Learning from past investment incidents in peripheral regions: semiconductors in Patras, Greece.

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Executive Summary

Based on a case study of **recent investment incidents (Atmel)** in the semiconductor industry at Patras, Greece, the paper attempts to contribute to a **better understanding of historically grounded cross-regional, multiscalar economic development dynamics and contingencies**. It is attempted to articulate this through the case study in a number of ways: a) by exemplifying the role of FDI in cross-regional knowledge based **innovation networks**, b) by presenting a case of **transantlantic investment flows and global business operations** and division of labour in **multiple locations**, as has been the case with the Atmel Group, c) by focusing on a particular section of the **ICT industries** (semiconductors-microcontrollers) which according to the literature showed long time propensity to organise in Global Production Networks, and d) by bringing into this discussion the role of **nationality**, relations between **public and private R&D** and **national and regional policy contexts**. Atmel's volatile (dis)investment in fabless R&D in the host region is thus best interpreted by using the conceptual framework suggested by Dawley (2007): "that accords a full and active role to the agency of the firm and the interrelations with the geographically variable socioinstitutional contexts that produce, regulate, and mediate investment decisions". In discussing the recent post-(dis)investment history the article also presents evidence of increasing momentum towards realising the potential of "regional assets", initiated by historical and path-dependent development of regional knowledge institutions strengthened by the previous investment episodes and the ensuing socio-institutional learning of the involved regional research, development and entrepreneurial community.

Keywords: *disinvestment decisions, semiconductor industry, investment incidents, lessons, Western Greece*

1. Introduction

The main topic, around which, this paper is constructed is the investment episode of U.S. semiconductor firm Atmel in a design and development facility at Patras, Western Greece.

Atmel's subsidiary, Atmel Hellas located in 1999 its design and development centre in the business incubator of PSP, but taking benefit of the supportive provisions of the Greek development law, moved to privately owned premises, in 2000. Atmel concluded an agreement with the Greek government to receive a 40% subsidy on investment and employment creation. At the same time Atmel's investment in the design facility was emphasized by government actors as a major **event for FDI attraction in the new technologies in Greece**, up to 2004. It was also a part of the National Centre for Investment[i] campaign for foreign investment attraction and a high profile case presented before the Athens business club that operated in parallel to the 2004 Olympics. The design facility gave work to 100-140 people until 2006, when Atmel announced its intention to close it, following of a strategic corporate plan to cutback on less profitable and non-core activities. The way the case evolved, with the shortness of the investment cycle and fast withdrawal of Atmel from the location of Greece, presents an opportunity to draw lessons on what drives the location-(dis)investment decisons of MNEs, efforts for FDI attraction from the state, and the local impacts of MNE investment.

The investment episode can be described as comprising of two major "events", namely the "moment" of establishment or investment and the point of the divestment or closure. Furthermore three phases can be described in relation to the two major events; the pre-investment phase, the operational phase and the post-disinvestment phase.

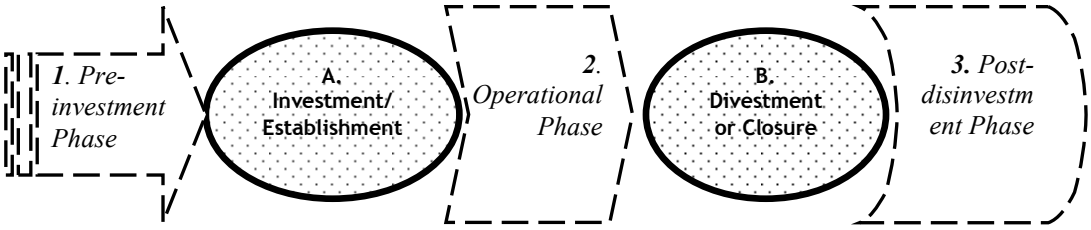

Illustration 1 Phases and Events of the investment episode

Based on this formalised historical conceptualisation the paper seeks to explore and whenever possible provide explanations to a set of questions relating to the investment episode. The main questions are related to the decision(s) behind the two major events; the investment and divestment. Following the conceptual approach by Dawley (2006) that "articulates MNE investment decisions within a historically grounded, socioinstitutional framework centered on an economic geography analysis of the corporation and the national, regional, and local institutional contexts" we content that it can be applied to interpret also the short and fluctuating history of investment in Research Design and Development in wholly owned fabless production facilities of the MNE firm in Patras.

I. **What was the enabling-facilitating context for the investment in Patras?**

The first point the paper seeks to make is to ground the investment episode employing the multiscalar, multilevel and socioinstitutionally embedded settings and incentives and specific social, cultural and political contexts both within and external to the corporation (Dawley).

II. **What were the intra-corporate and political institutional contexts, which shaped the divestment?**

The second question is what were the factors behind the decision for the closure or divestment. Any answer to the question has to be informed by an understanding of what was the decision making framework inside the company involving the branch, the company department and the mother company strategic considerations. Subsequent issues of attention are the role of the branch in the intra-corporate hierarchy and division of labour, the degree of autonomy and self-management vis-à-vis the parent company, the growth and market history of the branch and the choices of technological development as well as factor relating to the company as a whole, its business and competition strategy and positioning in the Original Equipment Manufacturers of the semi-markets. The aim of the paper is to analyze the **divestment**, in terms of the integration-responsiveness framework, and secondarily intracorporate decision making (internal competition-hierarchy), the developments within the Global Semiconductors Production Network (restructuring-rationalisation), and the role of institutions and embeddedness.

To a lesser extent we will deal in this paper, in a rather exploratory way with the nature of relations between the branch and the local economy during its operations phase. We will also proceed to explore the main long-terms effect of the investment that could be identified at the time of conducting the research.

In order to approach the research questions we construct a single (holistic) case study with a set of embedded levels of analysis (Yin, 1991). In explaining the two main events we propose a conceptual framework, which integrates four main actors, four decision arenas, and the semiconductor Innovation Networks and Knowledge clusters concepts as foundational elements.

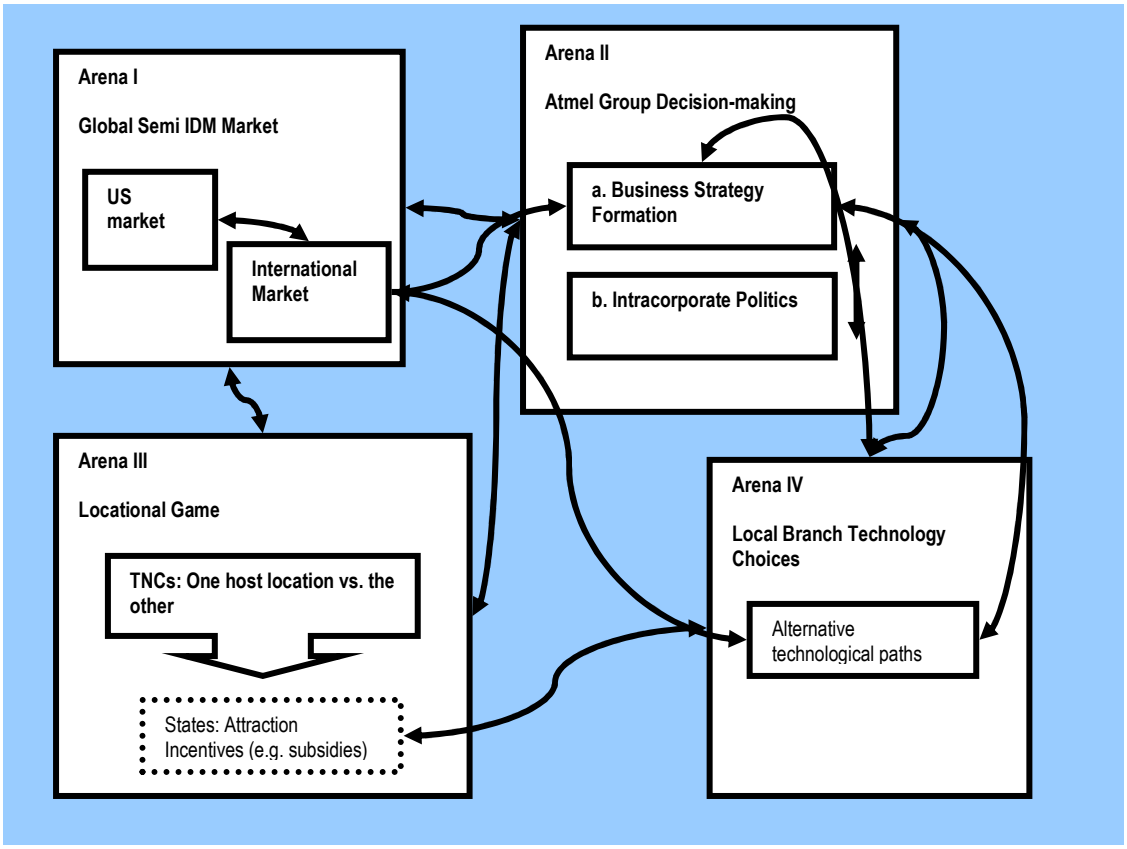

Illustration 2 Critical arenas for the Patras (dis-)investment

The case of Atmel investment is **relevant** to the discussion of semiconductor inward investment in peripheral regions, *first* because it can be compared and contrasted to other cases (of Atmel and other MNE investment) and help identify differences in the socio-institutional context and corporate-territory relationships, *second* because it is a case of investment in semiconductor research, design and development (fabless) rather than fabrication, and can thus help expand the picture and *third,* because of the differential effects it had on the local economy, especially in terms of the interaction with local educational institutions (University, research centres), new business start-up creation and the local labour market, which are dissimilar to the other known cases.
Especially for the Greek context Atmel's investment has been acknowledged as of instrumental importance to the development of the Greek semiconductors sector and thus merits an analysis as it relates to many recent spatial economic phenomena (new firm formation).

2. Theoretical framework

The role of MNEs has been an exceptional feature of the contemporary economic, social and political developments. Increased MNE activity is now more than ever before, a fundamental characteristic of the international economic system. It seems that there is little dispute that MNEs have become "the primary movers and shapers of the world economy" (Dicken, 2007). The ability of MNEs to tap into productive resources and take up operations in multiple locations and at an almost global scale, has kept the interest on analyzing, attracting, and managing FDI flows ever increasing.

Meanwhile, **strategies for attracting inward investment** have become a common feature of development policies of nations, as well as, increasingly of subnational entities. The case of Ireland's phenomenal success with attraction of inward investment has fed the belief that inward investment can be the shortcut to higher levels of development. However, studies of the Irish case and other, also point out to the significance of other factors, beyond price competitiveness and attraction policies, which have enabled and helped sustain the local operations of MNEs (Pike and Rodriguez-Pose).

Attraction and retention of inward investment has been a cornerstone of local and regional policies. Especially for the peripheral and less favoured regions of Europe (Armstrong and Taylor), inward investment strategies have been coupled with the use of incentives, by the EU regional policy, as well as state policies. The absence of EU-wide regulation for inward investment attraction in regions, apart from the competition regulation and state grants, has allowed for the set-up of locational tournaments, where MNEs "play one less favoured region against the other, in search for the highest bidder" (Cheshire and Gordon).

Studies of **MNE location in regional economies** (e.g. Location of Automotive Industry in Britain) have been a central theme of regional and economic geographical research in the last decades. This research agenda has expanded with case studies of high-profile investments and divestments or closures (Phelps et al). Another strand of the literature has investigated and classified the "embeddedness" of firms and industries within their local environment or milieu (White). The classification of foreign owned firms as being of a "development" or "dependent" type by Turok (1993) is a useful conceptualisation of the effects of local MNE affiliates, and their backward and forward linkages with their host economies. More recent contributions have expanded the area of inquiry beyond the "territorial linkages", which emphasized supply factors, and into the area of "network linkages", which attempts to constitute the local affiliate more broadly in the network of international transactions (White).

Another distinct feature of recent attempts to deal with the location decisions of MNEs, as well as the divestment decisions, has involved the opening up of the "black box" that has been the **firm** for mainstream economic research, despite its obvious economic significance and central place in economic geographical theory (Phelps and Fuller, 2000). Intracorporate competition and internal decision making, due to the effects they bear on the location and flows of economic activities are "becoming central to the understanding of contemporary industrial restructuring, regional development, and policy" (Phelps and Fuller, 225).

In technology management, "there is increasing consensus among, scholars, policy makers, and practitioners that the present and future secret of business survival and prosperity lies in strategic partnering and co-opeting successfully rather than outright competition. This is particularly so in **knowledge-intensive, highly complex and dynamic environments** such as all high technology industries where collaborating to compete in knowledge generation and exchange has become so pervasive it is often hard to notice having become the standard modus operandi" (Carayannis and Alexander, 1999). In understanding the firm decisions of strategic **co-opetitive R&D partnerships**, argues Carayannis and Alexander, one should examine "how a knowledge generating and leveraging value-maximising organisation (not just a for-profit firm), should position itself in relation to the range of players with whom the organisation interacts (in terms of market relationships, generating and pooling of strategic knowledge assets including intellectual property rights and human capital, and other dimensions) to maximise shareholder value in the long term. This " 'bull's eye' model may help capture more fully the dynamics, nature and potential of co-opetitive, knowledge-driven linkages among profit and not-for profit, private and public, research, policy analysis and education-focused institutions" (Carayannis and Alexander). In the history of Atmel's involvement with the Patras location, there is strong evidence of the dynamics and linkages suggested by the "bull's eye model"; in the strategic partnership and acquisition of DCT, the investment in and formation of Atmel Hellas, the multifaceted collaboration between Atmel, the Patras University and the Greek state.

While recent theoretical development shed more light into the process of MNE investment and divestment, the theoretical directions of **Global Production Networks** (Dicken et al), the Eclectic paradigm (Dunning) and product cycle theories (Vernon) form a conceptual basis on which an articulate explanation of location drivers, and the evolutionary process behind investment decisions and outcomes can be formed.

Corporate decisions to invest or divest are based on a multitude of processes and justifications, which cut across the corporate structure and are influenced, or in some cases caused, by external factors. As Benito (2005) argues there is a variety of approaches and perspectives to study **divestment**. Appropriate levels of analysis include the "national and regional, the industry level, the firm and even individuals". Interestingly, "one should not presume that the insights provided by geography, economics, and business research can make greater claims of fruitfulness and understanding than those provided by sociological and political approaches".

While the main streams of the literature on divestment —industrial organisation, finance and corporate strategy (Chow and Hamilton qtd in Benito)—can provide the broad base to discuss this particular case of divestment (Atmel's), the case does not fit well with more specific frameworks, like the "integration-responsiveness" framework employed by Benito to analyse "how the core factors may lead to relocation, divestment and market exits as the effects of corporate restructuring and adjustment processes, and not just as failures in foreign markets". The incompatibility lies in the fact that the Patras Development Centre was not a

branch plant intended to serve the local or national market but to develop products for wireless LAN and Voice over IP that Atmel would market globally. Therefore in this case core factors behind divestment are corporate restructuring and adjustment and performance in global markets.

The integration-responsiveness framework focuses on business strategies a) as ideal types and in general and b) as specific drivers for integration and responsiveness. In Benito's words, "appropriate strategies are those that match companies' resources and capabilities to given market conditions in various locations. The decisive determinants are the extent to which there are, on one hand, significant competitive advantages to be gained by integrating activities on a world-wide basis—especially economies of scale and scope—and on the other hand, market and resource conditions in specific locations demand local adaptation and responsiveness; hence the label integration-responsiveness model."

The literature on the **potential impacts of inward investment in the 'host' economies** (Dicken, 2007), provides us with a set of effects of an MNE in a host economy, that can form the base for our discussion. Namely, effects related to the 'local organisational ecology of the firm' ("the mix of firms and parts of firms, foreign and domestically owned, connected together through geographically extensive production circuits and networks"), and other more strictly economical effects starting from the injection of capital, and going on to the technology transfer, the quantity and quality of local linkages, the influence upon local firms (competition, linkages, stimulation of spin-offs) and finally job creation (number and quality of jobs) and effects on labour relations.

Perhaps the most instructive approach to the study of **(dis-)investment in semiconductors in Europe's peripheral regions** comes from the economic-geographical framework expanded by Dawley (2007) and used in his article to interpret the history of fluctuating rounds of inward investment in semiconductor fabrication in England's Northeast. We believe that the holistic conceptual framework proposed therein, as well as, the specific generalised propositions:

- "on the pivotal agency of the corporation, as an actor in connecting, mediating, and producing processes of economic and political power over time, across space, and in place",
- explaining the particular "responses to the dynamics of the semiconductor industry as moments that were molded within the longer-term path-dependent institutional and geographical evolution of the corporation,
- revealing "how each corporate investment decision evolved in response to particular multiscalar institutional institutional settings and incentives and specific social, cultural and political contexts both within and external to the corporation,
- in "placing firms" and "firming places" within the economic geography analysis of MNE (dis)investment episodes,
- revealing the sustained asymmetry of power between MNEs and host economies that ceded political leverage through the development of "low cost to enter-low cost to exit" regulatory environments,
- on "power geometries within intra-corporate managerial, technical and divisions of labour that structure and are structured by the quality of MNEs' functional and political integration between home and host countries",

constitute a solid analytical basis on which to interpret and relate the (dis)investment episode and decisions of the Atmel group in the region of Western Greece. While our dealing with the Atmel investment is informed by the approach taken by Dawley's article we seek to draw also from the literature on co-opetitive R&D consortia (Carayannis and Alexander) to inform our historical understanding of the dynamics of the US semiconductor market in the

period of Atmel's (dis-)investment decisions in transatlantic knowledge and development locations. We contend that evolving strategic dispositions of the US semiconductor producers market provided the initial contextual drive for Atmel's takeover strategy that eventually reached the Greek location.

Furthermore in the presentation of our case we are seeking to assist comparability and cross-examination with the previous documented cases of the North Tyneside fabrication facility (Siemens and Atmel). In that respect there should be noted two critical differences: first that the Patras investment was in a fabless research, design and development facility, not in a fabrication plant. This does not create any known problem in the applicability of the analysis, since the Atmel Group's strategy in the relevant study period covered acquisitions and investments in both fabless plants and foundries. This difference provides an option for further research in Atmel's location decisions in Europe and the organic links between the various facilities. Second, our empirical data on Atmel's Patras (dis-)investment decision, point to the role of individuals in the top management of Atmel Group, Atmel MMC department and Atmel Hellas in functionally and politically mediating between and integrating the home and host institutions in a power geometry were within and beyond the intracorporate, managerial and technical divisions of labour highlight, the culture, nationality and sentiment also play a role. This conjecture, we argue, is strengthened by the presence of an uncontrollable change in intra-corporate politics, the resignation of the executive officers and its affiliates, which was preceded by a change in corporate and stakeholder attitude from a territorially and technologically expansive strategy favouring European location to a more grounded to US assets and socio-institutional context restructuring move to fabless design in core technologies.

Illustration 2, proposes a summarized view of the relevant contexts (arenas) for the (dis-)investment.

Methodology

The **methodology** used included semi-structured interviews with five groups of people involved: the management team of the Patras Science Park, members of the management team of the Atmel design facility, former members of staff who have moved to other businesses since the contraction, as well as, government officials responsible for inward investment and university researchers and professors. Interviews took place over the period of February-March 2008. It has been attempted to support the inferences expressed by the informants especially on the issues of corporate decisions and strategy with a study of the relevant corporate literature, press statements, news reports and analyses. The overall approach was inductive, suggesting an analytical framework based on basic directions and relationships provided by the case study data.

2. The case of Atmel facility at Patras

The creation of Atmel Hellas: acquisition and changing multilocational contexts

The case of the Atmel investment in a design and development facility at Patras, begun in 1999, when Atmel acquired **DCT** (Data Communications Technologies), a data communication systems designer headquartered at Research Triangle Park (RTI), NC, US, having a Development Center in Patras Greece. DCT started operations in 1995 and launched products in microcontrollers and wireless modems. As an equity partner in this venture, RTI provided DCT with office space and equipment during its start-up phase. DCT was financed with corporate investment from Atmel Corporation. DCT and Atmel also had an agreement for joint

development of a number of state-of-the-art integrated circuits, which were manufactured and sold by Atmel. In 1998, an agreement was concluded between Atmel and DCT, for the acquisition of the latter[ii]. This included the Development Center of Patras[iii]. DCT had been designing modem technology products and at 1998 had brought Rockwell's K56Plus modem technology to the market through its own modem products[iv]. DCT's work from the beginning of its R&D life has been multi-located, at the RTI and also at Patras (DCT-Hellas) and characteristically the founder and vice president were graduates of the faculty of Electrical Engineering at Patras University.

The acquisition of DCT took place within the evolving landscape of the US semiconductors industry. The leading research consortium of semiconductor manufacturers, SEMATECH, made major changes in its (collaborative) strategy in the years post 1995 from competitive to pre-competitive R&D consortia to co-opetitive approaches of collaboration modes (Carayannis and Alexander, 2004). In 1996, in particular, direct US government funding of SEMATECH ended. "This gave SEMATECH more flexibility in its strategy, as it [did] not [have to] answer to the public policy imperatives imposed by government funding." (Carayannis and Alexander, 2004: 4). "While SEMATECH was founded to shore up the position of US semiconductor firms against the assault of foreign firms, this rationale [did] not make sense in [the context] of globalised industry. Its members were not the only key players in the US market with tremendous domestic start-up activity in start-ups which specialised in producing new semi-conductor designs for application-specific integrated circuits (ASICs). These companies are often called "IP firms" as they are primarily involved in producing intellectual property, not actual chips, selling their designs to the major semiconductor manufacturers. The cross-disciplinary technical demands of the move toward a "system-on-a-chip", which integrates many devices on a single microprocessor, increased the demand for these small focused design companies. At the time US remained an important center of semiconductor R&D while production was rapidly locating outside the US.

While SEMATECH moved its focus to international co-opetitive R&D, with the addition of individual non-US firms, Atmel also from 1995, explicitly "embarked on a steep trajectory of intellectual property, **design** and manufacturing-capacity **acquisitions**" (Dawley). The collaboration of DCT and Atmel and the subsequent decision of acquisition are embedded to this institutional and temporal moment in the corporate history and the macro-institutional framework of the semiconductor industry.

Placing the investment in the national and subnational contexts

The Development Center (Atmel Hellas) was established at the business incubator of Patras Science Park in 1999 with a core of 12 engineers. "At that time the Science Park presented itself as a competitive location, among other things, it offered the availability of network cabling, which was difficult to find in office buildings at the city centre". (former Atmel Hellas Technical manager Interview 13 February 2008). "The provision of office space at the Patras Science Park, was essential, particularly for the first aid at the initial phase, before the larger investment, and it directly served the situation related to the costs of location" (former Atmel Hellas Manager Interview 18 February 2008).

Atmel decided to expand its operations in the Patras location, to a fabless plant dealing with the vertical design of applications for wireless networks. The director of Atmel's multimedia department, with the endorsement of the founder, both of Greek descent, and with support from the university faculty, intended to locate the R&D activities more intensively in Greece. After the short history of DCT they seeked to create a larger scale design centre in the

country. For that respect the company entered negotiations with the Ministry of Finance of the Greek government to discuss its application to the provisions of the state development law, which grants 40% subsidy for investment. After a very positive and supportive response by the Greek state, Atmel appointed a consultant to conduct a feasibility study. With the positive report from the then Organisation for Investment Promotion the company entered an agreement with the state for a 6.5 bn Drachmas ($20 million) investment, drawing 40% state subsidy linked to the creation of 200 job positions in the Patras facility (OIP senior analyst, Interview 15 February 2008).

The evidence of the interviews, the news material and company reports points to several directions concerning the formal drivers of the investment. The reasons that have reportedly, driven the investment in the Patras facility, except from the government subsidy grant of 40% of investment, are: the existence of a pool of highly-qualified and non-unionized engineers at the University of Patras from which the company could draw competent workforce, without any major local competitors for this talent, the lower labour cost in comparison to US, Japan and the rest of Europe, and the reasonable operational costs in comparison to US, Japan, the rest of Europe as well as developing countries. In Table 1 we present in a symbolic way the set of factors that were either explicitly used to qualify the investment or referred to by press statements and acknowledged by interview respondents. We organise these observations in facilitating and enabling factors without recognising any supremacy of the one over the other.

While every respondent came up with roughly a similar set of justifications for the investment, the move to attract Atmel with a sizeable investment subsidy, apart from the rigid regulatory provisions, served equally a number of government priorities and considerations at that time. In the minimum, given the country's low record in attracting high-tech FDI the investment was a flagship effort in the marketing campaign and business forum ahead of Athens Olympics. The newly elected government at that point gave this investment extra emphasis. It was also fitting closely with the objectives of the Investment attraction policy directed at companies of ex-patriates and attempting to take advantage of diaspora business, politics and talent. Government also showed remarkable laxity when coming to Atmel's liabilities towards the state given that the company did not actually comply with its obligations and started to divest (OIP senior analyst, Interview 15 February 2008).

Table 1 Drivers of the Investment

Drivers of Investment		Explanation
ENABLING FACTORS	Available and Competitive Local Talent	Skill Graduates of the University of Patras and the Technological Institute, other skilled labourers in Greece Non-unionized professional engineering labour
	Proximity to R&D Departments and University Labs	Existing relations with 2 specialised Research Labs at the University of Patras
	Timing of the Investment	Very dynamic company, expanding globally, stockmarket success
	Technological niche	Wireless and Bluetooth technologies rapidly expanding. Availability of resources and expertise at Patras
	Pool of expertise	National, ex-pats, mobility increased in comparison to the past
	Management	The founder and CEO of the company was a 1st generation Greek emigrant. "Emotional value added" (Presentation Atmel)
	Cost factors	Engineering cost among the lowest in the EU, while productivity at high levels Operating cost low, compared to the US, EU and Japan
FACILITATING FACTORS	Location Environment	Proximity to urban area, cultural activities, consumption
	Workforce loyalty	Few companies competing for labour supply
	Mentality in the field	Learning culture of Greek people, impressed on family, social tissue
	Risk	Government Investment Law subsidizes investments of up to 40% thus reducing the risk of the investment

Placing the dis-investment in Atmel's corporate context

Exploring the context of divestment has been a more complicated task than identifying the drivers of the initial investment. Corporate decisions to invest or divest are based on a multitude of processes and justifications, which cut across the corporate structure and are influenced, or in some cases caused, by external factors. As Benito (2005) argues there is a variety of approaches and perspectives to study divestment. Appropriate levels of analysis include the "national and regional, the industry level, the firm and even individuals". Interestingly, "one should not presume that the insights provided by geography, economics, and business research can make greater claims of fruitfulness and understanding than those provided by sociological and political approaches".

While the main streams of the literature on divestment —industrial organisation, finance and corporate strategy (Chow and Hamilton qtd in Benito)—can provide the broad base to discuss this particular case of divestment, the case does not fit well with more specific frameworks, like the "integration-responsiveness" framework employed by Benito to analyse "how the

core factors may lead to relocation, divestment and market exits as the effects of corporate restructuring and adjustment processes, and not just as failures in foreign markets". The incompatibility lies in the fact that the Patras Development Centre was not a branch plant intended to serve the local or national market but to develop products for wireless LAN and Voice over IP that Atmel would market globally. In turn Atmel, was not manufacturing consumer products but intermediate products sold to OEMs and other companies as elements to be included in final product solutions. As a result the integration-responsiveness framework can only be applicable, with some necessary alterations reflecting the business environment for semiconductor MNEs and the intra-corporate realities for Atmel, as well as the trajectory of the local facility.

In the following part we will show that in the case of the Patras development center the divestment process was foremost related to strategic considerations of scale and scope, affecting the parent company, and less on resource conditions in market and resource conditions in the Patras location.

First, the specific international strategy chosen by Atmel, and which, justified the investment in a foreign design facility at Patras, is closer to aspects of the type of "transnational business strategy", whereas MNCs are driven "by the seemingly conflicting objectives of simultaneously achieving global efficiency, being locally responsive and leveraging the learning potential in different national operations" (Benito, 241).

Second, the interview material, as well as the firm's official statements point to re-structuring as a causal factor for divestment in the Patras facility. In December 2006, Atmel announced strategic restructuring initiatives, which included:

> - A focus on the company's high-growth, high-margin proprietary product lines. To better align Atmel's resources with highest growth opportunities, the company is **redeploying resources to accelerate the design and development of leading-edge products** that target expanding markets and is **halting development on lesser, unprofitable, non-core products**.
> - Optimize Atmel's manufacturing operations. Atmel will seek to **sell its wafer fabrication facilities** in North Tyneside, United Kingdom and Heilbronn, Germany. These actions are expected to increase manufacturing efficiencies by better utilizing remaining wafer fabrication facilities while reducing future capital expenditure requirements.
> - The adoption of a **fab-lite strategy**. Through better utilization of its remaining wafer fabs and the expansion of its foundry relationships, Atmel will significantly reduce manufacturing costs and continue to design and develop innovative new products utilizing world-class manufacturing facilities
>
> (Atmel Press Statement 12/12/2006)

Third, in contrast to other sectors of corporate life, where strategic restructuring, seldom occurs "due to the sheer magnitude and depth of restructuring processes, which bring seemingly dramatic consequences for the corporate network" (Benito, 2005:242), strategic restructuring choices are more common in the semiconductor sector. Given the existence of key characteristics such as:

1. emphasis on technological change and technological capacity building (Angel, Morgan and Sayer in Dawley)
2. truly global operations in production and markets (Dicken in Dawley)
3. the cyclical nature of the semiconductor industry market

and the presence of "two interrelated drivers of volatility: derived demand and sticky supply", restructuring events are certainly not a new phenomenon for semiconductor firms, and have characterised much of the reactions of firms to the industry cycles since the 1970s (Dawley, 2007: 59). Dicken stresses the fact that "in such a volatile technological and competitive industry as semiconductors, firms inevitably employ a whole variety of strategies to ensure their survival and in pursuit of growth. Some firms pursue a 'niche' strategy; others have preferred to increase their vertical integration. Cutting across these strategies are those of increasing transnationalization, rationalization and reorganization of production on a global scale" (Dicken, 2007: 336). The announced restructuring initiatives for Atmel included rationalisation, cost-reduction, sell-out of fabrication facilities (Nantes, Tyneside, Heilbronn) and a fab-lite strategy expanding foundry relationships. These initiatives can be characterised as reactions to the recent trends in the semiconductor industry and the move towards rationalisation and fabless production.

> "The companies like Atmel, the so-called Integrated Device Manufacturers, as a company model, they are eclipsing. The norm in the industry is for fabless firms who design semiconductors but do not manufacture them. Atmel used to be a merchant producer, which manufactured its own chips and developed them in-house from the beginning to the end, setting the standards and providing a ready made solution to customers. This older model has begun to lose ground since 2000, now there are predominantly foundries who manufacture chips and ready-made solutions and nothing more, and in the case of fabless firms who design integrated circuits, now more and more, many of the chips components are being purchased from other firms". (Interview 19 February 2008)

Moreover, the scale economies factor seems to operate as an important driver for divestment of the re-structuring kind, in the case of Atmel group. In contrast to the "takeover tiger" strategy that Atmel followed from 1995 onward (Dawley, 2007:63), the company switched to a restructuring strategy targeted to the achievement of scale effects, which included, closure of Departments, sell out, closure and reorganisation of plants and focusing on core activities. In turn, the re-structuring strategy resulted in bold rationalisation of foreign operations by the group. While not expressly stated in the 2006 Press announcement the restructuring involved the **abolishment of the whole of Atmel's Multimedia and Communications Department (MMC)**, which was the department that had initially absorbed DCT (back in 1996) and of which, a great deal of the development activity related to wireless LAN and VoIP devices had been taking place at Patras (Two Interviews of 19 February).

Relating the divestment to the Patras site, technological path and market success

To argue that the divestment result at the Patras facility was central to the rationale behind restructuring cannot be easily substantiated, through the existing data and interviews. The size of the investment compared to the market size of company was rather small, and any decision would not possibly have any substantial impact on the firm's performance. On the other hand, it seems more plausible as an explanation that "the Patras facility happened to be **at the wrong side in the intra-corporate organisation**, as it was among the poor performers in financial terms". (2nd Interview 19 February 2008) and "the reasons [for divestment] were mainly due to cost-cutting and restructuring. But it should be noted that this decision was taken by the foreign management of the company and not Greek managers, because in between [the investment and divestment] the management had changed hands. Nevertheless the local development has been contracted but not yet terminated and now employs 10-15 people". (Interview 13 February 2008). The current terms of operation are "to support products until their respective end of life, due to existing agreements between the parent company and buyers" (Interview 14 February 2008).

The question why the Patras facility was not among the strong performers in the intra-corporate assessments is much more tentative and complicated to answer in any definitive way, due to poor availability of information regarding the market results for the products that the Patras facility had introduced. At the minimum level, it was stated that the performance was related to the technological and product path chosen at or for the Patras facility investment. "The development had focused on **wireless devices** at a moment where this choice was justified as investing in a technology that was rather new, since the wireless networks were not as widespread as they are today and Atmel's MMC Department was able to catch a market share from the very beginning. In other words they launched the first product together with other large companies like Texas Instruments. The result was that they were able to **control a large share of the wireless (LAN) market for computers**, that in 2001-2 had reached approximately **6% and this was designed here at Patras**. Then from 2003-2004 a period of decline started, with diminishing market shares". (Interview 19 February 2008).

On the reasons behind the decline, three issues have been highlighted as having a significant influence on local performance:

1. decisions for the choice of technological standards
2. marketing deficiencies on behalf of Atmel's international sales force and
3. coordination and communication between the local facility and the central management.

Regarding the **choice of technological standards** it was said that "there were some choices [by the local management and MMC] regarding the standards that the market would follow but eventually the market took a different direction, so that the result was that the facility was working on products that had a type of specifications that was not selling very well, while the market as a whole was rapidly moving to an other type of specifications. And they were late to react to that". (Interview 19 February). Regarding the **marketing efficiency** of the Atmel group, which was responsible for all marketing activities and not the Patras facility, it was observed, that "the company might have been relatively weak in matters of marketing, that it couldn't promote products very successfully. For instance at the time when they were alone [in the market], and there was limited competition the products, were selling on their own. When suddenly competition intensified, they were not able to maintain their market position" (Interview 19 February 2008). Regarding **coordination and communication** another interviewee pointed to a lack of expertise on "corporate governance" especially at the local level (Interview 13 February 2008). This factor possibly hampered the success of local operations since "in essence there was good technical management at the Patras facility, but Atmel did not allow local administration, the local staff did not have a say regarding the prospects of the firm or the products, the local facility was not administering any budget and didn't have the authority to shape policy". (Interview 14 February 2008)

Explaining the contraction of the Patras site, in terms of "responsiveness" seems less potent, than the explanation based on integration factors and financial performance, because certain drivers of location, that had justified the initial investment continue to be present in the local economy, so that local conditions do not seem to have had an impact on the divestment decisions. In investing in the acquisition of DCT and subsequently the Patras facility, Atmel was acting according to its plan to "invest heavily in developing intellectual, process and product capacity, across a diverse range of leading edge niches within the semiconductor markets" (Dawley) and "to continue a growth strategy with complementary technologies and expertise," (Atmel CEO quoted in Haber, 1999, and Atmel 1998 Annual Corporate Summary).

It does not follow that the location advantage had eroded in the later phase. The Patras facility was still hailed as a success in 2004 "I am extremely proud of Atmel's accomplishments in Greece. They highlight the growth and success of the company in some of

the most advanced areas of technology and in the international marketplace. The Patras design center will provide leading edge designs for future technology development for Atmel." (Atmel CEO). Of course the location driver for the investment had been heavily related to localised knowledge creation in the University, and embodied knowledge in the face of skilled and competitively priced professional engineering labour. Being a local development unit, tied, to the global network, the facility did not have any marketing, or production competencies related to its local market, that could possibly provide room for adjustment in the event of the restructuring. On the other hand, it was aspects of the local competitive advantage based on the specific technological and project trajectory that had become obsolete by developments elsewhere and especially the change in market standards. Nevertheless, and in the situation where, the technological choices, and product development decisions were taken centrally, there is little room to label the local development operation and even less so, the locality as less flexible or less adaptable.

While acknowledging the "unique and path dependent character of local operations and competencies" (Benito, 244), local performance seems not to be the most important driving factor behind contraction. As one interviewee observed: "it was a mistake for Atmel not to maintain the centre; it was both good and competitively priced. The only problem was management issues. After the dissolution there have been foreign companies interested in acquiring the facility, as well as companies interested in employing the former staff". (14 February 2008). It is up to debate whether the investment would have been maintained were it not for the change in corporate management.

In Table 2, we organise the evidence provided by the interviews, and corporate and press material into three broad arenas, which have been illustrated in Atmel's corporate case and produced results, which affected the dis-investment decision for the Patras design and development centre.

Table 2 Drivers of Divestment

Drivers of Divestment	Manifestations	Results
Changing International Landscape for the Semi Market	IDMs eclipsing, pressure to specialise	Poor performance of (now peripheral) units, Rationalisation strategies, restructuring
International Business Strategy	Cost-reduction, Rationalisation, Moving out of this field of operations	Redundancies, closure
Intra-corporate Politics	Internal Conflict for the Control of the company	Change of Greek management team, weakening of emotional link to the local facility

Table 3 Basic types of divestment strategies and their characteristics

Basic types of divestment	Characteristics
Adjustment-driven	Small and gradual. eg. selling off a larger entity within a larger subsidiary, outsourcing, closing down and activity or relocating
Failure-driven	Closing down a unit
Restructuring driven	Strategic manoeuvres with seemingly dramatic consequences for the corporate network. Involve many corporate units performing activities in a variety of locations

Drawing from Benito and Benito and Welch 1997, and Clark and Wrigley 1997

3. Regional Institutional Context and Assets

In this last section of the paper we discuss the impact of the (dis)investment on the local economy. In order to draw a picture of the implications, we first have to look into the level of embeddedness of the investment, within the local socio-institutional conditions. In this effort we are basing our treatment on the ideas of Turok (1993), who gives emphasis on type and level of local linkages of the affiliate and also on some particular indicators of embeddedness discussed by Phelps et al (2003).

Table 4 The potential effects of inward investors on the local economy: the developmental case and the dependency case compared

	Developmental	***Dependency***
Type of local linkages	Collaborative Technological Trust	Unequal trading relationship Subcontracting to local firms Emphasis on minimizing costs
Duration of linkages	Long-term partnership	Short-term contracts
Degree of flexibility	Close relationship with local suppliers to facilitate product development	Weak commitment to local firms
Ties of inward investor to local economy	Deeply embedded Management functions highly decentralised to facilitate local control over operations	Weakly embedded Branch plant controlled from elsewhere in organization
Benefits for local firms	Transfer of technology and expertise to local firms Local firms involved in product development	Local firms contracted to make low-tech components
Quality of jobs created	Diverse range of jobs including high skill	Low skill
Growth prospects for local economy	Self-sustained growth through expansion based upon the new industrial cluster	Growth dependent on strategic decisions made outside the region by the multinational firms

Source: Turok 1993

One major reservation in using the existing economic geographical models, proposed to explain local linkages and furthermore, local embeddedness of investment, is that most recent attempts in the literature have almost exclusively focused on either manufacturing activities or in the case of the ICT sector, on software development. Previously, we have referred to the idea that the semiconductor industry, is perhaps, best described as constituting a global production network (Dicken), with wide-ranging and evolving spatial and organisational specificities. Therefore there is a certain misfit between traditional models and the analysis of implications from semiconductor investment, as in the case of the Development facility in Patras, mainly because they stress the obvious resource and material linkages that are both more easily discernible and also usually sought after with regards to inward investment in manufacturing. Acknowledging that the Patras case was an example of an almost vertically integrated fabless plant, although it was the case in product development, does not suffice for an analysis of this type. Consequently we will proceed with making exceptions to the model scenario situations and besides the narrow view of territorial embeddedness we can place the current workings of the disinvestment in the broader historically grounded socio-institutional account at the regional level.

The Patras economic region, a peripheral less favoured region, has had a recent record of great fluctuation in economic performance and is in the midst of a socioinstitutional restructuring after the onset of deindustrialisation. Riding on a rapid course of urbanisation, and industrialisation, which lasted well until the 1970s and was propelled mainly by the influx of cheap unqualified labour from the rural periphery, as has been the case with major Greek cities the city of Patras became an industrial city port with its main activities in paper mills, textile process and food and drinks production in a mutually constitutive relational nexus which engulfs firms, territories and spaces of low cost large scale production. Beginning from the late '70s however, changes in the international economic context, the opening up of the Greek economy to European markets due to the country's EU admission, as well as the intensifying spatial competition for labour and resources with the agglomeration of Athens, left the city's traditional industrial economic assets at a disadvantage and further weakened its role in the national urban system. Lack of serious investment in the city and region, with the exception of the establishment of the Technical University, reinforced a trend of unequal development, evident particularly in rural inner-periphery. For the most part of the 1980s and early 1990s the industrial decline of the Patras region, similar to other industrial city-port areas, contributed to critical problems of labour redundancies, chronic unemployment and subsequently unbalanced growth in low value services of the public and private sector.

Economic recovery was assisted by state and EU-funded investments in the University and research institutes, the establishment of a Regional Hospital and the rise in public sector employment and later renewed physical infrastructure investments in roads and a highway bridge connection to mainland Greece, and investment in new industries at the Patras Industrial Area. Also the increased traffic of the port with Italy contributed to some increase in shipment and logistics activities.

It was in the late 1980s that the idea of investing on technological development as a means to respond to the industrial decline and loss of prosperity, gained significance within a part of the local community of researchers and entrepreneurs. Since roughly the same time Research groups at the Departments of Physics and Electronical Engineering have been pursuing a research programme, which eventually opened up the opportunity for alternative applications of semiconductors in microcontrollers and media devices. It was within this context of research collaborations and transatlantic knowledge networks that the first entrepreneurial spin-offs from academic researchers appeared in Patras and a small community of mobile

researchers and graduates formed the grounding unit for the establishment of a small but fluctuating population of fabless firms. Not unusually for the semiconductors sector, venture capital and buy outs were evidenced in 1992 by the indirect acquisition of a small locally based defence electronics design firm by Intel. The subsequent multi-located DCT case, which eventually shaped the dynamics of firms, territories and regional specificities in the Atmel investment, can be characterised as stemming from the same evolutionary context of cross-national and cross-regional firm and research relations rather than being a unique occurrence.

Corporate status and functions
As discussed in the previous chapter, the local affiliate performed R, D & D functions concerning certain products in wireless and voice over IP circuits and boards. It did not have any downstream functions (Phelps et al 31) such as sales and marketing. These activities, according to the existing evidence were performed centrally by the MMC department and the Atmel group. Consequently the most significant aspect of the functions was the integrated pre-fab design and development of products at the location.

Research Development and Design Activities
R, D & D has been the core activity of the local affiliate. In that respect the role of the University has been instrumental, since it provided both the bulk of the qualified staff, as well as the knowledge and expertise on the specific technical field.

The supply chain and local purchases
Clearly this indicator does not apply to this case since, most inputs except labour and knowledge have been imported to the region. Obviously there have been purchases and supplies by local and national firms (especially construction) but this did not refer to the core activity of the firm.

Skills and training demands
The pool of skills has been said to include graduates of higher education from the region and the rest of Greece as well as ex-pat experts that were attracted to return. There was a diverse range of jobs, most of them technical and high-skilled, of good quality and above average wages (Atmel Hellas presentation). However, given the fact that the investment was short lived, the jobs in the affiliate were not maintained, and after a peak of 140 employees in 2004, now only 15 staff of all specialties work in the premises.

Repeat investment
In a sense the operation of Atmel as an MNC included investing in the acquisition of DCT and then the establishment of Atmel Hellas, and subsequently the investment in privately owned premises and production equipment that took place in 2004. However, since the strategic decision for restructuring no repeat investment has taken place. Some informants argued that had it not been for the intra-corporate conflict for Atmel's control a repeat investment would have been both feasible and needed to realign the fabless plant to a different product area and technology. This view remains up to conjecture as there are very few press reports on Patras role in Atmel's corporate context.

Benefits for the local economy: spin outs
Besides the strictly defined linkages, it is argued that the investment, although short lived provided some positive effects for the local economy. These relate to learning and informal training of the staff: "The impact was positive as regards the people who worked in the company. They learned how to work competitively under a global production firm, they gained a culture of cooperation that is often lacking in the prevailing local culture, they

learned the importance of working towards results, which is what matters, and lastly they learned the rules of the game for the semiconductor industry" (Interview 14 February 2008)

Perhaps the most important occurrence, related to the contraction of operations has been the stimulations of spin-offs and spin-outs from the local affiliate, by former members of staff. These spin-outs are totally independent from the Atmel company, which did not show interest in fostering spinouts or selling out parts and production teams from the local affiliate. A common characteristic of the spin-out firms is that they were formed, or in the less direct cases were strengthened, by individuals who were former employers at the Atmel affiliate. Borrowing the idea of Carayannis et al (1998), to term all, these new start-ups, as spin-offs, "emphasizes on an indebtedness to the parent company that does not recognize the sacrifices in money, time and effort usually required to establish the spinoff company". Moreover some of the spin-offs have chosen a different technical field of focus than that at the "parent organisation".

In short the most important **spin-outs** include:

Bluedev and Antcor, who were formed before the contraction by teams of engineers who left the parent company, fairly early, and another six firms that were formed during the contraction phase. The most recent is ThinkSilicon, which was founded in summer 2007 and focuses on IC design, and is formed by former members of the Atmel IC design office.

The largest in terms of employment is Bytemobile, which currently provides employment to 50 skilled employees. In the case of Bytemobile, it's technically not a spin-out as only part of the staff were formerly members of staff in Atmel Hellas. The majority of the employees come from Daedalus, a spin-off firm of the University of Patras employing mostly students and graduates, which was acquired by Bytemobile, a US headquartered MNE for mobile and convergent IP network solutions. The firm's European Development Centre is located at Patras Science Park.

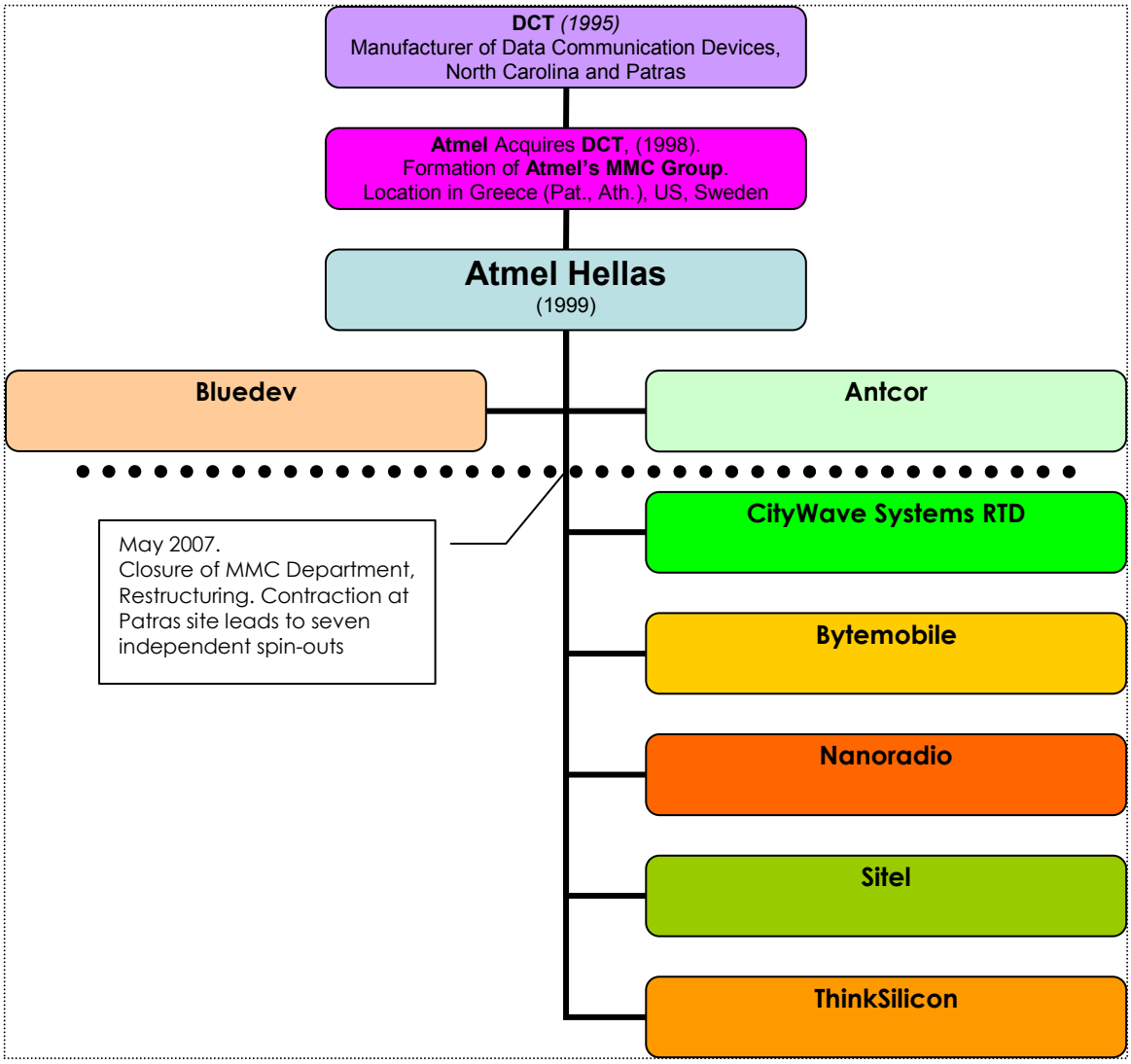

Diagram 3 "Spinouts" from Atmel Hellas, 2008 (based on an idea of John Kikidis, elaborated by Iákovos Stamoulis)

A similar case is Nanoradio, a Swedish MNE, founded in 2004, which produces Wireless LAN chipsets. Nanoradio operates a software R&D department in Greece, which is based at Patras Science Park.

Another case is that of Sitel, a Netherlands headquartered, fabless firm, producing chipsets for DECT telephony. The company operates a design centre in Patras, which employs former Atmel staff.

While assessment of activity and prospects of the firms, which either directly or indirectly spun-out from the Atmel (dis)investment, is not in the scope of this paper, there are some important features in the development that should be observed:

1. Most firms are located or collocated at Patras and the Patras Science Park
2. Together with some independent firms they form a local group (population) of semiconductor firms. This gives the Patras region a higher location quotient in semiconductors than in any other place in Greece.
3. There is an ongoing process for collocation and clustering of activities between the firms, with the aim to achieve synergies and facilitate collaborative and other

linkages, the Corallia initiative of the Hellenic Technological Clusters initiative, which "constitutes an eco-system of microelectronic companies-members of the Hellenic Semiconductor Industry Association"[v1].

Thus Atmel's (dis)investment despite the continued ownership of the facilities and the design centre infrastructure, which is subject to the company's liabilities towards the Greek state, has allowed in the presence of relational culture, basic incubating infrastructure and a supportive research and academic community, the created regional assets consisting of mainly embodied skills, knowledge and access and participation to collaborative research networks to, work down to the local economic tissue, in terms of business spin-offs, newly acquired skills and competencies and renewed business ethics and culture. Interview material from the PSP, and particularly, new start-up companies, shows that the (dis)investment episode, **after the divestment/contraction in the initial semiconductor MNE branch has enabled the surfacing of some longer term** (and continuing) **benefits for the local economy** (such as retained employment in the field, increase in the pool of skilled labour, increased international linkages and connectivity) mainly involving the communities of researchers and practitioners and regional institutions. This allows for a **more optimistic view** when considering the overall benefits of subsidized FDI investments in peripheral regions. On the other hand, this development path of the creation of a population of independent start-ups has been conditioned by the inaccessibility to the former Atmel premises, where regulatory obstacles and disinterest by the Atmel company have since prevented a large scale reinvestment.

Conclusions

If we attempt to draw some formalised lessons for inward investment, in peripheral less favoured regions that would be in a few words: nothing starts from scratch, building the local advantages is what really matters for investment attraction. In the case of Patras, applied research from the university and a community of high-skilled and committed professionals, active both locally and internationally have been the initial driving force for the location of semiconductor firms from the early 1990s. These developments paved the way for attracting larger foreign investments that have altogether evolved into the establishment of a small firm population in the sector.

In Atmel's location and investment in Patras the paper has investigated the drivers of investment and drawing from interview material has stated that these have mainly been:

- the presence of qualified and skilled local talent at competitive price
- proximity to university and state and corporate R&D
- the presence of a technological niche within the University of Patras labs

It has further discussed the reasons for divestment, which are firstly related to the parent firm's decision to restructure and rationalise non core activities and secondarily on financial and other considerations. The available evidence suggests that inside the decision making of Atmel there was a change of attitude toward the operations of the MMC including the Patras facility. This became apparent in 2006-2007 when after the change of top management at the Atmel group, operations in Patras were contracted. While the paper has discussed local performance issues, an important observation is that these have not been the main reasons for the contraction and divestment but international strategy considerations and the outcome of the internal conflict for the control of Atmel.

[1] http://www.htci.gr/clusters/cluster01.html

The case study has provided an additional example "of the ways in which an historically grounded, multiscalar and socio-institutional understanding of investment episodes reveals how seemingly temporal even cyclical-economic imperatives are mediated and woven across a diverse array of institutional contexts and settings to created varied investment outcomes over time, across space, and in place" (Dawley, 2007). The analysis of the case study, which is informed by the holistic conceptual framework proposed by Dawley, reveals that Atmel's corporate decision evolved within a context of "multiscalar institutional settings and incentives and specific social, cultural, and political contexts both within and external to the corporation" (Dawley). We have extended our discussion of the home economy socio-institutional and economical framework by drawing also from the literature on co-opetitive R&D consortia (Carayannis and Alexander) to inform our historical understanding of the dynamics of the US semiconductor market in the period of Atmel's (dis-)investment decisions in transatlantic knowledge and development locations. We contend that evolving strategic dispositions of the US semiconductor producers market provided the initial contextual drive for Atmel's takeover strategy that eventually reached the Greek location.

Our empirical data on Atmel's Patras (dis-)investment decision illustrate the role of individuals in the top management of Atmel Group, Atmel MMC department and Atmel Hellas in functionally and politically mediating between and integrating the home and host institutions in a power geometry were within and beyond the intra-corporate, managerial and technical divisions of labour, the culture, nationality and sentiment also play a role. This hypothesis we have argued is strengthened by the presence of an uncontrollable change in intra-corporate politics, the event of the resignation of the executive officers and its affiliated members of the board, which was preceded by a change in corporate and stakeholder attitude from a territorially and technologically expansive strategy favouring European location to a more grounded to US assets and socio-institutional context restructuring move to fabless design in core technologies.

In discussing the nexus of state-corporate relations within the host economy context the case study, has also highlighted the laxity and subservience of state institutions in attracting and regulating the investment and subsequently in enforcing the regulatory provisions in labour law and the liabilities stemming from non-conformity to the subsidy agreement with the Greek state.

Another important finding is that even in the case of an investment with short life, the presence of an adaptable and highly skilled workforce and an entrepreneurial subculture developed within the framework of Patras-US-international research and development partnerships can be able to form new start-ups and draw new foreign venture financing, so that economic activity and levels of employment are maintained in the sector. In the long run, the stimulation of start-ups from the contraction of the initial investment can bring lasting impacts to the local economy, and self-sustained growth through expansion based on the formation of a new industrial cluster. The existence of (new) FDI attraction mechanisms and aftercare support could be an important facilitating factor in that respect. For Patras Science Park, the most important conclusion is that it has been the location of choice for the hosting of various inward investment incidents and ventures and has also played an important role in the facilitation and incubation of spin-outs from local firms and University Departments. Science Parks and technological business incubators in this respect are a valuable infrastructure, in the absence of which, the effects of closures and contraction would be more pronounced and entrepreneurs from start-ups would have to face additional burdens related to location costs and basic infrastructure provision. The contraction of Atmel, happened at the time when incubator space at the Science Park, was expanded and could thus accommodate the demand of most spin-outs formed by Atmel's closure. Looking at the

current economic conditions, and providing state-of-the art services tuned to the needs of local entrepreneurs in and out of Science Park location, is always the general objective, but needs constant re-assessment and improvement, in order to be able to assist evolving local competitive advantages.

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[i] http://www.elke.gr/newsletter/newsletter.asp?nid=24&id=48&lang=1

[ii] "In June 1998 Atmel issued 415,932 shares of common stock to the former stockholders of DCT in connection with Atmel's acquisition of all the outstanding shares of DCT. The aggregate market value of securities issued was $2,849,000 at the time of issue. The shares were issued in a private placement to 22 investors, including three accredited investors. Except for one accredited investor, all other investors were employees of DCT who became employees of Atmel". ITEM 5. MARKET FOR THE REGISTRANT'S COMMON STOCK AND RELATED STOCKHOLDER MATTERS COMMON STOCK DATA © 1995-2008 EDGAR Online, Inc. http://sec.edgar-online.com/2000/03/15/15/0000891618-00-001469/Section7.asp
http://findarticles.com/p/articles/mi_m0EKF/is_2255_45/ai_53871450

[iii] In June 1998, the Company acquired all of the remaining outstanding common and preferred stock of DCT for $1,151 cash and 207,966 shares of Atmel common stock. Certain of the selling shareholders of DCT were officers and family of officers of Atmel who participated in the transaction on the same terms as other selling shareholders. Atmel previously owned less than 20 percent of the preferred stock of DCT and recorded the investment at cost. DCT is engaged in the design, production and marketing of data communication products. The excess of the purchase price over the acquired assets amounted to $5,084 and was allocated to goodwill. Goodwill is being amortized its useful life. At December 31, 1998, goodwill, net of accumulated amortization, amounted to $2,838. The revenue and net income of DCT is not material to the results of Atmel for the years ended December 31, 1998 and 1997 and, accordingly, no pro forma results have been presented. Atmel Corporation, Form 10-K405 Annual Report 1998.
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[iv] RTI International - News Release - 20.9. 1995
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[v] http://www.htci.gr/clusters/cluster01.html