International assignment directions of R&D employees in multinational enterprise subsidiaries

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Abstract

In this study we explore the effects of the roles of research and development (R&D) laboratories; the roles of subsidiaries; and, the level of technological intensity of the sector in which multinational enterprise (MNE) subsidiaries operate on international assignment directions of R&D employees. International assignments constitute an underinvestigated issue in the international human resource literature despite its significant research and managerial importance. In particular, to the best of our knowledge no prior research on international assignments of *R&D employees* has been undertaken. Based on a large quantitative study on MNE subsidiaries operating in Greece, the findings suggest that variables of the aforementioned categories of factors influence different international assignment directions, with the role of the R&D subsidiary exerting the most crucial effect. Researchers should examine the unexplored issue of R&D professionals' international assignments to a larger extent; while MNE management should particularly take into account the micro-work context of the R&D international assignees when developing effective international human resource management programmes.

Keywords: International assignments; Research and development employees; Multinational enterprise subsidiaries; Greece

Introduction

In the modern business environment, movement of human capital plays an important role in assisting multinational enterprises (MNEs) develop and sustain a competitive advantage in the international marketplace (Boyacigiller 1990; Hocking et al. 2004; Shay and Baack 2004). During their movements MNE international assignees perform a variety of roles within their organizations such as control activities, development of social capital and transfer of knowledge (Bonache and Brewster 2001; Haas 2006; Harzing 2001; Hocking et al. 2007). International assignees include traditional expatriates, short-term assignees and international business travellers (Tahvanainen et al. 2005). There is ample research evidence on the reasons why corporate expatriates seek or accept international assignments (for a recent review see Hippler 2009).[1]

However, international assignments of MNE research and development (R&D) professionals in particular have seemingly not been investigated in the literature. It is surprising that management scholars have paid scant attention to this issue that applies to the main implementers of MNE-related knowledge, namely R&D experts (Manolopoulos 2006). There is much literature that deals with the nature and importance of R&D internationalization (Asakawa 1996, 2001; Cantwell 1995; Håkanson 1981; Ronstadt 1978). The examination of movements of R&D employees is crucial since staffing and assignments of researchers working in foreign R&D laboratories may enable the MNE expand its technological options and define the sources of its competitive advantage. This is not only because human assets are the cornerstones of advanced competitiveness in the modern MNE (Schuler and Rogovsky 1998); but also because the mobility of R&D researchers and scientists can be a valuable technological source for this organization. This is likely to be explained by the fact that tacit knowledge embodied in these employees is likely to reflect a mix of the mainstream characteristics of the MNE technological heritage and the

distinctive elements of knowledge base of its subsidiaries (Papanastassiou and Pearce 1999).

The objective of the current study is to examine the effect of specific factors on the direction of international assignments of R&D corporate expatriates. In line with the subsidiary focused perspective (e.g. Birkinshaw and Hood 2001; Prahalad 1999) that posits that strategies and related practices can emerge also from the subsidiary apart from the MNE headquarters, we examine assignments of R&D scientists from the subsidiary towards the MNE system or other host country facilities. In particular, following the seminal work of Haug et al. (1983), we investigate the employee directions to the parent company laboratory; another R&D lab of the MNE; or, another host country independent research facility. The host country that is the base of investigated MNE subsidiaries in the current study is Greece. There exists little research on the investigation of international human resource management issues in Greece and advancing economies in general (Manolopoulos 2006). In examining movements of corporate expatriates, we respond to the recent plea for research focused on the increased use of international assignments (Brewster et al. 2001; Collings and Scullion 2006; Collings et al. 2007; Starr and Currie 2009). We aim at filling a void especially in the area of international assignments of *R&D professionals* in which seemingly no prior study exists. Our conjecture in the present paper is that the factors that affect directions of international assignments of R&D employees are the roles of R&D laboratories; the roles of subsidiaries; and, the level of technological intensity of the sector in which the MNE subsidiary operates.

To analyze, firstly, the roles of foreign R&D laboratories are significant to examine since movements of decentralized knowledge-related activities are closely

related not only to the goals of the MNE carrying out the investment, but also to the distinctive strategic positioning of subsidiary research laboratories (Manolopoulos et al. 2005). Secondly, the roles of subsidiaries are investigated because a chief prerequisite for the efficient deployment and transmission of knowledge inputs throughout the MNE refers to employee international movements (Bartlett and Ghoshal 1989). Consequently, international assignments are inextricably intertwined with the MNE strategic objectives of global efficiency, local responsiveness and worldwide learning, and hence, the resulting subsidiary roles in their host countries (Collings et al. 2009). Thirdly, the examination of the technological intensity of the sector is warranted inasmuch as it captures the likely industrial embeddedness associated with personnel practices (cf. Gooderham et al. 1999). Sectors differ in terms of their level of technological intensity and R&D employees in high-technology sectors can be active contributors to MNE international innovation projects (Hedlund and Ridderstråle 1995). Therefore, directions of international assignments of R&D corporate expatriates may also be affected on whether the sector is a high- or low-technology one.

The structure of this paper is as follows. The second section presents the theoretical background to the study and advances research hypotheses. The third section explores methodological issues of this research. The fourth section presents and discusses the findings. The concluding section addresses the key implications of the study for management research and practice as well as discusses limitations and directions for further research.

Research background and hypotheses

Roles of R&D laboratories

Employees that work in R&D laboratories of different roles have dissimilar responsibilities in the MNE group and can undertake international assignments of different directions. To elaborate, in the past international R&D units may have been established to undertake adaptation work but increasingly the evidence suggests that they can become active contributors to the MNE innovation efforts worldwide (Pearce 1989). There is considerable evidence of different roles in R&D laboratories (Cordell 1973; Håkanson and Nobel 1993) and numerous studies have developed typologies of foreign R&D units (Håkanson and Nobel 1993; Kuemmerle 1996; Pearce 1989; Rondstadt 1977).

The classification adopted in this study derives from the comprehensive typologies of Haug et al. (1983) as well as Hood and Young (1982). This classification identifies three distinctive roles for an overseas R&D laboratory. The first role refers to the effective use of well-existing technologies and procedures of the MNE group so that they would become embodied in the production process of well-established products. Therefore, the main function associated with this role is adaptation development of either the products or the production process. Laboratories that assume this role are support laboratories (SLs) that are crucial to the successful commercialization of subsidiary products in *a-priori* determined target markets.

In addition, more empowered roles can be assumed by host country R&D units in the pursuit of MNE international competitiveness. Therefore, the second role than an R&D unit in the host country can have is to operate as a closely integrated part of a subsidiary in order to develop distinctive products. These products can subsequently be supplied to regional, or even, global markets (Pearce 1999). This type of R&D unit is defined as locally integrated laboratory (LIL). Instead of using the existing MNE technology in order to produce well-established products, LILs extend

the scope of the subsidiary through the use of all available resources in an innovative way that seeks to expand the competitive MNE product range. This implies that LILs have a quite "productive" scope (Papanastassiou and Pearce 1999). The third possible role that an R&D laboratory can have is to provide basic or applied research inputs into a programme of precompetitive work organized by the MNE. The laboratories that are involved in such tasks are internationally interdependent laboratories (IILs). The LIL and IIL types of R&D units would accommodate the objective of a regional or global innovative approach for the MNE concerned (Pearce 1999).

R&D employees in SLs may closely follow the mandates of the MNE since their lab would be embedded in the MNE network in an attempt to carry out the technological strategy of the MNE group. These professionals are likely to be instilled with the values of the MNE, and seek to apply their expertise and knowledge for the benefits of the MNE group (Manolopoulos 2006). Thus, they may be highly motivated to assume assignments to extend their knowledge in the parent company lab or other MNE group lab. This can happen as R&D scientists are eager to learn more about the R&D systems and processes that take place inside the MNE.

On the contrary, R&D experts in IIL types of labs would require a close coordination with strong research units that may be university centres, independent R&D institutions or even labs of other firms. R&D employees in IIL types of laboratories behave in an autonomous way and are not particularly embedded in the MNE context (Pearce and Papanastassiou 1997). Hence, they may seek international assignments in host country independent R&D facilities in order to explore new technological domains where they can carry out significant basic or applied research.

R&D international assignees from LILs represent an intermediate case as far as their movement directions are concerned. On the one hand, they are likely to be a

closely integrated part of the MNE technological strategy, and thus, seek to forge links with other MNE R&D actors. On the other hand, they are likely to seek to expand the innovative technological base of the subsidiary aiming at producing goods for regional or global markets. These experts can look for expansion of the competitive product range of the whole MNE group (Pearce 1999). Perhaps the latter consideration is even more important in the case of advancing economies with a key geographic position such as Greece. MNE subsidiaries based in Greece may assume strategic roles in the greater Southeast European region (Manolopoulos et al. 2007), and so, their R&D units would likely seek to produce technological outputs for the broader regional market. Consequently, we posit that:

Hypothesis 1a: Other things being equal, R&D corporate expatriates employed in SLs prefer international assignments in parent and/or other MNE group laboratories.

Hypothesis 1b: Other things being equal, R&D corporate expatriates employed in LILs prefer international assignments in other host country R&D facilities.

Hypothesis 1c: Other things being equal, R&D corporate expatriates employed in IILs prefer international assignments in other host country R&D facilities.

Roles of subsidiaries

Numerous typologies of subsidiary roles and strategies have been developed in the literature (Bartlett and Ghoshal 1989; Gupta and Govindarajan 1991; Harzing and Noorderhaven 2006; Jarillo and Martinez 1990; White and Poynter 1984). In general, subsidiaries can assume “market access” responsibilities and supply the local market with a part of the MNE product range, and so, be strongly dependent on MNE existing group procedures and technologies; or, become creative organizations that

perform high value-added activities, and hence, become more embedded in localized knowledge development systems (Cantwell 1995; Dunning 1995; Kuemmerle 1999).

In our research, we work on the "scope" framework derived by White and Pointer (1984). This is owing to the fact that knowledge and technology-related aspects of subsidiaries are clearly positioned within such "scope" typologies (Papanastassiou and Pearce 1999). The first subsidiary role suggested by White and Poynter (1984) is the truncated miniature replica that produces goods for the host market, which are part of the MNE established product range. This subsidiary lacks autonomous strategic decision-making and does neither produce new products nor implement new technologies. The second subsidiary role proposed by White and Poynter is the rationalized product subsidiary. This subsidiary applies knowledge that is already well-established in the MNE group and embodied in proven commercialized and effectively produced goods. In doing so, the rationalized product subsidiary becomes part of the internationally-coordinated supply network of the MNE group. The truncated miniature replica and rationalized product subsidiaries are to a significant extent embedded in the MNE decision-making system, and so, we decided to merge them into one category in the current study. This MNE-embedded category role is contrasted to that of the world (or regional) product mandate (PM), which is the third role in White and Poynter's classification. PMs employ subsidiary-level resources and knowledge in order to develop and supply distinctive new products that are likely to target a wide market spectrum. In doing so, the PM may acquire a unique position in the MNE group and fully evade the MNE system as far as technological dependency is concerned.

R&D employees in PMs are involved in genuine decentralized technological projects and participate in the production of innovative products using just the

premises of the R&D laboratory of the subsidiary. The subsidiary-level resources that PMs employ are either generated in-house or become accessible through collaborative arrangements in the local economy (Papanastassiou 1999). Employees that work in PMs are ascribed to wide MNE roles, are given more decision-making power and are often engaged in advanced value-added activities (Birkinshaw et al. 1998). Taken all this together, one could expect that when R&D scientists from PMs undertake international assignments they would likely seek to move to other host country R&D facilities that can augment their technological base and experience. These R&D assignees may not look for projects within the MNE network as they are not particularly integrated into the corporate system. In contrast, R&D professionals from non-PM subsidiaries would likely move to parent and other MNE group laboratories in order to enrich their technological experience with company-wide technological processes and values. Essentially, working with colleagues in other MNE laboratories are likely to legitimize their R&D attempts that seek to expand and perfect their MNE-related technological knowledge (cf. Hallier and James 1999). Thus, we propose that:

Hypothesis 2a: Other things being equal, R&D corporate expatriates employed in PM subsidiaries prefer international assignments in other host country R&D facilities.

Hypothesis 2b: Other things being equal, R&D corporate expatriates employed in non-PM subsidiaries prefer international assignments in parent and/or other MNE group laboratories.

Technological intensity of the sector

There appear to be various levels of human capital sophistication in high- and low-technology sectors (Corley et al. 2002; Kirk and Belovics 2007), especially as far

as R&D scientists are concerned. High-technology firms strongly rely on the existence of highly skilled professionals (Butchart 1987; Chadwick et al. 2003). The demand for talent builds momentum for accumulation of skills and leads to increased levels of creativity and productivity, and so, employee movements within a sector (Dicken and Malmberg 1999). International assignments can be viewed as temporary transfers between different R&D units in order for R&D employees to seek advancement of their skills.

A major challenge facing high-technology firms refers to integrating human competences from outside the firm into the existing organizational stock of resources. The search to generate human competences in high-technology firms is accompanied by greater labour mobility so as to meet diverse organizational requirements (Ramirez 2007). Universities and research institutes play a significant role in the development of high-tech firms (Bresnahan and Gambardella 2004). There is additionally significant evidence suggesting that universities and independent research centres encourage research interaction, entrepreneurship and employee movements between organizations, which, in turn, generate spin-offs especially in high-tech sectors (Goldfarb and Henrekson 2003; Rappert et al. 1999; Shane 2003). In these sectors, movements of experts between autonomous research facilities are likely to enhance technological knowledge and experience (Mason et al. 2004).

Thus, it is likely that international assignees in high-tech sectors can seek projects in other strong host country R&D facilities that would considerably augment their technological knowledge and opportunities. On the contrary, R&D scientists in low-technology sectors may seek assignments within the MNE system since they will probably seek confirmation from other organizational members of their technological

know-how that can be rather company-specific (cf. Almond et al. 2005; Geppert and Matten 2006). Therefore, we argue that:

Hypothesis 3a: Other things being equal, R&D corporate expatriates employed in subsidiaries operating in high-technology sectors prefer international assignments in other host country R&D facilities.

Hypothesis 3b: Other things being equal, R&D corporate expatriates employed in subsidiaries operating in low-technology sectors prefer international assignments in parent and/or other MNE group laboratories.

Methodology

Data collection

The data for this study were collected in MNEs based in Greece. The *International Capital (ICAP)* database was the sampling frame employed. This database is the most comprehensive sapling frame that exists in Greece, and forms a standard source of financial data for foreign and indigenous firms operating in this country. The *ICAP* database has been repeatedly used in previous studies involving firms based in Greece (e.g. Dimitratos et al. 2004; Manolopoulos et al. 2007; Souitaris 2002). In total, 317 MNE subsidiaries were included in this database. All these subsidiaries originate from different MNEs. The industries of investigated subsidiaries involved telecommunications, electronics and information technology, chemicals and pharmaceuticals, machinery, food and beverages, textiles, services, miscellaneous and other manufacturing. These MNEs originated from the EU, US, Japan, and other European nations.[2]

The research was conducted in two stages. The first stage involved a national questionnaire-based postal survey in order to identify MNE subsidiaries that have an R&D department. Questionnaires were posted to the chief executive officers (CEOs) of subsidiaries in order to acquire the necessary information. 133 useable responses were collected out of 315 subsidiaries (two questionnaires from the original 317 firms were returned undelivered). Thus, the effective response rate for this first stage is 42%, which is considered to be perfectly acceptable when compared with similar postal surveys (Harzing 1997). Among these 133 subsidiaries, 70 were identified to have an R&D department (53%).

The second stage of the survey involved collection of R&D employee responses concerning their possible international assignments. Among the 70 subsidiaries that were identified to have an R&D laboratory, all R&D professionals were asked to fill in a structured questionnaire related to the issues of interest to the current study. The total number of possible respondents from these 70 R&D units were 948. A careful three-stage process was used to develop this questionnaire. Firstly, the questionnaire was scrutinized by two academics and two professional consultants, who provided improvements in the wording and advice on its layout. Secondly, following a major revision, the questionnaire was handed to five subsidiary CEOs of subsidiaries. In most cases, their recommended corrections were similar to each other and yielded the second revision. Thirdly, the questionnaire was handed to ten R&D scientists for the final testing. No further changes to wording or structure were required. The questionnaire included closed-ended questions and was accompanied by a cover letter explaining the objectives of the study assuring strict confidentiality. All items used were derived from previously derived scales.

At the end of each of the following two months following the initial posting of the questionnaire to R&D professionals, a reminder letter was sent to all R&D employees that had not responded yet. In total, out of the initially 948 posted questionnaires and following two reminders, 350 questionnaires were not returned; or, were deemed to be unusable due to incomplete responses, errors in responses etc. As a result, 598 fully useable questionnaires were collected, rendering an effective response rate of 63%. Out of these 598 respondents, 341 scientists (57%) from the investigated 70 MNE R&D units had undertaken assignments abroad and are those included in the analysis of this study. No statistically significant differences between respondents and non-respondents were obtained in relation to the number of R&D employees and years of operations of the laboratories, and so, response bias does not appear to constitute a threat to the results.

Statistical method and measures

In order to test out the hypotheses, ordered probit regression models were run with the directions of international assignments forming the ordinal polychotomous dependent variables. Ordered probit models were employed since our dependent variables were based on attitudinal survey Likert-type scales (Liao 1994). Probit models have become major analytical techniques in management research (Hoetker 2007).

The dependent variables in this regression analysis are the three measures of *international assignment directions*, notably (A) to the parent company laboratory, (B) to another R&D laboratory of the MNE group and (C) to another host country independent research facility. Respondents were asked to provide information on the international assignments they assumed during the last five years. In case expatriates undertook assignments abroad in more than one of those directions, they were

requested to evaluate the most important to their careers direction. They were asked to evaluate on a four-point Likert scale whether these (most important) assignments occurred very often (over three times per year - value of 4), frequently (1-2 times per year on a regular basis - value of 3), occasionally (when there is a need - value of 2) or never (value of 1) (drawn from Haug et al. 1983). The numbers of responses in each of the three directions were 157 for A (to the parent company laboratory), 108 for B (to another R&D laboratory of the MNE group) and 76 for C (to another host country research facility).

The three independent variables of interest in this study are, first, the *role of the R&D laboratory*. This variable sought to identify on a four-point Likert scale (4= only role, 3= main role, 2= secondary role, 1= not part of a role) to what extent the function of the lab falls into one of three categories: adapts existing products and/or processes to make them suitable to the local markets and conditions (Support Laboratory - SL); develops new products for the regional or global markets (Locally Integrated Laboratory - LIL); and, carries out basic research (not directly related to the current products) as part of a wider MNE group level research programme (Internationally Independent Laboratory - IIL) (drawn from Papanastassiou and Pearce 1999).

The second independent variable of interest is the *role of the subsidiary*. This variable sought to identify on a four-point Likert scale (4= only role, 3= main role, 2= secondary role, 1= not part of a role) to what extent the function of the subsidiary falls into one of three categories: focus on the production of differentiated products for regional or global markets applying subsidiary-level knowledge (Product Mandates - PMs); specialize in the production of specific products or component parts of the final products using knowledge that is already well-established in the MNE (Rationalized

Product Subsidiary - RPS); and, produce standardized products that are part of the MNE established product range (truncated Miniature Replica - TMR) (drawn from White and Poynter 1984). As noted, RPS and TMRs were merged into non-PMs, and so, subsidiary role is captured through a dummy variable (1= PM, 0= non-PM).

The third independent variable of interest is the *technological intensity of the sector*. This was again captured through a dummy variable whereby 1 refers to subsidiaries operating in high-technology sectors (HIGHTECH) and 0 to subsidiaries in low-tech sectors. Following the respective distinction by Tether and Storey (1998) and Pearce (1994), high-technology included firms in the telecommunications, electronics and information technology, chemicals and pharmaceutical industries; and, low-technology all other firms.

Furthermore, five control variables are employed in this research. *Size of the subsidiary (SUBSIZE)* (e.g. Chiao et al. 2008; Stewart and Bulent 2007) was measured using a three-point Likert scale taking into consideration the volume of gross sales expressed in million Euros (1= less than € 20 m, 2= between € 20-40 m and 3= more than € 40 m). *Age of the subsidiary (AGESUB)* (e.g. Dimitratos et al. 2009; Fang et al. 2008) was measured using a three-point Likert scale capturing the number of years of subsidiary operations in Greece (1= recently established subsidiaries that had been operating in Greece since 1995, 2= well-established established subsidiaries that had been operating in Greece between 1976 and 1994 and 3= old subsidiaries that had been operating in Greece before 1975). The study also controls for chief demographic employee characteristics. *Age of the respondent (AGERES)* (e.g. Olsen and Martins 2009; Takeuchi et al. 2005) was measured using a three-point Likert scale (1= R&D professionals under 36 years old, 2= professionals between 36 and 45 years old and 3= professionals over 45 years old). *Gender of the*

respondent (e.g. Selmer and Leung 2003; Shortland 2009) was captured through a dummy variable whereby 1 refers to male R&D professionals (MALE) and 0 to females. *Marital status of the respondent* (e.g. Brown 2008; Caligiuri and Tung 1999) was captured through a dummy variable whereby 1 refers to married R&D professionals (MARRIED) and 0 to singles.

Findings and Discussion

Table 1 reports the means, standard deviations and pairwise Pearson correlations between all variables of the study. In relation to the correlation coefficients between the three independent variables of the study, the only significant pattern between R&D lab and subsidiary roles is the positive coefficient between LIL units and PMs. This implies that there is no direct association between the two kinds of roles as one could have expected, notably the more MNE-embedded SL labs do not accompany non-PMs and the more "autonomous" IIL labs do not accompany PMs. In addition, IILs are negatively correlated with the high-technology sector dummy variable, which is a finding that supports the argument that basic or applied research associated with programmes of precompetitive work is primarily organized by MNE subsidiaries operating in low-tech sectors. This surprising finding may be justified by the idiosyncrasies of the investigated sample as products produced and consumed in the small Greek market in the main lie on the low- rather that the high-tech end of the spectrum (OECD 2008).

Insert Table 1 about here

Table 2 displays the results of the three ordered probit regression models. The ten independent and control variables were regressed on international assignment directions to "the parent laboratory" (A), "other MNE group laboratory" (B) and

"other host country R&D facility" (C). Diagnostic checks for the disturbance terms and heteroskedasticity tests took place for all three models. No deviations from the assumptions of linearity, homoscedasticity and normality were found in relation to the regression variates. In addition, multicollinearity was not found to be a source of bias since the assessment of variance inflation factors for the regression variables resulted in values close to 1, which are significantly lower than the accepted cut-off value of 10 (Netter et al. 1996). The pseudo R^2 values in all three regression sets are above 20%, which are quite satisfactory given the cross-sectional and cross-national nature of the sample.

Insert Table 2 about here

Hypothesis 1a posited that R&D corporate expatriates employed in SLs prefer international assignments in parent and/or other MNE group labs. Regression model (A) presents a highly statistically significant coefficient between SLs and international assignments to the parent MNE lab, and so, Hypothesis 1a is supported. Not only that but also the results of regression model (C) suggest that international assignees from SLs avoid movements to other host country facilities. Consequently, given that scientists in SLs seek to augment their knowledge base by moving within the MNE system, their international assignments in independent host country R&D facilities can involve significant transaction costs with little extra return involved (cf. Pearce 1992).

Hypothesis 1b supported the statement that R&D corporate expatriates employed in LILs prefer international assignments in other host country R&D facilities. The evidence from regression models (A) and (B) provides strong evidence to the contrary: professionals employed in LILs primarily move to parent units and, to a lesser extent, to other MNE group laboratories (the coefficient for the latter type of

lab is significant at the 10% level). Hypothesis 1b is thus not supported. It may be that investigated LILs are a closely integrated part of the MNE technological strategy, and so, international assignees from these types of labs seek to be integrated within the MNE technological "culture" and values. This is likely to be a finding specific to the Greek sample because in general MNEs operating in Greece tend to rely heavily on the MNE system as far as technological strategy is concerned (Manolopoulos et al. 2009). Moreover, Hypothesis 1c argued in favour of other host country R&D facilities being the preferred international assignment directions for R&D corporate expatriates employed in IILs. The evidence from regression model (C) supports this hypothesis, although at the marginal significance level of 10%. It appears that movements to host country independent R&D facilities are desirable in order for IIL employees to investigate novel technological domains related to basic or applied research (Papanastassiou and Pearce 1999).

As far as Hypothesis 2a is concerned, there are no statistically significant results for PM subsidiaries in regression model (C) linked to other host country facilities. Hence, Hypothesis 2a that proposed that R&D corporate expatriates employed in PM subsidiaries preferred international assignments in other host country R&D facilities is not supported. This is likely to be related to the rather surprising positive correlation pattern between PMs and LIL units and, on the whole, to the possible idiosyncrasies of the Greek market concerning low levels of production of high-tech goods identified above. Originating from a home nation whereby production of high-tech products is not the major country strength, scientists employed in PMs of subsidiaries in Greece may have a weak incentive to pursue international assignments in other host country R&D facilities (cf. Bennett and Zhao 2004; Bogdan 2008). In addition, PMs show a statistically negative regression

coefficient at the 10% level for PMs in regression model (A) suggesting that employees in non-PMs subsidiaries tend to move to parent laboratories. Consequently, Hypothesis 2b that posited that R&D corporate expatriates employed in non-PM subsidiaries preferred international assignments in parent and/or other MNE group laboratories receives some support.

Hypothesis 3a and 3b assumed that R&D corporate expatriates employed in subsidiaries operating in high-technology sectors preferred international assignments in other host country R&D facilities; while, those in low-technology sectors preferred international assignments in parent and/or other MNE group laboratories, respectively. The sole regression coefficient related to the technological intensity of the sector shows that international assignees employed in subsidiaries in high-tech sectors prefer movements to other MNE group labs. This finding does not provide support to either Hypothesis 3a or 3b. The explanation for this finding may be that R&D scientists in high-technology sectors often pursue links with technological "centres of excellence" located in the MNE (Cantwell and Janne 1999). To further corroborate this argument, it may be that since investigated high-tech sectors (telecommunications, electronics and information technology, chemicals and pharmaceuticals) may be viewed to be "global" ones, R&D assignees can pursue projects with important MNE research centres in a common effort to develop specialized products for major markets worldwide (Mansfield 1998). The regression results also show three other statistically significant results for subsidiary size, age and marital status of the researcher, yet the respective coefficients are marginally statistically significant.

Conclusions

International assignments remain one of the most persistently understudied areas in international human resource management nowadays (Lee 2003). In particular, this study is seemingly the first research that provides some evidence into respective movements of *R&D* corporate expatriates. International assignments of these scientists may be affected by particular characteristics that are linked to this profession such as the role of the R&D lab, the role of the subsidiary and the technological intensity of the sector. The findings of the current study suggest that all these three sets of variables affect international assignment movements. This especially applies to R&D lab roles and technological intensity of the sector, which present the most statistically significant results. Therefore, the evidence of this study argues in favour of incorporating characteristics of the micro-work context of R&D employees such as the laboratory role when examining R&D employee international assignments. The evidence of the present research shows that these characteristics of the micro-work context can be more important than employee-related characteristics that have captured a significant deal of the international assignment literature (e.g. Hippler 2009; Starr and Currie 2009). Our main contribution for research indeed rests on the fact that consideration of the micro-work context, and primarily that pertaining to R&D labs is essential to the investigation of R&D employee international assignments.

The findings of the present study suggest that management take into account that different roles of R&D labs and subsidiaries as well as the level of technological intensity of the industrial sector in which MNE subsidiaries operate induce movements to dissimilar international assignment directions. Effective management of international assignments is a principal factor accommodating successful global staffing for the modern MNE (Collings et al. 2009; Welch et al. 2009). The

implications of the findings for MNE management developing international assignment programmes are that R&D employees working in SL and LIL laboratories as well in non-PM subsidiaries prefer assignments in the lab of the MNE headquarters. Scientists working in LIL R&D laboratories and high-tech sectors prefer assignments in other MNE group laboratories. Also, professionals working in IIL R&D labs prefer assignments in other host country facilities, while employees in SLs avoid assignments in those facilities.

There are limitations in the current study that may provide avenues for further research. We examine four of these considerations in this paper. Firstly, we did not seek to capture a complete list of potential factors that influence international assignments of R&D corporate expatriates. The effectiveness of international assignments and, in general, human resource practices is due to a comprehensive set of factors associated with the micro-work context, subsidiary and MNE-related variables; employee-related considerations; as well as local institutional and global industrial considerations of the MNE (e.g. Tregakis et al. 2001; Tregaskis and Brewster 2006). Future research on R&D international assignments may take into consideration these factors along with the relative predictive power of each of these sets of factors.

Secondly, the results of this study can be constrained by the Greek investigated sample. Greece is a reasonably small country on the EU periphery and the goals of MNEs for their subsidiaries and R&D operations can be specific to this nation. As discussed above, the idiosyncrasies linked to the Greek economy may explain some results that have not met our expectations. Future study would investigate MNE subsidiary activities based in other countries also. Thirdly, in this study as we primarily emphasized on roles of R&D labs/subsidiaries and industrial sectors, we did

not take into consideration more sophisticated employee-related parameters. One such major parameter refers to different categories of R&D corporate expatriates including traditional expatriates, short-term assignees and international business travellers (Tahvanainen et al. 2005). It may be that the motives for movements in each of those groups are different, and so, research can include this important issue in future investigations. Fourthly, another limitation upon which further study could build on has to do with the lack of perceptions of headquarters managers. In the current study only the subsidiary perspective was examined though the R&D employee responses. These responses may not necessarily coincide with those of headquarters managers, a limitation that future study can attempt to address.

Notes

1. Corporate expatriates are broadly defined as employees who are sent to another country on a temporary basis to accomplish an organizational goal (Dowling and Welch 2005; Harrison et al. 2004). Therefore, in this paper we use the terms "international assignees" and "corporate expatriates" interchangeably.

2. The statistical results that follow were similar across EU, US, Japanese and other European MNEs. Hence, the MNE country of origin does not form a variable of interest in the subsequent analyses.

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Table 1: Descriptive statistics and correlation matrix

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1. To parent lab (A)	2.05	1.11	1												
2. To MNE lab (B)	1.87	1.14	0.28	1											
3. To other host country facility (C)	1.55	0.89	-0.27	-0.42	1										
4. SL	2.88	1.04	0.31**	-0.24	-0.33*	1									
5. LIL	1.94	0.78	0.23**	0.19*	-0.39	-0.14	1								
6. IIL	1.41	0.63	-0.19	-0.18	0.28*	-0.11	-0.14	1							
7. PM	0.23	0.11	-0.21**	0.27	0.19	-0.15	0.33**	-0.21	1						
8. HIGHTECH	0.31	0.14	0.18	0.32***	-0.25*	0.22	-0,11	-0.22**	-0.16	1					
9. SUBSIZE	1.84	0.88	0.16	0.27	0.16*	0.19	-0.27*	-0.12	0.14	0.16	1				
10. AGESUB	1.68	0.78	-0.24	0.05	-0.09	0.06	-0.15	-0,27**	-0.39	0.21*	0.22	1			
11. AGERES	1.41	0.93	0.06	-0.13	-0.12*	0.12*	-0.22	-0.06	-0.24*	0.09	-0.24	-0.11	1		
12. MALE	0.58	0.27	0.21	0.23	0.15	0.03	0.05	0.18	0.11	0.13	-0.19	0.26	0.16	1	
13. MARRIED	0.67	0.32	-0.14	-0.11*	-0.19	0.16	0.11	-0.12	0.25	-0.15	0.13	-0.17	0.17**	-0.18*	1

*** significant at 0.01, ** significant at 0.05, * significant at 0.10

Table 2: Regressions with intl assignment directions as dependent variables[a]

Regressions with international assignment directions			
Direction	A	B	C
SL	.825*** (.311)		-.417* (.281)
LIL	.774*** (.326)	.525* (.298)	
IIL			.327* (.184)
PM	-.584* (.302)		
HIGHTECH		.728*** (.201)	
SUBSIZE			.486* (.297)
AGESUB			
AGERES			-.327* (.186)
MALE			
MARRIED		-.721* (.482)	
n	157	108	76
Pseudo R-square	0.26	0.21	0.23
F	4.17***	3.09**	2.21**
LR chi^2	23.32**	21.15**	24.76**
*** significant at 0.01, ** significant at 0.05, * significant at 0.10			
Figures in () are standard errors			
Direction of host country personnel movements:			
A: To the parent laboratory			
B: To other MNE group laboratory			
C: To other host country R&D facility			

[a] Only statistically significant results are shown