debates that emerged about the potentialities and limits of this idiosyncratic developmental model and its apparently successful integration into the global economy. Whilst neo-classical economists have tended to explain the Irish fast-growing experience in terms of the adoption of a liberalisation and export-led strategy that opened the economy to vast inflows of high-tech foreign and direct investment (FDI) (Barry 1999, 2000; Krugman 1998; Ó Gráda 2002), critical commentators have argued that such an account ignores the active role played by the Irish state, and related institutions and

T. Friedenthal

Department of Economics, University of Buenos Aires, Buenos Aires, Argentina

G. Starosta (✉)

Department of Economics and Administration,
National University of Quilmes and National Scientific and
Technical Research Council, Buenos Aires, Argentina

organisations, in shaping the precise mode in which the ‘local’ economy integrated into ‘globalised networks’ of high-tech production and innovation (Ó Riain 2004). According to this alternative view, the Irish case is that of a, so-called, Network Developmental State that manages the connection between the local and the global and, through its active involvement in industrial development, steers the national economy along a path of integration into the technologically most dynamic elements of the world economy. In contrast to the authoritarian ‘state developmentalism’ of East Asian Tigers, and their (initial) reliance on the ‘super-exploitation’ of cheap manual labour, the Celtic Tiger model was predicated on its democratic institutions and better qualified, higher-wage jobs in cutting-edge sectors of the economy.

Without disputing the empirical value of many of the *descriptions* offered in the literature, here we take issue with those apparently opposed *explanations* insofar as they both account for the trajectory of the Irish developmental process on the basis of the successful implementation of ‘correct’ nation-state policies (even if they disagree on the precise nature of those policies). By contrast, this chapter argues that the Irish experience is yet another concrete expression of the further development of the essentially *global* laws of motion of the new international division of labour (NIDL), as explained in Chap. 4. More specifically, it argues that the *particularistic-skill-replacing* technical change that characterises the production of relative surplus-value across the globe has allowed capital to integrate into the NIDL not only national working classes which were materially and morally suitable for the performance of the simpler manual tasks initially required by the micro-electronics revolution, but also those with comparatively more skilled but still relatively cheaper labour-power. Moreover, we show that the very dynamics of the NIDL then made possible its extension into the more intellectual productive functions of the labour process of capitalist large-scale industry, such as software production. Premised on its origins as a source of latent and stagnant surplus population for the global accumulation of capital, the specificity of the Irish national sphere of valorisation has been determined by those two potentialities of the historical unfolding of the NIDL (that is, the subsection of relatively more complex and intellectual productive functions to its laws of motion). We therefore show that the particular state policies and institutions prevailing in Ireland are therefore grounded in this specific form of integration into the NIDL, which they have *mediated* but not *determined* by themselves.

THE HISTORICAL PRESUPPOSITIONS OF IRELAND'S SUBSUMPTION WITHIN THE NIDL

As mentioned above, the specific modality and potentialities of the subsumption of the Irish space of valorisation under the NIDL have their historical premise in the forms taken by Ireland's genesis as a nationally-independent territorial jurisdiction. In order to comprehend the origins of the Celtic Tiger, we must first place the process of capital accumulation in Ireland in a long view of its historical development. More concretely, in this first section we take a brief look at the early subsumption of the Irish economy under the capitalist international division of labour, which flowed from its existing links with England. We shall see that the secret of Ireland's developmental path resides in the formation and chronic reproduction of a relatively large surplus population, as a direct result of the unfolding of global capital accumulation; that is, that the Irish working class became essentially redundant for global capital accumulation by the end of nineteenth century, a condition that would stretch, in different shapes, well into the twentieth century.

The Economic Content of the Genesis of the Irish National Space of Accumulation: The Formation and Chronic Reproduction of a Rural Relative Surplus Population

The upsurge of industrial capital accumulation in England during the second half of the eighteenth century (with its concomitant increased demand for food), led to a long-term rise in corn prices which, also bolstered by the Napoleonic wars, caused the price of wheat to double between 1770 and 1810 (Regan 1980: 10). This process had a profound impact on the dynamics of capital accumulation in Ireland. In effect, the sharp increase in corn prices resulted in a widespread shift across the country from grazing to tillage, which brought with it a profound change in the rural social structure. The labour-intensive character of tillage promoted the subdivision of holdings and thus enabled the formation of new familial units that could survive on ever-smaller plots devoted to the subsistence cultivation of the potato.

Thus, an explosive rural population growth ensued in Ireland, intensifying the competition for land and increasing the pressure for a further subdivision of holdings. In turn, this led to an expansion of ground-rent,

which would force an increase in tillage area at the expense of subsistence plots in each individual holding (Mulhall 1988: 97). The contraction of the acreage left for the peasantry's reproduction after the rise in rent was facilitated by the increased cultivation of the potato. Since this was both a rotation and a subsistence crop, the tenant's small plot could be split into a part devoted to corn for rent and another for growing potatoes for subsistence. Rural family labour engaging in cottage industry gave that contraction further room to develop. All this obviously implied a systematic extension of the annual hours worked by the rural family. As Breathnach (1988: 122) points out, these developments meant that by 1800 'the Irish economy had become characterised by a much-bloated labour force heavily dependent on what was to prove an ephemeral export market'.

By the time the Act of Union was passed in 1800, incorporating Ireland into the United Kingdom, the country possessed a fairly developed manufacturing industry compared with most European countries (with the exception of England) (O'Malley 1981: 29–30). Non-textile industries experienced growing competition but still managed to stay afloat by means of restructuring on a larger scale to keep pace with their English counterparts (O'Malley 1981: 31–2). However, the further advance of mechanisation, coupled with the definitive phasing out of tariff protection stemming from the provisions set in the Act of Union, heavily impacted on the Irish cotton and woollen manufacturers and many of them shut down permanently during the depression of 1825–1826. Weaving and embroidery of muslin continued in Ulster, but cotton yarn was being increasingly imported. Due to the concurrent development of powered spinning of fine linen yarn, many Belfast cotton mills were able to change over to linen production and escape closure. On this basis, Belfast managed to become a major global location for the development of mechanised fine linen spinning.

These developments dealt a hard blow to the rural poor, who depended upon domestic spinning to supplement their meagre farming incomes (Breathnach 1988: 129–30). The situation was further complicated when a rise in corn prices, which had formerly resulted in the profound changes in rural structure discussed above, returned after the end of the Napoleonic Wars in 1815. To make matters even worse, the decline of domestic spinning in Ireland coincided with the beginning of a secular rise in cattle prices that led to a widespread conversion from tillage back into (export-oriented) grazing lands. The basis of the entire existing rural system was seriously undermined, and it was only a matter of time until it

eventually collapsed. As a result, the idiosyncratic Irish emigration trend started to gain momentum and would finally turn into an absolute population decline after the devastating Great Famine of 1845–1848.

If economic hardship had been limited mainly to the textile industries up to that point, further progress in the mechanisation of large-scale industry in the 1870s in Britain and elsewhere spread to the rest of the Irish manufacturing sector (O'Malley 1981: 33–4). And yet there was a notable exception to this general trend toward industrial decline. As Breathnach (1988: 130) notes, the aforementioned constitution of Belfast as a specialised site for mechanised linen production induced the establishment of a supplementary engineering industry and attracted a major shipbuilding sector. The north-eastern city and its surrounding satellite towns thereby became a classic urban-industrial region of the industrial revolution. By contrast, the remainder of Ireland became a location for agricultural production with low labour requirements, namely export-oriented cattle rearing (O'Malley 1981: 39). As a result, this latter part of the country would eventually turn into a vast reservoir of relative surplus population.

Nevertheless, general economic stagnation and decline in the south of Ireland was not the immediate outcome of its industrial crisis. As a matter of fact, the Great Famine was followed by a period of relative prosperity for Irish farming (Mulhall 1988: 98–9). Reversal to pasture due to the change in prices involved a steep fall in the total number of holdings while larger ones actually increased, therefore implying a process of consolidation enabled by the decimation of the surplus rural population through emigration and the famine. Moreover, these very same conditions of capital accumulation in southern Ireland would also form the material basis for the effective abolition of landlordism. Thus, the death knell for landowners started to ring when the agricultural crisis of the early 1880s set in.

In effect, diminishing transport costs increasingly made possible the integration of new national spaces with exceptional natural conditions into the international division of labour as raw-material and agrarian-commodities producing countries.¹ Domestic agricultural prices dropped sharply as a consequence and, just as the earlier rises in corn and cattle prices involved an expansion in the ground-rent available for appropriation in Ireland, this later fall in prices caused it to plummet. This shrinking of agrarian surplus meant that the valorisation of small agrarian capitals and the landlords' appropriation of ground-rent were no longer mutually compatible. So the land question moved to the forefront of the political arena and, as the mostly British ownership of the land turned the Irish

land question into a national question, the struggle against landlordism became a struggle for national independence. The outcome of this struggle was: the abolition of landlordism, by way of a series of changes in the juridical relations governing the possession of the land—that is, agrarian reform (Guinnane and Miller 1997); and it would, soon after, result in the partition of Ireland and the emergence of a new national space of accumulation, the Irish Free State, later the Republic of Ireland.

Whereas a certain degree of concentration of holdings mentioned above meant that a novel class of prosperous small agrarian capitalists had already developed (that is the larger farmers, who represented about one-third of the population in 1900, according to Mulhall 1988: 99), this process was far from uniform and co-existed with the reproduction of the pre-existing fragmentation of land holdings into very small plots. In this sense, the abolition of landlordism and the establishment of peasant proprietorship did not do away with previously established patterns of differentiation in the rural social structure (Mulhall 1988: 129). Insofar as the land reform simply transferred existing holdings into outright proprietorship, the resolution of the land question did nothing to uproot the precarious basis for the material reproduction of the great bulk of Irish farmers, who continued to survive on the production of young cattle in tiny holdings for sale to dealers and fatteners elsewhere (Breathnach 1988: 130). Thus, the continued existence of a rural social structure that permitted the reproduction of the peasant through subsistence agriculture constituted an exceptionally large and sustained source of rural *latent* surplus population and determined a relatively low level of wages (which in turn acted as a barrier to mechanisation).

By the time both the land question and independence had been settled, capital accumulation by larger farmers in Ireland was being sustained by a double source of extraordinary social wealth. On the one hand, the remaining (rather minimal) ground-rent available for appropriation in the national space of valorisation, previously captured by the landlord, now flowed to a large extent into the pockets of the farmers. On the other hand, we saw that the prevailing conditions of reproduction of labour-power implied its relatively low value, which in turn entailed an increase in the surplus-value directly extracted by the eastern, larger farmers when employing wage-labour. Additionally, surplus-value was indirectly appropriated in commodity circulation when purchasing the smaller peasants' livestock below its normal price of production for subsequent fattening and re-sale.² The agricultural sector was thus the core of the newly

independent state's economy, employing 670,000 out of a total workforce of 1.3 million (Kirby 2010: 16).

*The Continued Reproduction of the Irish Surplus Population
in New Modes of Existence Under a Weak 'Inward-Looking'
Industrialisation Process*

The decade following independence witnessed the continuity of capital accumulation under these conditions, which included intense and relatively free trade with England (Breathnach 1988: 131). But Ireland entered a *seemingly* different development path after 1932 when a regime of import substitution industrialisation (ISI) was introduced. Domestic industry protection was extensive and the average tariff level was raised from nine per cent to 45 per cent between 1931 and 1936, while tariffs on some goods reached 75 per cent. Non-tariff measures—such as quotas, import licenses, and regulations—were set in place, among which the most important were the Control of Manufactures Acts (1932 and 1934) aimed at securing Irish control of domestic industry. Furthermore, a state bank was established to divert surplus capital into the hands of industrialists, as banking institutions were reluctant to lend even under government guarantee (Kirby 2010: 17).

Here an important point of clarification is needed. As Caligaris's and Iñigo Carrera's earlier chapters flesh out in great detail, this phase of capitalist development geared towards an inward-looking industrialisation process did not actually involve a *qualitative transformation* in the specific modality of the accumulation process *vis-à-vis* the initial agro-export stage. Instead, it entailed the expanded reproduction of the very same mode taken by the overall circulation process of capital, defined by the appropriation of a portion of ground-rent flowing into the national space of accumulation through the export of primary commodities. In this sense, both are part and parcel (strictly, *stages* or *phases*) of the, so-called, classical international division of labour (CIDL).

With respect to all these general features, the Irish experience with ISI hardly differed from similar developmental trajectories elsewhere in the world. But what sets the case of Ireland apart is that, from its very early stages, the limited amount of ground-rent available for appropriation meant that capital had to resort to additional extraordinary sources of social wealth to sustain its accumulation under this specific modality, and in the face of the ever-growing difference between local and world-market

production costs. Furthermore, these limitations would also rule out the eventual constitution of fragmented foreign normal capitals (that is transnational corporations, or TNCs) as the fundamental subjects of the appropriation of ground-rent (on this see Chap. 2). Rather, this form of the accumulation process took shape through the proliferation of a multitude of domestically owned small industrial capitals with a very low degree of concentration.

Therefore, this mode of accumulation of capital showed from its very beginning that it had specifically constrained potentialities to unfold in Ireland. Unlike the similar contemporary experiences of the largest Latin American countries (for example, Argentina, Brazil, and Mexico), the more limited magnitude of the extraordinary sources of social wealth sustaining capital's valorisation process in the Irish Republic's national space did not allow for its development beyond a (particularly weak) primary ISI phase, and had very limited capacities for labour-absorption. Thus, manufacturing output rose by just 7.2 per cent between 1932 and 1936, while gross national product at constant prices was only ten per cent higher in 1938 than in 1931, even though industrial employment rose from 110,600 to 166,100 over the same period, suggesting an overall productivity decline (Kirby 2010: 18).³ Emigration volume fell, in turn, to an average of 14,000 a year over the decade (it had previously reached treble that rate, partly a consequence of the 1930s' world crisis). Furthermore, the inward-looking orientation of new industrial production brought about a 29 per cent decline in exports by 1933, which only recovered their 1930s' volume in 1960 (Kirby 2010: 18).⁴ The fairly substantial industrial employment increase (about 40 per cent) over those first years of the new regime was nonetheless insufficient to eliminate the high chronic unemployment that stemmed from the peculiar, and essentially unchanged, Irish rural social structure. In sum: the ISI phase was already facing the immanent limits of its particularly small domestic market in the 1940s; considerable balance of payment problems emerged in the 1950s; while the 1.7 per cent per annum pace of output growth and 0.2 per cent average annual increase in manufacturing employment over the course of that decade caused unemployment to swell; and emigration reached over 50,000 a year, so that between 1946 and 1961 the workforce shrunk from 1,228,000 to 1,053,000 people (Kirby 2010: 19).

In our view, this quantitative evidence expresses the following. The reproduction of the specific content of Ireland's process of capital accumulation during this period revolved crucially around the association between

small landholding agrarian industrial capital and small non-agrarian industrial capital over the appropriation of a twofold source of extraordinary social wealth: on the one hand, the remaining (although declining) ground-rent; on the other, and crucially for the purpose of our argument, the extraordinary surplus-value stemming from the peculiar conditions of existence of the Irish workforce, which allowed the cheapened purchase of their labour-power without undermining its normal long-term reproduction. Moreover, given that the magnitude of ground-rent was meagre and actually diminishing, capital accumulation increasingly came to rest one-sidedly on the relative cheapness of Irish labour-power. Those feeble foundations sustaining the accumulation of capital would mean that in less than two decades the widening productivity gap, with normal capital accumulating beyond the national borders, was already confronting the Irish process of capital accumulation with its specific inherent limits. As Breathnach (1988: 132) succinctly puts it, 'Ireland's rather tentative attempt at economic autarky ... ran out of steam in the 1950s ... at a time when the rest of Europe was booming'.

This idiosyncratic economic trajectory under such a weak ISI process carries a broader significance, whose implications would become apparent in the following decade, as we discuss in the next section. But, for the moment, let us just note that it means that this developmental path did nothing to transcend the general condition of the Irish national sphere of valorisation as a reservoir of surplus labouring population *vis-à-vis* the essentially global contradictory dynamics of capital accumulation. It only meant that the reproduction of the Irish working class as a relative surplus population changed its mode of existence.⁵ The only novelty of the ISI phase *vis-à-vis* the earlier reproductive conditions of the Irish working class was that its chronic mode of existence as stagnant surplus population extended beyond the agrarian sector to include its employment by non-agrarian small industrial capitals.

Such were the conditions for the reproduction of capital and the working class in the late 1950s in Ireland. The specificity of the Irish process of capital accumulation was defined by the dominance of small capitals both in agrarian and non-agrarian sectors of industry, whose survival therefore progressively hung upon the purchase of the relatively cheap labour-power of Irish workers, while it constantly produced a permanent outward international migratory flow of the national labouring population. The prospects for the subsequent trajectory of this national space of accumulation did not look very promising. Yet, just as its potentialities appeared to be

dwindling (if not, simply vanishing), the global process of production of relative surplus-value started to undergo profound transformations, which would revolutionise the specific form of the Irish process of capital accumulation and breathe new life into its development.

THE EMERGENCE OF THE NIDL AND GLOBAL CAPITAL'S
EARLY TAPPING OF IRELAND'S CHEAP LABOUR-POWER
RESERVES IN QUALITATIVELY NOVEL FORMS

By the 1960s and through the production of relative surplus-value, which was actually behind the increasing productivity gap between normal capital accumulating in industrially advanced national spaces and small capital accumulating in Ireland, global capital was entering the germinal stages of a thorough revolution in the materiality of the capitalist labour process that would lead to the emergence and development of the NIDL. In its general determination, this emerging re-configuration of the international division of labour would involve the worldwide fragmentation of the different phases of the production process of large-scale industry.⁶ Ireland became a very early expression of these novel tendencies shaping capital accumulation on a global scale. This should come as no surprise, given the country's prevailing condition as a reservoir of plentiful cheap wage-workers who, additionally, possessed the necessary productive attributes to be actively incorporated as specific organs of the, now globally dispersed, collective labourer.⁷ On top of this essential determination, Ireland also enjoyed a favourable geographical location, in proximity to main industrial and consumer centres, and possessed natural conditions well suited for the maritime transport of commodities. As a consequence, from the 1960s onwards the process of capital accumulation would start to reproduce under a new form. State policies mediating the reproduction of the previous mode of accumulation were consequently dismantled, and were replaced by forms of state direct regulation that channelled the unfolding of the potentialities of Ireland's changed role within the international division of labour.

Ireland had already started to experience a persistent net inflow of foreign capital in the decade prior to the 'opening' of the economy in 1959, which was only partly due to state borrowing under the Marshall Programme.⁸ However, the volume of this net capital inflow increased substantially during the following decade, escalating strongly after 1969.

In turn, the specifically outward orientation of capital accumulating under this new basis naturally involved a swift increase in the share of Irish manufactured exports to total exports, which increased from 6 per cent in 1950 to 19 per cent in 1959, and 37 per cent in 1971 (McAleese and Martin 1972). And, given that this surging trend in manufactured exports was essentially *global*, it naturally brought about a thorough reduction in trade restrictions in all major markets, which was nothing more than the establishment of the international juridical forms better suited to mediating the novel specific content of global capital accumulation. From the point of view of the national form of the capitalist state, this implied a new set of external and internal juridical and political regulations.

With respect to Ireland, the transformation of external juridical relations comprised the following measures, among others: the repeal of the Control of Manufactures Acts (which hitherto impeded the foreign ownership of Irish industry) in 1959; the unilateral reduction of external tariffs in 1963 and 1964, enabling the signing of the Anglo-Irish Free Trade Agreement (AIFTA) with the UK in 1966; the extension to Ireland of bilateral rights granting most-favoured-nation treatment by its principal trading partners (under the auspices of General Agreement on Tariffs and Trade (GATT), several years before Ireland became a contracting party in 1967); and finally, Irish integration into the European Economic Community (EEC) in 1973, which resulted in the abolition of the Common External Tariff (CET) on Irish exports by 1978. In the domestic sphere, the economic transformation was mediated by two main state policies: in the first place, grants to export-oriented industries—part of which were conceded only to firms located in rural areas; and, in the second place, a complete remission of income and corporate profit tax on manufactured exports, which was replaced by a ten per cent flat rate on all manufacturing in 1980.⁹ Additionally, there were institutional changes within the state, among which the key role and increasing power and organisational autonomy of the Industrial Development Agency as a ‘hunter and gatherer’ of FDI stands out (Ó Riain 2004: 40). Note, however, that these changed political and juridical regulations were not the underlying *cause* of the new economic forms taken by the accumulation process in the Irish space of valorisation, as most of the literature tends to assume (thereby inverting the form and content of the phenomenon at stake). Instead, they only acted as *necessary mediators*, at the national level, for their emergence and subsequent reproduction, which was

actually *grounded* in the transformations originating in the essentially *global* dynamics of the production of relative surplus-value by the total social capital. Indeed, we have seen that the seeds for Irish integration into the nascent modality of the NIDL had already been sown and were germinating by the time the juridical and political forms needed for its effective development first set in.¹⁰

Normal capital producing commodities for the world market thus flowed into Ireland, seeking the higher profitability attainable by exploiting the fairly well-trained but relatively cheaper Irish workforce in a range of advanced industrial labour processes, which was made possible by new skill-replacing technological changes. The range of sectors that attracted the relocation of capital was initially very varied and included food and milk products, textiles, clothing and footwear, metals and engineering, pharmaceuticals and chemical industries (McAleese 1972: 80). However, it would be fundamentally the electronics, engineering, and chemical-pharmaceutical industries that would act as the main ‘drivers’ of this reconfiguration of the material basis of capital accumulation in Ireland (Breathnach 1988: 133). ‘Phase zero’ of the NIDL’s worldwide unfolding was taking place, and Ireland was directly involved (see Chap. 4).

Insofar as active participation in the NIDL required that individual capitals reached the necessary scale of operation to be able to compete on the world market, the rapid economic transformation involved precluded its channelling through the valorisation of small capitals that had dominated the Irish economy in the prior phase, since they obviously lacked the requisite degree of concentration.¹¹ The immediate subject of this process was thereby internationally relocating normal capital in the form of booming inward FDI, which was export-oriented. Indeed, foreign enterprises established in Ireland in the early 1960s exported, on average, 75 per cent of their gross output (McAleese 1972: 79–80). But the specific nature of new foreign capital formation in Ireland is also evident in the diverse origin of FDI and the particular evolution of the distribution of Irish manufactured exports by area of destination (McAleese and Martin 1972: 616–7). Together, the varied composition of origin of capitals (mainly British and German, with some US) and of the destination of their production, rule out the idea that capital relocating in Ireland was driven mainly by proximity and prospects of unrestricted access to the European market.¹² A breakdown of manufactured exports in 1970 also gives us a more detailed picture of the particular production processes in

which Ireland specialised by that time. As well as subsectors of the chemical, textile, and construction industries with significant shares in exports, it is possible to observe a strong presence of subsections of machinery production, and especially domestic electric equipment and medical and measuring instruments, in manufacturing export trade (McAleese and Martin 1972: 628–31).

Still, the peculiar pattern of specialisation followed by Ireland in this process of integration into the NIDL was fundamentally determined by its direct participation in the production process of a core element of the novel technological base on which that division would come to rest, namely, computers. Although some (mainly US) electronic component manufacturers had already established plants during the 1960s (Drew and Foster 1994)—in what amounts to early evidence of the international fragmentation of information technology (IT) production—the decision by Digital Equipment Corporation (DEC) to set up a large-scale minicomputer manufacturing operation in Ireland in 1971 is widely acknowledged as a milestone in the Irish IT industry's development. Soon after, five other minicomputer producers and a mainframe manufacturer followed suit and located assembly plants in the country (van Egeraat and Jacobson 2004).

As with the previous wave of FDI in Ireland, the establishment of computer assembly operations was an expression of the international fragmentation of industrial labour processes, albeit a specific one. Indeed, although computers were the material basis for the automation of capitalist large-scale industry, and thus for a tendency towards the elimination of simple direct labour, their own production initially multiplied the need for the latter, insofar as computer assembly and subassembly originally required mostly *relatively* simple productive tasks. Thus, from the very outset the global total social capital tended to locate the simpler portions of the computer manufacturing labour process outside industrially advanced countries. Two main reasons explain why this nascent industry established its assembly facilities specifically in Ireland (and Scotland): the existence of a suitably skilled but relatively cheap workforce; and geographical proximity to user markets, given the rather bulky character of the final product, which entailed significant transport costs. Thus, while the peculiar combination of skills available and wage levels accounts for capital's location in Ireland (and Scotland) rather than in other Western European relatively low-wage countries (such as Spain, Greece, or Portugal), proximity and the kind of

exploitable labour-power determined why computer final assembly was not initially located in (and actually was the last computer manufacturing process to relocate to) the East Asian region, where a substantially cheaper and more compliant workforce was being eagerly incorporated by the global total social capital into the active industrial army of labour. Conversely, even at that early stage of the development of the computer industry there were many components that could not be profitably produced in Ireland and which were already being sourced from East Asia, as technical skill requirements were substantially lower and geographical distance was comparatively unimportant given the small size and weight of this type of product.¹³

These tendencies in the evolution of the NIDL in Ireland would continue to unfold with the subsequent technological supersession of the minicomputer by the personal computer (PC) in the following decade. Emblematic landmarks in this industry's trajectory in Ireland were Apple's establishment of a PC assembly plant in 1980, and Intel's decision to locate an advanced microprocessor wafer manufacturing plant, along with PC and motherboard assembly facilities, in 1989. These foreign investments spearheaded a wave of relocations of computer manufacturers into the country, which would lead to a veritable boom in the Irish hardware industry up until the mid-1990s (van Egeraat and Jacobson 2004). However, increasing competition from lower wage countries, particularly from East Asia, struck the Irish electronic components sector, causing many low- and medium-tech component manufacturers to close their plants between 1995 and 1998 and relocate abroad (Barry and Van Egeraat 2008).¹⁴ The increasing substitution of smaller notebooks for bulky desktop PCs in the personal computer market rapidly eroded the proximity advantage and led to the rise of East Asia as a world market site for computer assembly (firstly in Taiwan and South East Asia, and later in China) (Dedrick and Kraemer 2008). This latest technological development in the computer industry would therefore drive Ireland's status as a location for system assembly of PCs into a final decline.

Now, if the rise and demise of the computer hardware industry was not synonymous with the rise and demise of the Celtic Tiger, this could only mean that a novel base for Ireland's integration into the IDL had developed in the meanwhile. As we shall see, this novel base was software production. So Ireland, once a leading location (along with Scotland) for the offshoring of computer manufacturing, became an equally leading world market site for the offshoring of software production.

THE RISE OF THE IRISH SOFTWARE INDUSTRY
AND THE BASIS FOR THE CELTIC TIGER'S BOOM
IN THE 1990s

The global emergence of a separate software industry can be traced back to the 1950s and 1960s (Dossani and Kenney 2008: 53–4). Its subsequent evolution in the late 1970s and early 1980s revolved around two main lines of development. On the one hand, the material autonomisation of software from hardware and, on the other, the achievement of sufficient production scales for the creation of a distinct software market composed of independent software vendors (ISVs) (Grad 2015). These two mutually reinforcing processes came to fruition in the 1980s. On the hardware side a first key milestone was the successful introduction of the IBM PC in 1981, which combined Intel's microprocessor and Microsoft's MS/DOS operating system (the Wintel standard that would become dominant by the late 1980s), and which resulted in declining hardware prices and an increasing demand for applications. But perhaps more fundamental for the evolution of the independent software industry was the introduction of the workstation in the early 1980s, which was adopted by business users given the limited computing capabilities of the first generations of PCs. The workstation was not only suited to a wide spectrum of business end uses, but also enabled stand-alone programming for mainframes. On the software side a first crucial landmark was the development and universal adoption of the Unix operating system, which combined with the workstation to crystallise in the emergence of the Unix-Workstation (U-W) standard. But what really revolutionised the ISV industry was the development of (and further recoding of Unix in) portable C programming language, which gave rise to Unix/C. In effect, these developments warranted the portability of applications and *system* software (Johnson and Ritchie 1978). Thus, if the U-W standard rendered software *production* platforms independent (because the workstation allowed programming for a whole spectrum of computers), software *products* also attained that status, inasmuch as they could be easily ported to run on very different and rapidly evolving machines. Crucially for the development of the NIDL in the industry, Unix/C programming language opened the doors to a wide fragmentation of the software production process, for it enabled the detachment of system architecture, design, and integration from programming itself, thus rendering the programming component modularised (Dossani and Kenney 2008: 54).

These successive technical revolutions in software production changed the productive attributes that capital demanded from wage-workers involved in its development. In the early mainframe era, a relatively simple (and gendered) division of labour emerged between the *planner*—a highly-skilled, usually male, scientific user—and the *coders*—usually women—who carried out the less complex work (Ensmenger and Aspray 2002). Plain coding initially involved the purely mechanical task of translating a set of instructions or operations delivered to the coder in a language of a relatively higher level of abstraction into a machine-specific numerical (ultimately binary) code. With the development of assembler programmes and assembly languages, this simplest aspect of coding—and therefore of software labour—was fully automated and correspondingly eliminated. This consequently changed the nature of coding, and gave birth to the *programmer*. Inasmuch as assembly language statements usually maintained a one-to-one correspondence with machine language instructions, while the latter varied with the different computer architectures, programming (coding) was now, in its simplest aspect, machine-specific. This required an understanding of the material structure of the machine from the programmer that only *on-the-job* experience could provide. This platform dependency of software was a great obstacle to its development.

The first clear step towards the overcoming of these initial limitations came with the development higher-level languages, whose main conceptual lines of development revolved around formal syntactic notation and formal semantic definitional techniques (Sammet 1972: 607). However, the vast proliferation of higher-level languages signalled that the potential to transcend platform dependency ultimately remained unfulfilled. Programming still involved a great deal of routine manual code-writing and was still very much dependent on an understanding of machine-specific architectures; in other words, it involved a great deal of labour that only a relatively experienced workforce could deliver. These material conditions of software production resulted in the *particularistic*, craft-like character of early programming that was much debated in the late 1960s (Ensmenger and Aspray 2002). In turn, this lack of *universality* in programming labour implied that the necessary productive attributes of the programmer could not be yet developed through a process of formal education.

Under these circumstances a, so-called, software crisis erupted. Essentially, it was a result of the increasing technological gap between accelerating computing capacity and lagging software productivity, so that

‘the errors in and cost of writing software tended to grow geometrically with the size of a software artefact’ (Campbell-Kelly 1995: 87). Larger-scale projects also clashed with the prevailing subjective, or craft-like, basis of the software technical division of labour. All this led to a series of efforts aimed at the development of the scientific management of its production process, which materialised in, so-called, structured programming during the 1960s and in the discipline of software engineering in the mid-1970s (Mir et al. 2000). Nevertheless, the actual overcoming of these barriers would only result from the further step forward in the automation of software production made possible by the aforementioned development of the Unix-C programming language.

As we have seen, this language ensured easy portability, and therefore resulted in the virtual universality (or platform independency) of the products of programming labour, that is of software. Easy software portability was the outcome of the elimination of a considerable fraction of routine programming labour, known as *porting*. In turn, this was possible precisely because this language succeeded to a large extent in the aspiration that all languages shared, to render programmes virtually independent of the specific material structure of the machines that powered them. This led to the widespread adoption of Unix-C programming language in the late 1970s and early 1980s, which implied that automatic coding by means of a high-level language attained a far reaching universality (Ensmenger and Aspray 2002: 141). Moreover, high-level language programmers were now capable of writing programmes with no knowledge of machine-specific material architectures. In effect, computers controlled by programmes called *compilers* automatically translated the universal instructions spelt out by the programmer into machine-specific codes. Fundamentally, from the point of view of the productive attributes of wage-workers, the upshot of these material changes in the software labour process was that the general skill requirement for the bulk of programmers came down to a command of Unix-C programming language, which *could now* be attained through a process of formal education.

Needless to say, the knowledge of the specific material architecture of computers and components still remained a most important part of software production. However, it became the attribute of newly emerging specialised organs of the collective worker, which was the other side of the general degradation of the productive subjectivity of the programmer. In other words, this technical change entailed a process of internal differentiation of the software collective labourer, now composed of system

architects, designers, integrators, and plain programmers. This was largely facilitated by Unix-C structured programming, which, by enabling a more definite separation between conception and execution, allowed the aforementioned modularisation of (plain) programming. In turn, this provided an objective material framework for the development of the technical division of labour and therefore a more solid basis for the development of larger-scale projects that the expanding processing capacity of computers increasingly demanded.

In sum, a particular combination of determinations was in place in the late 1970s and early 1980s that would prove of utmost significance for the ‘sudden’ emergence of the Celtic Tiger. On the hardware side, the appearance and rapidly-growing computing capacity of the micro-processor meant that smaller, more powerful, and substantially cheaper computers and hardware components could be produced, which became accessible to a wider range of business users. Additionally, the PC was created, opening a new and potentially immense market for computers. This implied, in turn, a huge increase in global demand for software production at all levels. As for software, the appearance of Unix-C programming language emancipated capital from the burden of its dependency on the lengthy on-the-job-learning of *particularistic* productive attributes of programmers, thus opening the door to speedy developments in the newly required universal productive attributes in portions of the existing or future workforce *worldwide*. Software production, a labour process that was at the core of computers (and hence of the NIDL), was itself starting to be subject to NIDL dynamics, in the same vein as hardware production had been a little more than a decade earlier. Economic conditions were therefore ripe for capital to valorise through the exploitation of the adequately skilled but *relatively* cheaper programmer that could be produced *outside* industrially advanced countries. The first steps in the fragmented internationalisation of the productive subjectivity of the collective labourer of software production started to unfold.

Now, inasmuch as both high-level programming language development and software companies with the capability to undertake large projects were mainly of US origin, a fluent command of the English language was an important and general skill requirement demanded from the potential respective organ of the collective worker to be offshored. On the one hand, while high-level languages tended to evolve towards everyday linguistic forms, English was the language of most pioneer developers. On the other hand, we are dealing here with the international fragmentation

of a mostly *intellectual* labour process, where the technical division of labour is not *objectively* borne by the materiality of the system of machinery of large-scale industry. Instead, and similarly in this respect to the manufacturing division of labour discussed by Marx, the unity of the collective labourer is based on a '*subjective* principle' (Marx 1976: 501), that is, it has no other immediate material support than the direct relations that its, now internationally fragmented, members are able to establish. As a consequence, their generally direct social co-operation in the software labour process can only be established through a common spoken language. It is regarding other, more *specific* productive attributes that differences between potential locations arise.

Following the laws of motion of the NIDL, as described in Chap. 4, the offshoring of the software labour process certainly started with its simpler tasks, which can be roughly subsumed under the label of plain programming. Although the precise content of the work to be done and therefore the skills required surely differed by type of software, all of them involved a definite (yet varying) amount of those plain programming tasks. But the plain programmer is always an individual member of a team that itself is a collective sub-organ of the (wider) collective worker, whose unity actually establishes the organisation of the respective production process as a whole. The plain programmer is therefore always immediately associated with other more highly skilled software workers. As a consequence, the qualitative and quantitative articulation between these two general kinds of productive subjectivity (that is, degraded and relatively more expanded) determined the specific pool of skills—computer scientists, mathematicians, physical scientists, electrical engineers, systems analysts, programmers, and so on—that global capital demanded in each particular case. The specificities of Ireland as a national space of valorisation, determined as they were by the particular forms taken by its very early subsumption under the novel general forms of the international division of labour, would make it an ideal location in this regard.

As we have seen, Ireland's subsumption under the NIDL in hardware production entailed the presence of a specialised complementary pool of relatively more skilled workers, which was necessary from the very beginning—and was thereafter reproduced in an increased scale through formal education—for capital to exploit the larger, relatively unskilled, and cheaper Irish workforce involved in the initial assembly of computers. Among a broader spectrum of workers trained in scientific, engineering, and technical matters this complementary organ of the collective labourer

was largely and crucially composed of individuals trained in electrical engineering, one of the main reservoirs capital would initially draw on to meet the demand for medium-skilled programming labour. Thus, Ireland could provide software-producing capitals with the skills pool that was technically necessary to profit from the exploitation of the relatively cheaper plain programming labour that was the main driving force behind the relocation of capital's valorisation process in the sector. On these grounds, Ireland would become the earliest preferred site for the global relocation of programming labour, which would in turn sow the seeds for the subsequent impressive expansion of the more variegated and dynamic software industry that was one of the key drivers of the prosperity associated with the Celtic Tiger boom during the 1990s.¹⁵

Thus, as the international fragmentation of software production took off—slowly at first in the second half of the 1970s, but more rapidly during the 1980s—Ireland became the main site for the relocation of a wide range of related labour processes. The activities of foreign (mainly US) companies locating in the country during those years can be divided into the following categories (Sands 2005: 47): (1) *software development centres*; (2) *systems integration, sales and consulting, custom software development*; (3) *software supporting sub-contractors*; and (4) *manufacturing, logistics, localisation, porting, testing*. A closer inspection of the distribution of firms in each category reveals that a broad base of leading TNCs, embracing virtually all different types of software related activities, were already locating in Ireland in the 1970s and 1980s. Thus, although US software product companies such as Microsoft, Oracle, and Lotus did tend to offshore mainly manufacturing, localisation, and distribution functions, there were significant cases of foreign TNCs that appended software development centres to their manufacturing operations, particularly among hardware manufacturing companies (such as Digital and Ericsson), and telecommunications firms (such as AT&T and Alcatel) (Coe 1997: 220–1). Interestingly for our argument, Coe also reports that Ireland would come to be seen as an important UNIX development centre in Europe, with companies such as Motorola and ICL establishing UNIX programming centres (Coe 1997: 220). In our view, this speaks to the fact that the original main driver of the international fragmentation of software production was, fundamentally, the search for cheap plain programming (coding) labour, the simplest but necessary part of any software labour process which, however, must always be technically combined with the corresponding full range of more complex associated skills. As a matter

of fact, Coe notes that some kind of dual workforce was being created in Ireland, with two distinct cores: 'one of highly skilled development and localisation staff and one undertaking the less demanding and more repetitive manufacturing tasks' (1997: 223). Later on, this feature would turn out to be crucial for the development of a vibrant Irish indigenous software sector during the 1990s, which became one of the most visible distinguishing marks in debates over the Celtic Tiger phenomenon.

The sample compiled by Sands (2005) also suggests that the distribution of software TNCs in Ireland across those four categories changed during the 1990s, indicating that their FDI seem to have been more concentrated in the last category (that is manufacturing, localisation, distribution), which is also the least skill-demanding category. In effect, although the localisation component involved more skilled work, it represented about 30 per cent of jobs in a typical software firm—half consisting of language graduates involved in translation and the other half of graduate software engineers who actually adapt code for the various national markets (Coe 1997: 222). Yet, this low-skill bias of software TNCs has been to a large extent made up for by the emergence and expansion of a thriving indigenous software sector. Although in the late 1980s it was still composed of very small firms mostly focused on custom software development and other related services for the local market, during the 1990s their strategy changed to product development for export and firms became somewhat larger, but ultimately (despite normal concentration processes) remained small in the main, with the sector thus remaining a highly fragmented one (Sands 2005: 49–53). These smaller-scale operations usually require both low- and high-skilled workers, with the latter generally in a higher proportion *vis-à-vis* larger software development. The dynamism of this indigenous sector has therefore offered a compensatory source of demand for more skilled software labour in the face of the relative skill-downgrade of the more recent wave of relocation by TNCs.

So far our account of the genesis of Ireland's transformation into a Celtic Tiger has placed the accent on the country's integration into the NIDL through its active participation in the computer and software industries, the fundamental carriers of the far-reaching material revolution in the conditions of production that channelled capital's global restructuring of social labour. But those were certainly not the only industries that found in Ireland a convenient national territory for the exploitation of relatively cheap but suitably qualified workers, based on the international fragmentation of the productive subjectivity of the collective labourer.

Notably, an equally dynamic pharmaceutical industry developed from scratch from the end of 1950s and took off during the 1970s. Interestingly for our argument, it followed the same general pattern that governed the overall broader integration of Ireland into the NIDL, namely its participation in medium-complexity portions of industrial labour processes. Experiencing continuous employment growth beyond the 1970s (even after 2001 crisis), the Irish pharmaceutical industry accounted for approximately five per cent of the country's manufacturing employment in 2005, exporting USD17 billion in 2006 (16 per cent of Irish industrial exports and more than a six per cent share of global pharmaceutical exports). The sector's workforce is one of the highest skilled within Irish manufacturing (Egeraat and Barry 2009).

The Irish medical and precision instruments industry is another economic sector that has experienced considerable growth since the early 1970s, as a result of TNCs' increasing tendency to offshore manufacturing activities, in line with the general dynamics of the NIDL (Barry and Bergin 2013). Indeed, by 1970 Ireland's medical and measuring instruments exports already represented a substantial share (about 25 per cent) of Irish total manufacturing exports (see McAleese and Martin 1972: 630–1). According to Barry and Bergin (2013: 326), Ireland is actually 'the second larger exporter of medical products in Europe, after Germany'. Furthermore, it is noteworthy that the share of medical precision and optical instruments in total manufacturing employment in Ireland is quite high (7.9 per cent) *vis-à-vis* the European Union (EU) (2.9 per cent) (Addison-Smyth 2005).

Finally, during the 1990s the country benefited from an important wave of inward FDI in service activities, especially call centres, which has also been an expression of the more recent unfolding of the NIDL through the international fragmentation of back-office work (Breathnach 2000). Crucial factors in this development were Irish relatively low-wages, the existence of a modern telecommunications infrastructure (resulting from a complete overhaul in the 1980s), and the availability of language skills. Indeed, US firms (among which are IBM, Compaq, Dell, Citibank, Hertz, and Oracle) account for 70 per cent of call centres in Ireland and 80 per cent of the sector's total employment, of which a high-proportion (70 per cent) is female labour, and almost a quarter (23 per cent) are foreign workers. By mid-1998, total call centre employment amounted to 6000 persons, distributed in 50 operative centres mainly concentrated in the Dublin region. More broadly, the specific pool of skills demanded

from the respective collective labourer also fits into the *general* pattern of Ireland's subsumption under the NIDL, that is, a comparatively high presence of medium-level productive functions coupled with the requisite army of cheap workers bearing a degraded productive subjectivity. As Breathnach (1988: 310) reports, employment in teleservices includes a considerable level of skilled graduate-level work (in the region of 50 per cent), but also a great bulk of routine work requiring lower skill levels.

In sum, we can now appreciate how the Celtic Tiger originated. As a consequence of the very early economic formation of Ireland as a national space of valorisation, the conditions prevailing in the country when the microelectronics revolution started to take shape favoured its pioneer-like integration into the nascent NIDL in a definite set of industrial activities. More concretely, although it also included some traditional sectors, the development of the Irish specificity within the NIDL was especially shaped by the international fragmentation of the pharmaceutical, medical and precision instruments, computer and software industries. These are all industries that demanded a comparatively large proportion of medium- to high-skilled workers, which global capital could find in Ireland at a substantially lower cost than in advanced capitalist countries (yet which were nonetheless geographically close to key European markets), alongside the requisite cheap and disciplined less-skilled work that for technological or economic reasons could not be relocated elsewhere (for example, East Asia). Moreover, all these sectors, along with an incipient international back-office service industry, experienced strong growth in Ireland as an expression of NIDL dynamics, and each one of them contributed to the 1990s boom. However, as for the boom itself, our approach suggests that the peculiar occasion of Ireland's sudden entrance on the world stage as the Celtic Tiger, was fundamentally determined by the explosive increase in global demand for computers and IT products during that decade, as the incorporation of the novel forms of computer-based automation generalised across the globe. Although the new technical basis of the global production of relative surplus-value had already emerged in the early 1980s, the cyclical downturn of the world market in the first years of that decade delayed the manifestation of the accelerated growth of the key driver sectors of the, so-called, new economy. As the world economy resumed an expansive phase during the second half of the 1980s, those sectors took off and actually led the recovery of global accumulation. It is no wonder then that most accounts tend to date the beginnings of the Celtic Tiger phenomenon to 1987, but cannot agree on the specific mix of (externally-related) economic and political

factors that changed in those years in order to explain the boom (inter alia: fiscal stabilisation; tax cuts and government-size reductions; social partnership; belated natural convergence inhibited first by protectionism and then by ‘poor and wrong-headed fiscal policy’; state policies that raised the education levels of the workforce; an unexplained miraculous sudden growth in export markets and/or inward FDI; competitive devaluations of the Irish pound in 1986 and 1992; the formation of the single European market; or, lastly, EU structural funds) (see Breathnach 1998; Kirby 2004, 2010; O’Malley 2012). In our view, the reality is that the *fundamental ‘structural’ underlying causes or determinations* of Ireland’s ‘Tigerhood’ had already been laid out earlier by the specificity of Ireland’s subsumption under the NIDL as discussed in this chapter. In this sense, no profound change occurred *circa* 1987. The point is that the cyclical conjuncture of the world economy in the late 1970s and early 1980s meant that the effects of the structural transformations would remain latent for some years. Likewise, we can only tentatively suggest here that the explanation for the *end* of the boom (that is, the transformation of the Celtic Tiger into a Eurozone crisis economy) should also be sought in the twofold dynamics of the further development of the NIDL [the appearance of new competitors with cheaper and more disciplined but adequately-skilled labour-power in key sectors in Central and Eastern Europe and (South-)East Asia], and of the further cyclical development of the long-standing crisis of general overproduction of capital on a world scale.

CONCLUSION

In this chapter, we have offered a historical sketch of the long-term developmental trajectory of capital accumulation in the Irish national sphere of valorisation. We grounded it in the essentially global dynamics of the accumulation of the total social capital, through the production of relative surplus-value and changes in the modalities of the international division of labour they entailed.

As we have seen, from its genesis as a politically-autonomous national space of valorisation up until the crisis of ISI in the late 1950s, Ireland had been subsumed under the CIDL on extremely weak foundations, which in turn are the expression of a modest and declining flow of ground-rent into the national territory. This led to the constitution of what proved to be a long-standing and resilient determination of Ireland as a reservoir of latent and stagnant surplus population for the needs of global capital

accumulation, which would be reproduced under changing historical forms. This determination gives unity to the first great phase of capitalist development in the country.

Premised on this 'chronic' historical condition that redounded in the availability of a mass of cheap yet adequately skilled labour-power and a strategic geographical location, the Irish national space of valorisation experienced a pioneering subsumption under the NIDL in the making from the 1950s. These conditions constitute the second great phase of capitalist development in the country, and would give the integration of Ireland into the NIDL an idiosyncratic shape. In the first place, from a very early phase the Irish process of capital accumulation was marked by a pattern of specialisation of its productive structure that revolved around, what was then, a key sector of an emerging microelectronics-based automation of capitalist large-scale industry (computers and hardware first in the 1970s and 1980s and software a decade later). In the second place, unlike the late-industrialisation experiences of the East Asian Tigers, the subsumption of Ireland under the laws of motion of the NIDL did not start with the simplest organs of the collective labourer of large-scale industry. Instead, from the very beginning capital could profit in Ireland from the exploitation of the cheaper labour-power of medium-complexity productive attributes available in that national sphere of valorisation (alongside the requisite mass of unskilled workers it could also find there). These are the historical conditions that eventually came into fruition in the 1990s and which therefore underlay the impressive economic expansion associated with the Celtic Tiger boom.

At first sight, this phase of prosperity seemed to imply that Ireland had definitively overcome its historical condition as a reservoir of relative surplus population for the global accumulation process. However, the Celtic Tiger's recent crisis seems to suggest that one should not rush to conclusions and that Ireland's subsumption into the NIDL might not rest on very solid foundations. On the one hand, the very transformative tendencies of the material forms of production of relative surplus value that underlie the NIDL constantly make possible the integration of ever newer sources of even cheaper and more compliant but suitably-skilled labour-power. On the other hand, those very same tendencies revolutionise the means of communication and transport and thereby lead to the gradual erosion of any competitive advantage in geographical proximity to European markets that has also played its part in the peculiar forms taken by Ireland's subsumption under the NIDL.

NOTES

1. See the respective Chaps. 2 and 3 for an extended account of the determinations behind the incorporation of new territorial sources of raw materials for global capital accumulation and the consequent configuration of the ‘classical’ international division of labour.
2. See Chap. 2 and Starosta (2010) for the determination of small industrial capitals and their systematic release of surplus-value in circulation.
3. Surprisingly, Kirby (2010) quotes these figures as evidence of the ‘initial success’ of the new government’s industrialisation policy.
4. Between 1932 and 1938 exports were also affected by the Economic War with Britain that followed the Irish government’s decision to stop payment of land annuities owed to the British Exchequer and which had originated during the land reform period.
5. See Marx (1976: 794–802) on the different modes of existence of the relative surplus population resulting from the unfolding of the general law of capital accumulation.
6. See Chap. 4 for a further examination of these issues.
7. Although from an early stage the Irish working class lacked the relevant ‘particularistic’ technical skills, they possessed the ‘universalistic’ productive attributes (including flexibility and versatility) derived from a generally good level of basic education (Breathnach 2007: 136). As for the former particularistic productive attributes, note that most jobs in the newly emerging sectors initially were either ‘unskilled’ or, in a minority of cases, were ‘semi-skilled’ (Barry and Brunt 2002; Breathnach 1993); in both cases, those attributes could be more or less rapidly developed with ‘on-the-job’ training.
8. The government received £40.8 million plus a £6.5 million grant between 1949 and 1952, but total net capital inflow during those years amounted to £106 million (McAleese 1972).
9. Some authors place this low corporate tax regime on an equal footing with cheap but adequately-skilled labour power as the fundamental reason for the inflow of FDI into Ireland (Barry 2004: 16). O’Hearn (2003: 37) goes as far as considering it as essential to the inflow of FDI by TNCs, with an available pool of relatively low-waged IT experts reduced to a factor of secondary importance, since their wage bill is relatively low compared to other costs. These views fail to ask about the source of social wealth that can sustain such a low corporate tax without eroding the normal fiscal base of the capitalist state. In fact, O’Hearn unwittingly offers clues to this question. As he notes, the low corporate tax regime went hand in hand with a drastic and regressive rise in taxes on incomes and expenditures which, moreover, was not directed towards spending in basic social

programmes (O’Hearn 2003: 47–50). Thus, the levels of state spending on health, social housing, and education were among the lowest in Europe in the mid-1990s, with many social services run down. But this can only mean that the low corporate tax rate regime is only sustainable at the expense of undermining the normal conditions of long-term reproduction of the Irish working class—that is, at the expense of the purchase of labour-power at its full value. In other words, the low corporate tax regime seems to be but a concrete form of the exploitation of relatively cheap labour-power and not an independent factor in attracting FDI.

10. Concerning the IDA in particular, it is noteworthy that even those who see it as a planning agency that autonomously steered the form of integration into the NIDL recognise that in key cases the selection of (eventually successful) target industries usually follows a prior wave of uninvited inflows of FDI. Thus Barry (2004: 18) narrates that ‘having attracted several computer and components firms in the 1970s, for example, and being favourably impressed by their performance in situ, electronics and computer software were among the industries listed as meeting these criteria in 1983, when an all-out campaign to develop Ireland as a major European location of such activities began’. Similarly, the turn to a deliberate ‘export-oriented strategy’ in Korea occurred *after* the *unexpected* impressive performance of exports towards the end of the ‘inward-looking’ First Five-Year Plan, which took even policy makers by surprise (Grinberg 2011).
11. Strictly speaking, as the experience of late industrialisation in Taiwan shows, it is possible for a mass of small capitals to turn into the active immediate subjects of the valorisation process on the basis of their subsumption under the NIDL. However this possibility must be predicated on a much cheaper labour-power and more brutal conditions of its consumption (that is, exploitation) than the historical conditions of reproduction of the working class prevailing in Ireland allowed. As for the Korean experience of generating national champions (that is, the *chaebols*), it must be noted that those large industrial conglomerates had already been created *before* the turn to ‘export-oriented industrialisation’ (Krause 1997: 138; Kim 1976; Woo 1991).
12. Although it is true that the share of exports to the UK tended to decline, it still reached 63.1 per cent in 1971. By contrast, the share of exports to the EEC reached only 12.4 per cent (other OECD countries took 13.8 per cent and all other areas 8.1 per cent) (McAleese and Martin 1972: 616–7). The composition of exports by destination was therefore very varied.
13. By 1980–1981 the occupational structure of the electronics industry in Ireland was, in international comparative terms of the complexity of labour-power, halfway between that prevailing in the USA and that in the, so-called, East Asian Tigers (Drew and Foster 1994; see also Barry and

- Brunt 2002; Breathnach 1993). On the other hand, compared with the average Irish manufacturing occupational structure, the electronic industry is relatively more skilled.
14. PC assembly operations peaked in 1998 (when measured by employment figures) and started to shrink thereafter, so that by 2002 the only system assemblers remaining in Ireland were Dell and Apple (with the latter heavily downsized) (van Egeraat and Jacobson 2004: 813–14).
 15. Evidence of this lies in the fact that, even allowing for a threefold overstatement of Irish figures due to transfer price fixing by TNCs to benefit from the country's low corporate tax policy, Ireland's software exports in 1990 were still seven times greater than those of Israel or India (Dossani and Kenney 2008: 56).

REFERENCES

- Addison-Smyth, D. 2005. Ireland's Revealed Comparative Advantage. *Central Bank of Ireland Quarterly Bulletin* 1: 101–14.
- Barry, F. (ed.). 1999. *Understanding Ireland's Economic Growth*. London: Macmillan.
- Barry, F. 2000. Convergence is not Automatic. *The World Economy* 23(10): 1379–94.
- Barry, F. 2004. Export-Platform Foreign Direct Investment: The Irish Experience. *EIB Papers* 9(2): 8–37.
- Barry, F., and A. Bergin. 2013. Offshoring, Inward Investment and Export Performance in Ireland. In *The Oxford Handbook of Offshoring and Global Employment*, ed. A. Bardhan, D. Jaffee, and C. Kroll. Oxford: Oxford University Press.
- Barry, A., and B. Brunt. 2002. Female Employment in the Multinational Electronics Industry in Ireland's South-West Planning Region. *Irish Geography* 35(1): 28–39.
- Barry, F., and C. van Egeraat. 2008. The Decline of the Computer Hardware Sector: How Ireland Adjusted. *Quarterly Economic Commentary* Spring: 38–57.
- Breathnach, P. 1988. Uneven Development and Capitalist Peripheralisation: The Case of Ireland. *Antipode* 20: 122–41.
- Breathnach, P. 1993. Women's Employment and Peripheralisation: The Case of Ireland's Branch Plant Economy. *Geoforum* 24(1): 19–29.
- Breathnach, P. 1998. Exploring the "Celtic Tiger" Phenomenon: Causes and Consequences of Ireland's Economic Miracle. *European Urban and Regional Studies* 5(4): 305–16.
- Breathnach, P. 2000. Globalisation, Information Technology and the Emergence of Niche Transnational Cities: The Growth of the Call Centre Sector in Dublin. *Geoforum* 31(4): 477–85.

- Breathnach, P. 2007. Inward Investment to Ireland. In *Doing Development Differently: Regional Development on the Atlantic Periphery*, ed. S. Hodgett, D. Johnson, and S.A. Royle. Sydney: Cape Breton University Press.
- Campbell-Kelly, M. 1995. Development and Structure of the International Software Industry, 1950-1990. *Business and Economic History* 24(2): 73-110.
- Coe, N.M. 1997. US Transnationals and the Irish Software Industry: Assessing the Nature, Quality and Stability of a New Wave of Foreign Direct Investment. *European Urban and Regional Studies* 4(3): 211-30.
- Dedrick, J., and K.L. Kraemer. 2008. Impacts of Globalization and Offshoring on Engineering Employment in the Personal Computing Industry. In *The Offshoring of Engineering*, ed. National Academy of Engineering. Washington, DC: The National Academies Press.
- Dossani, R., and M. Kenney. 2008. Implications of Globalization for Software Engineering. In *The Offshoring of Engineering*, ed. National Academy of Engineering. Washington, DC: The National Academies Press.
- Drew, E.P., and F.G. Foster (eds.). 1994. *Information Technology in Selected Countries: Reports from Ireland, Ethiopia, Nigeria, and Tanzania*. Tokyo: United Nations University.
- Ensmenger, N., and W. Aspray. 2002. Software as Labor Process. In *History of Computing: Software Issues*, ed. U. Hashagen et al. Berlin: Springer-Verlag.
- Grad, B. 2015. Software Industry. IEEE STARS program. http://ethw.org/index.php?title=Software_Industry&oldid=112940. Accessed 26 Oct 2015.
- Grinberg, N. 2011. Transformations in the Korean and Brazilian Processes of Capitalist Development between the mid-1950s and the mid-2000s: The Political Economy of Late Industrialisation. Unpublished PhD diss. London School of Economics and Political Science.
- Guinnane, T.W., and R.I. Miller. 1997. The Limits to Land Reform: The Land Acts in Ireland, 1870-1909. *Economic Development and Cultural Change* 45(3): 591-612.
- Johnson, S.C., and D.M. Ritchie. 1978. UNIX Time-sharing System: Portability of C Programs and the UNIX system. *Bell System Technical Journal* 57(6): 2021-48.
- Kim, K. 1976. Political Factors in the Formation of the Entrepreneurial Elite in South Korea. *Asian Survey* 16(5): 465-77.
- Kirby, P. 2004. Development Theory and the Celtic Tiger. *European Journal of Development Research* 16(2): 301-28.
- Kirby, P. 2010. *Celtic Tiger in Collapse*. Basingstoke: Palgrave Macmillan.
- Krause, L. 1997. The Political Economy of Korea: Fifty Years of Macroeconomic Management. In *The Korean Economy 1945-1995: Performance and Vision for the 21st Century*, ed. D. Perkins, D. Cha, and K. Kim. Seoul: Korea Development Institute.
- Krugman, P. 1998. Good News from Ireland: A Geographical Perspective. In *International Perspectives on the Irish Economy*, ed. A. Gray. Dublin: Indecon.

- Marx, K. 1976. *Capital*, vol. 1. Harmondsworth: Penguin.
- McAleese, D. 1972. Capital Inflow and Direct Foreign Investment in Ireland 1952 to 1970. *Journal of the Statistical and Social Enquiry Society of Ireland* 22(4): 63–105.
- McAleese, D., and J. Martin. 1972. Ireland's Manufactured Exports to the EEC and the Common External Tariff. *Economic and Social Research Institute, Economic and Social Review* 3(4): 615–31.
- Mir, A., B. Mathew, and R. Mir. 2000. The Codes of Migration Contours of the Global Software Labor Market. *Cultural Dynamics* 12(1): 5–33.
- Mulhall, T. 1988. The Politics of Irish history. Transition in Ireland: Modernization or Underdevelopment?. Unpublished MA diss. Dublin City University.
- O'Hearn, D. 2003. Macroeconomic Policy in the Celtic Tiger: A Critical Reassessment. In *The End of Irish History? Critical Reflections on the Celtic Tiger*, ed. C. Coulter and S. Coleman. Manchester: Manchester University Press.
- O'Malley, E. 1981. The decline of Irish industry in the nineteenth century. *The Economic and Social Review* 13(1): 21–42.
- O'Malley, E. 2012. A Survey of Explanations for the Celtic Tiger Boom. IIS Discussion Paper, 417, Institute for International Integration Studies, Trinity College Dublin, October.
- ÓGráda, C. 2002. Is the Celtic Tiger a Paper Tiger? In *Quarterly Economic Commentary*, ed. D. McCoy, D. Duffy, J. Hore, and C. MacCoille. Dublin: Economic and Social Research Institute.
- ÓRiain, S. 2004. *The Politics of High-Tech Growth: Developmental Network States in the Global Economy*. New York: Cambridge University Press.
- Regan, C. 1980. Economic Development in Ireland: The Historical Dimension. *Antipode* 12(1): 1–14.
- Sammet, J.E. 1972. Programming Languages: History and Future. *Communications of the ACM* 15(7): 601–10.
- Sands, A. 2005. The Irish Software Industry. In *From Underdogs to Tigers: The Rise and Growth of the Software Industry in Brazil, China, India, Ireland, and Israel*, ed. A. Arora and A. Gambardella. Oxford: Oxford University Press.
- Starosta, G. 2010. Global Commodity Chains and the Marxian Law of Value. *Antipode* 42(2): 433–65.
- van Egeraat, C., and F. Barry. 2009. The Irish Pharmaceutical Industry Over the Boom Period and Beyond. *Irish Geography* 42(1): 23–44.
- van Egeraat, C., and D. Jacobson. 2004. The Rise and Demise of the Irish and Scottish Computer Hardware Industry. *European Planning Studies* 12(6): 809–34.
- Woo, J. 1991. *Race to the Swift: State and Finance in Korean Industrialization*. New York: Columbia University Press.