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**Connecting gender and economic competitiveness:
lessons from Cambridge's high tech regional economy**

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Abstract

Whilst recognition of the significance of gender divisions continues to transform economic geography, the discipline nevertheless remains highly uneven in its degree of engagement with gender as a legitimate focus of analysis. In particular, while social institutions are now widely regarded as key determinants of economic success, the regional learning and innovation literature remains largely gender-blind, simultaneously subordinating female worker voice *and* making invisible distinctively gendered patterns of work in the face of an increasingly feminised labourforce. Focusing on the industrial agglomeration of Information and Communication Technology (ICT) firms in Cambridge, England, first we outline the nature of inequalities in patterns of work and social interaction among female versus male employees within Cambridge's high tech regional economy. Second, we demonstrate how these inequalities in turn constrain female employees' abilities to contribute to key processes widely theorised to underpin firms' innovative capacities and economic competitiveness. Specifically these self-identified constraints centre on female workers' abilities to: (i) act as agents of information and knowledge diffusion *between* firms; and (ii) *use* new information and knowledge once it enters the firm. Third, we discuss the wider implications of our research with regard to integrating work-life balance and high tech cluster policies. Overall our results suggest that gender issues of social equity at the level of the individual worker need to be explicitly integrated with issues of economic competitiveness at the levels of the firm and the region, and that there exists a significant research agenda in this vein that has yet to be fully explored. This is not simply a case of female employees being socially excluded at work, but of their simultaneous exclusion from key elements of firms' productive processes.

Key words: Cambridge, gender inequality, multi-method, work, social interaction, competitiveness

Introduction

Over the last two decades, economic geography has been transformed by the recognition of gender as a key focus of analysis. As female labour participation rates have steadily increased, so geographers have examined the ways in which gender divisions and gendered social relations are

partly constituted by and affect economic processes. Moreover, they have engaged explicitly with feminist scholarship to examine the role of gender in shaping work, employment, local labour markets, structures of the firm, and employment practices (see e.g. Hanson and Pratt, 1995; McDowell, 1997; Walby, 1986, 1997). As such, analyses of gender structures have helped transform and broaden the very notion of ‘the economic’ itself (McDowell, 2000). However, economic geography remains uneven in its treatment of gendered social relations. Significantly, the regional learning and innovation literature which has become a lynchpin of the discipline over the last two decades, is notable for its almost total sidelining of gender divisions in its analyses.

Specifically, scholars have examined how regions foster conditions conducive to processes of knowledge creation, information dissemination, learning and innovation which are argued to underpin firms’ economic competitiveness (Lawson, 1997). However, dominant accounts of the institutional bases of innovative regional economies typically treat elite workers as an homogeneous group, with little differentiation by gender¹. This is a glaring omission on two inter-related levels. First, in terms of social equity, female workers’ voices are subordinated in the face of persistent gender inequalities within high tech firms. Second, by ignoring gender, scholars also make invisible significant constraints on female employees’ abilities to contribute to key parts of firms’ productive processes. In this paper, we draw on the case study of Information Communications Technologies (ICT) sector in Cambridge, England, one of Europe’s foremost high tech regional economies, to examine specifically the nature of explicitly *female* work patterns and networks of social interaction and how they in turn shape key processes widely theorised as underpinning firms’ innovative capacities and regional economic competitiveness.

The paper proceeds as follows. First, we provide a brief critical review of the regional learning and innovation literatures, arguing that an excessive focus on process over agency, and a preference for abstract theory over detailed empirical work have combined to sideline the ways in which gender divisions and social relations shape the plausible responses of workers and firms in high tech regional economies. Second, we introduce our Cambridge case study and outline our methodology. Third, we present our results, demonstrating how self-identified patterns of work and social interaction among female employees stand in stark contrast to key work patterns and social structures that have been consistently highlighted in the geographical literature as underpinning firms’ abilities to compete. Specifically, gender inequalities faced by female employees in turn constrain their abilities (relative to their male colleagues) to contribute to: (i) *inter*-firm information diffusion via constrained levels of job hopping, informal networking and socialising; and (ii) *intra*-

¹ The racial and cultural background of workers are also often sidelined (c.f. Saxenian and Edulbehram, 1998).

firm use of knowledge, via patriarchal corporate cultures in which female employees find it difficult to make their ideas heard. As such, this is not simply an issue of female employees being socially excluded in the workplace, but of their simultaneous exclusion from key parts of the productive' process widely theorised to underpin firms' economic competitiveness. Finally, we outline the wider relevance of our research in terms of the need for more socially-informed high tech cluster policies, and highlight a significant future research agenda in which the impacts of gender inequalities on economic competitiveness at the levels of the firm and the region need to be further explored and measured.

On the social determinants of economic competitiveness

With the shift to a knowledge-based economy, the capacity to support processes of learning and innovation has been increasingly identified as a source of competitive advantage (Henry and Pinch, 2000; Lundvall and Johnson, 1994; Storper, 1997). Those firms, sectors, and regions that can learn and innovate faster become more competitive because their knowledge is scarce and therefore cannot be immediately imitated or transferred to new entrants (Lundvall, 1992). Firms that innovate more consistently and rapidly typically demand higher skills, pay higher wages, and offer more stable prospects for their workforce (OECD, 1996). Consequently, the formal and informal institutional underpinnings of economically competitive firms and regions have attracted considerable policy and academic attention, especially within geography.

Significantly, geographers have moved away from an earlier focus on input-output linkages and transaction costs (e.g. Scott, 1988), to examine how regions' social, cultural and institutional endowments shape local employment relations, industrial adaptation, firms' abilities to learn and innovate, and hence regional dynamism (e.g. Pyke and Sengenberger, 1990; Saxenian, 1994; Schoenberger, 1997)². In particular, both formal and informal social networks between firms and other educational, research and political institutions have been shown to aid the circulation of tacit knowledge between firms, upon which economic competitiveness is increasingly based as codified knowledge becomes more 'ubiquitous' through more effective communications technologies (Lundvall and Johnson, 1994; Malmberg and Maskell, 1997; Maskell and Malberg, 1999). Scholars have also examined the different types of corporate culture and employee behaviour

² The economic geography literature is now littered with overlapping concepts that include 'institutional thickness', 'relational assets', 'associational economies', 'innovative milieux' and 'learning regions' (see e.g. Amin and Thrift, 1994; Camagni, 1991; Cooke and Morgan, 1998). All share a concern with the role of socio-cultural context in shaping firms' economic competitiveness.

patterns best suited to the use of new knowledge once it enters the firm (see e.g. Lam, 2002; Saxenian, 1994). As such, it is now almost taken-for-granted that learning, innovation and economic competitiveness are fundamentally inseparable from the regional socio-cultural context in which they occur and which significantly determines their nature at the level of the firm and individual worker (Asheim, 2001; Gertler *et al.*, 2000; Malecki and Oinas, 1999).

However, despite these key advances in the geographical literature, the *gendered* social relations and worker divisions in which firms and their employees are embedded and which shape their activities nevertheless remain virtually ignored³. While geographers argue that economic competitiveness is enhanced by a shared social environment that supports interaction (e.g. Keeble and Wilkinson, 1999; Lawson *et al.*, 1998), this shared social environment is too often conceptualised as implicitly masculine, and hence significant gender divisions and worker inequalities are obscured. Further, by ignoring key differences in male versus female patterns of work and social interaction, scholars have also failed to recognise significant gendered constraints on the plausible responses of workers in high tech regional economies, to contribute fully to firms' innovative processes and hence abilities to compete. Several inter-related empirical, epistemological and methodological factors have conspired to sustain this glaring omission.

First, males have historically dominated high tech labour forces, and hence the corporate case studies on which many scholars have drawn. However, female labour participation rates in high tech have significantly increased, and *continue* to increase, from the late 1980's when much of the new industrial district literature was written. Women now comprise 22% of professional IT workforce in the UK, compared with 33% in the EU, and indeed 45% in the US (Amicus,⁴ 2001). Second, many geographical accounts of innovative regional economies rely on self-reporting by 'boosterist' agents (Lovering, 1999) who have a vested interest in verifying the theoretical propositions being put forward (MacKinnon *et al.*, 2002). As a result, unequal power relations and negative social divisions, such as those premised on gender, tend to be masked. Third, much of the learning and innovation literature fails to ground its arguments in in-depth empirical enquiry at all (Markusen 1999; Martin and Sunley 2001), scholars instead often basing their analyses on secondary data sources, such as censuses and other large-scale surveys (see e.g. Maskell *et al.*,

³ Contributing in part to economic geography's apparent disengagement from big social questions that has exercised many key commentators of late (see Martin, 1999; Markusen, 1999 c.f. Pollard *et al.*, 2000)

⁴ This figure includes technical and administrative professionals. The estimate comes from Amicus, the union that organises the IT industry in the UK.

1998; Rosenfeld, 1997). Thus, rather than analyse empirically the concrete mechanisms through which workers transfer information and knowledge within and between firms, workers instead often become black-boxed as an homogenous (and hence genderless) factor input to production⁵. Finally, many scholars reinforce these tendencies by focusing on process rather than agency, whereby processes themselves become the causal agents (Martin, 1999). However, to abstract learning and innovation processes from firms' employees is to divorce them from *people* with very real social identities and multiple allegiances which motivate and shape their daily work activities and which in turn sustain (or indeed constrain) firms' abilities to learn, innovate and hence compete.

Encouragingly however, a small number of key studies have begun to examine the role of gender divisions in high tech firms and labour markets. Most notable is Massey's (1995) work on the gendered organisational cultures and recruitment and employment practices in UK high technology firms and the associated domestic division of labour. She argues that high tech workplaces are implicitly 'masculine' spaces ('high tech monasteries') not in the sense that it is mainly men who work there, but in the sense that 'their construction *as spaces* embodies the elite, separated masculine concept of reason dominant in the West' (p. 27, emphasis in original). This masculinisation is argued to produce a culture in which values traditionally associated with femininity are absent and which therefore devalues women workers. However, while Massey provides an excellent analysis of the gendered social, cultural and relational properties of these firms, she does not specify fully the ways in which the gender divisions and social inequalities faced by individual workers in turn shape those workers' abilities to contribute to their respective firms' productive processes. The key contribution of our research therefore is that we simultaneously root our analysis of gendered social inequalities faced by female workers within a broader focus on the determinants of firms' abilities to capitalise fully on their workers' skills and talents in pursuit of economic competitiveness. Drawing on Cambridge's high tech economy as a case study, our results suggest that gendered patterns of work and social interaction constrain female many employees' abilities to contribute to both intra- *and* inter-firm processes which are widely recognised in the geographical literature as underpinning economic competitiveness at the levels of the firm and the region. As such, we can never hope to understand fully the workings of innovative regional economies as long as we continue to ignore significant gender inequalities between workers.

⁵ Of course there are exceptions, notably Saxenian's (1994) work on Silicon Valley and Boston's Route 128; Henry and Pinch's excellent work on operationalising the concrete mechanisms of knowledge diffusion within Oxford's Motorsport Valley and Keeble *et al.*'s (1999) and Lawson *et al.*'s (1999) similar attempts at operationalising untraded interdependencies. All share a concern with tracing the empirical mechanisms by which knowledge is shared and circulated within regional production systems.

Introducing ‘Silicon Fen’

No other region has been so consistently held up as an exemplar of successful high tech growth in the UK by politicians, policy analysts and academics alike than Cambridge⁶. Notably, the European Union, in its 2002 annual ranking of member states’ innovative capacities, praised the Cambridge region for its high rates of innovation and enterprise. The study scored the EU’s 148 regions on 17 indicators⁷ and ranked the UK Eastern region, where Cambridge is located, in the top 10 high tech regional economies in the EU (European Commission, 2002). The region is therefore not just an important high tech cluster for the UK, but also a key European centre of scientific and technological innovation (Keeble, 2001). Further, the success experienced by high tech firms in Cambridge (as well as commentators downplaying some of its corporate failures) has inevitably led politicians to use the region, in both symbolic and material ways, as a blueprint model for other regions in the UK. Significantly, in April 2002 Lord Sainsbury highlighted the Cambridge economy as *the* exemplar high tech growth cluster in the United Kingdom, and outlined the Department of Trade and Industry’s efforts to replicate the region’s success in other areas of the UK economy (Sainsbury, 2002).

Scholars have identified interfirm social networks as key conduits through which information and knowledge is diffused between firms in the Cambridge region, in turn supporting innovation and regional growth (Castells and Hall, 1994; Heffernan and Garnsey, 2002; Keeble *et al.*, 1999; Lawson, 1999). Lawton-Smith *et al.* (1998) in particular suggest a significantly high degree of social and cultural cohesion between firms and individual employees, an analysis supported by Keeble’s later work (Keeble, 2001). However, we argue that a recognition of gender divisions forces a more nuanced and qualified interpretation of the degree of social-cultural cohesion identified in the above studies. Indeed, to broaden our analysis in this way also forces a recognition of significant gendered *constraints* on female workers’ abilities to contribute to processes of informal networking, social interaction and other work patterns widely theorised to underpin firms’ abilities to compete, and which stem from gender inequalities between workers. We focus specifically on the Information and Communication Technologies (ICT) sector which is particularly well represented in the Cambridge region. While estimates of the size of this sector vary

⁶ Cambridge’s high tech cluster comprises the City of Cambridge and its hinterlands within a 20 mile radius (Keeble *et al.*, 1999).

⁷ These indicators included human resources, the creation of new knowledge, the transmission and application of knowledge, and innovation finance.

extensively⁸, we conservatively estimate that it is currently comprised of almost 1 000 companies that employ over 17 000 workers.

[TABLE 1 HERE]

The dominant ICT sub-sectors in Cambridge are software consultancy and supply (SIC 7220), telecommunications (SIC 64.20) and scientific instrumentation (SIC 33.20), together accounting for 67.5% of ICT employment within the Cambridgeshire region. The relative strength of these sub-sectors in terms of employment is manifest in their respective location quotients, a measure of regional specialisation (see *Table 1*). Importantly, Cambridge's ICT sector mirrors the UK's national ICT industry on two levels, in turn emphasising the wider significance of our study. First, as at the national scale, almost 60% of ICT firms in Cambridge employ 10 or fewer workers (indeed, only 10% have over 50 employees) (see e.g. Keeble, 1989, 2001). Second, Cambridge's ICT firms display a persistence of strong gendered occupational segregation (see e.g. Crompton *et al.*, 1996; Humphries and Rubery, 1995; McDowell, 1997). Women represent around 15% of ICT workers in Cambridge (Gray and Damery, 2003) compared with a UK figure of 13% (Millar and Jagger, 2001). Further, these figures are increasing annually, further underscoring the importance of our research. The University of Cambridge, one of the region's main suppliers of skilled high tech labour, has actively sought to increase its recruitment of female students in the sciences⁹, through a series of funded programs, in turn reinforced by a series of national-level initiatives. Significantly, this is not only one of the UK's leading universities but also a key pipeline for high tech labour supply to the local Cambridge area, and to the south-east region of the UK at a larger scale.

Methodology

To move towards a clearer understanding of the ways in which gendered inequalities faced by female workers in Cambridge's ICT workforce shape their abilities (relative to their male colleagues) to contribute to key widely theorised processes to underpin firms' economic competitiveness, we employed a multi-method research strategy. Following an extensive postal survey of Cambridge's ICT firms to establish broad patterns in firms' employment of women (see Gray and Kurihara, 2004) we conducted initial interviews with 88 employees in 10 leading firms (defined by employee size and establishment revenues in 2002) in Cambridge's software and

⁸ Variation stems from different bodies use different definitions of sectors comprising the ICT industry.

engineering sectors. This was based on the key premise that if we are to understand the dynamics of a regional economy then we should focus on its *lead* sectors (following Markusen, 1994). Focusing predominantly on elite high tech workers, our respondents included both female and male Human Resources managers, CEOs, local engineers, scientists and technologists. All of the respondents had obtained at least a B.A. in their respective fields and many had PhDs in computer science, engineering, or maths. The third phase of the study focused on a subset of three of the initial ten firms. This was based on a series of ten group interviews with between three and seven male and female professional scientists and technologists sitting in on each interview. We segregated these group interviews by gender and by occupation to facilitate freer exploration of the role of gender in workers' respective workplaces.

Our interview protocol was open-ended, to facilitate the acquisition of detailed 'insider knowledge' not amenable to more structured questionnaire methods (Schoenberger, 1991; Clark, 1997). Interviews typically lasted one to one-and-a-half hours, with consistency between interviews addressed by means of a checklist of topics to be covered with all respondents, whilst allowing them freedom to describe their own experiences in their own terms. We questioned respondents across a series of key themes, including formal corporate interactions, daily and weekly work patterns, informal socialising, intra- and inter-firm peer relationships, and the nature of dependants and homelife. We also encouraged them to reflect upon their implicit and explicit responsibilities at work and their fulfillment of those. We tape-recorded the interviews, pushing respondents for concrete examples wherever possible and later employing various secondary data sources (annual reports, memos, etc) as part of a source triangulation strategy to verify interviewee responses.

We undertook as systematic analysis of the interview transcripts as possible through a process of progressive qualitative hypothesis testing. This involved coding the data to break it down, recategorising it, examining the links between groups, and then developing hypotheses with regard to the mechanisms and patterns that best fit the data and helped explain it (following Glaser and Strauss, 1967). In order to make our analysis more robust, we also employed 'member checking'; that is, checking the credibility of our analytic categories, constructs, and hypotheses with members of the groups from which we originally obtained the data. Whilst these respondents do not have privileged access to the truth, they *do* have privileged access to their own opinions and meanings (Baxter and Eyles, 1997), and it is upon these experiences that our analysis has been primarily based. The validity of this strategy is not only that these key actors, in their daily worklives, constantly construct and reconstruct 'the economic'; but also, that if people define their

⁹ In 2001, women comprised 13% of the university's computer science graduates and 8% of physics graduates (University of Cambridge, 2000).

circumstances as real then they are real in their consequences (Merton, 1957: 421-436).

Consequently, much of the information upon which our analysis is based has been gleaned through highly personal, albeit formalised, exchanges. We have therefore not named names in the write-up itself, but instead describe respondents' positionalities as far as possible within the boundaries of anonymity. We also refer to firms by pseudonyms to protect the confidentiality of our sources.

Unpacking gender and economic competitiveness in Silicon Fen

(I) Informal afterwork socialising and tacit knowledge transfer

Innovation can be seen as a process of collective learning in which complementary forms of information and knowledge are combined, to create new forms of knowledge greater than the sum of their constituent parts (Lawson and Lorenz, 1999; MacKinnon *et al.*, 2002; Nelson and Winter, 1982). As such, workers' abilities to access new sources of information and knowledge in close proximity to their respective firms' existing knowledge bases underpins in turn firms' abilities to compete, enhanced by the ever-increasing intersectoral nature of new technologies. Crucially, social networks between employees have been widely identified as conduits of information exchange between firms, reinforcing more formal types of interaction (Henry and Pinch, 2000). Indeed, Powell (1990) argues that social networks are *the* most efficient organisational arrangement for sourcing information given that information is difficult to price in a market and difficult to communicate through a hierarchy. As employees swap knowledge and ideas about how things are done in other firms, ideas become recombined in new ways in different firms with existing skills, technology, know-how and experience, hence stimulating innovation (Capello, 1999; Lawson and Lorenz, 1999; Saxenian, 1990). One key place that this knowledge transfer between workers occurs is in informal social settings, often outside of formal work hours and spaces. However, our results suggest that levels of afterwork socialising differ significantly between male and female employees in Cambridge's ICT sector, and also make visible significant gendered constraints on female workers' abilities relative to their male colleagues to contribute to processes of interfirm information diffusion that remain largely unidentified in the geographical literature.

A prominent analysis of the key role social networks in information exchange between firms is that by Saxenian (1994). Specifically she highlights how Silicon Valley's engineers, migrating to California from the East Coast, lacked any roots or family ties and so instead developed shared identities around the project of advancing a new technology, in turn premised on a porous division between work, social life and leisure activities (*ibid.*: 60-64). Consequently, these employees not

only meet frequently at trade shows, industry conferences, seminars, talks and other social activities organised by local business organisations, but also in more informal venues such as bars, clubs, pubs, internet cafes and coffee shops. In these social contexts, relationships are easily formed and maintained (Saxenian, 1990), technical and market information exchanged, contacts established and new ideas conceived. However, it is important to note that these are predominantly male ‘Silicon Cowboys’. In contrast, patterns of social interaction among the *female* high tech employees in our study are instead characterised by a more rigid separation of work and social life, premised in turn on childcare and other family commitments which these women bear the brunt of within the home (see also Hochschild, 1997; McDowell, 2001; Schor, 1992):

“The main thing I find about the corporate social events that take place in Cambridge is that most of them tend to start at 6.30 [pm], and if you have kids, that’s just the worst time, it’s just impossible to get to them. These events rule out people with kids practically, well the women at least. So while there’s a mixture [of socialising events], they all tend to be dominated by men, 85% men probably”. Vice President, TUJ, female with children

Significantly, the majority of our female respondents with children consistently outlined how they have been forced to adopt compromise levels of informal social networking relative to their male partners, for example consciously reducing the amount they travel outside the local area, their attendance at trade shows, industry conferences, local seminars and talks, as well as reducing informal social interactions in bars and pubs:

“While we share responsibility for the kids, typically [my partner] does the mornings and I tend to pick the kids up between 4.30 and 5. But he travels more. The company I’m with now, I don’t travel, other people in the company have to do it. It’s a big problem because now I don’t attend conferences at all. Partially because it’s a huge networking opportunity on an international scale. Because of my personal life I had to take the decision, and I can’t do it. It puts a lot of pressure on families when the parents travel”. Entrepreneur, SUJ, female with children

Female employees with children were also able to compare their current abilities to socialise afterwork with earlier periods in their career when they were more able to contribute to these types of social interaction in the firm:

“I used to work a lot more hours before I had kids and spend a couple of hours every day wandering around doing who knows what but not having the extra time means you have less socialising with colleagues, less time standing around chatting, spontaneous coffee. I suppose the other bit is in the evenings, where people go to the pub a lot. I do always feel a

bit of an outsider as a result because I just can't go to social things". Scientist, NSD, female with children

In contrast, many of our male respondents suggested that they are only able to attend these afterwork functions *because* they are supported by female partners who do *not*:

*"Blokes **can** do that more easily, but my wife couldn't. At the end of the day she bears the brunt of the kids, even though the fact we have child-care etc., the fact is that she's the one there now making the kiddies their tea, not me".* Head of Personnel, BSN, male

Gendered constraints on employee informal social interaction and information diffusion also play out at the *intra*-firm level, centred around the nature and content of part-time work. In contrast to the majority of male scientists and engineers working in high tech firms in Cambridge employed on full-time contracts (Massey, 1995; Massey *et al.*, 1992), our results suggest that their female colleagues are more likely to fill part-time contracts, primarily to enable them to fit work around childcare commitments which they bear the brunt of within the home (see also Hochschild, 1997; McDowell, 2001; Schor, 1992). In total, over 94% of all the part time employees in the firms we studied were women. While this is often framed in the business literature in a positive discourse of enhancing firms' competitiveness through numerically flexible labour deployment, it also has negative implications for workers and hence the firms that employ them. These were presented to us in terms of missed opportunities for informal, yet crucial, social interactions through which information and knowledge is circulated:

"Yeah, we are immensely flexible. People work flexitime: some start work at 7.30 in the morning, whereas others start at 10.30 and other times in between. Most people on part time contracts of different types are female. Although we are predominantly a male company, 80% of the company is male, 70% of our part-timers are female - half in their career and half at home. You end up with female employees that are no longer so connected to the social capital at work, which is mainly a bunch of blokes nattering around the cooler about whatever big is going on right now". HR Manager, BSN, male

"There's sort of a prescribed coffee and tea time each afternoon and each morning. Generally I don't go because I feel that I'm already there for such a short period of time that I find it difficult to justify. What you're doing is doing your hours as opposed to being able to contribute fully to what is a very high commitment, very passionate organisation. I don't know how to reconcile that". Scientist, NSD, female

Significantly, our results suggest that female employees *without* children also reduce their socialising with colleagues. Outside work, social events that predominate within the region are widely perceived as structured in inherently masculine ways, often equating to ‘male bonding’ sessions from which female employees feel excluded. Female employees therefore forego attendance at key social events where they might otherwise improve their own knowledge and employability, but also where they might otherwise act as agents of informal information exchange between firms. Our female respondents consistently outlined how their male colleagues often share a strong sense of identity into which they have found it hard to break:

“I find that the IT group does go out quite a lot together. But the main topics of conversation are cars and gadgets, and work. I just want to put that to one side and speak about something different. But it always narrows down to those subjects which is quite hard”. Engineer, BSN, female

“You don’t have that common ground or talk in the same way. The guys will sit there talking about a football game for two hours and it just doesn’t make me want to be with them outside of work. And for me, I may do the job, but I have no interest in it outside of work, so I don’t want to talk about it in the pub or to spend all my time at the Cambridge Network Group”. Engineer, WWS, female

Our results are therefore consistent with broader social network analyses which suggest that men and women tend to socialise in gender segregated networks, in both the personal sphere of friends and families and in the public sphere of work (Hanson and Pratt, 1992; Marsden, 1987; McPherson and Smith-Lovin, 1986, 1993). Of course, social networks are not necessarily contained within the labour market region. Notably, Benner (2002, 2004) has outlined the potential role of virtual online social networks among female high tech employees such as Silicon Valley Webgrrls through which information and job opportunities are shared between female employees who do not necessarily live and work in close spatial proximity to each other. However, the use of such compensatory on-line networks among the female workers in our Cambridge sample was limited.

Thus, while these patterns of work and social interaction typically contrast with those of male colleagues, they also stand in stark contrast to the modes of information and knowledge diffusion widely cited in the literature as underpinning regional innovative capacity. First, home and childcare commitments make social activities out of work hours difficult to attend. Second, limits on the hours many women are able to work make the work-experience more intense, and as a result they have less time to socialise *at work*. Third, the masculine nature of many social events often make them unappealing to women, thus encouraging them to limit their attendance. All three not

only constrain female employees' abilities to reproduce and enhance the value of their own labour power (see Massey, 1995), but also to act as conduits for inter-firm information and knowledge diffusion within and between firms. As such, by ignoring gender divisions and social inequalities faced by individual female workers, regional learning and innovation scholars have also made invisible significant gendered constraints on those same female workers' abilities to contribute to processes of knowledge diffusion widely theorised to underpin economic competitiveness at the levels of the firm and the region.

(II) Job-hopping and knowledge diffusion through employees as embodied competencies

The second key area in which gender inequalities faced by female workers constrain their abilities in turn to contribute fully to firms' economic competitiveness centres on their abilities to transfer information and tacit knowledge between firms through inter-firm labour mobility. As communications technologies have improved the transfer of codified (formal) knowledge between firms, so firms' economic competitiveness is argued to be increasingly dependent upon their ability to access sources of new tacit knowledge, which is highly personal, context-specific, and difficult to formalise; that 'we know more than we can tell' (Polanyi, 1967: 4)¹⁰. Henry and Pinch (2000) provide a convincing empirical demonstration of the concrete mechanisms through which this 'churning' process occurs in Oxford's Motorsport Valley, focusing on the flow of personnel between firms measured through key employees' career biographies¹¹. When employees move to new firms in the region and work with new colleagues with partially overlapping knowledges, comparisons of evolving ideas are made with other practices in the firm that are not internally generated. Thus there is an increased potential for new unexpected ideas, interpretations, and synergies to develop; that is, for increased learning and innovation (Grabher, 1993; Oinas and Malecki, 1999; Malecki, 1991). Employees may also maintain advantageous *ongoing* links between their new firm and their previous firm via personal relationships.

Crucially therefore, tacit knowledge is difficult to transfer in the absence of labour mobility, given its embodiment in individuals as specific skills (Maskell and Malmberg, 1999). Our results suggest that gender divisions impact on this processes in two key ways. First, based on an analysis of

¹⁰ Notions of tacit knowledge draw on the work of Michael Polanyi, and refer to the knowledge or insights that individuals acquire which is ill-defined or uncodified and which they themselves cannot fully articulate, in contrast to explicit (or codified) knowledge is knowledge that is transmittable in formal, systematic language. However, the distinction between 'tacit' and 'explicit' knowledge is not fixed.

¹¹ Keeble *et al.* (1999) adopt a similar framework to operationalise and measure 'untraded interdependencies' and collective learning in Oxford and Cambridge's high tech regional economies.

employee career trajectories (controlling for age), while we found only negligible gender differences in frequencies of job hopping, we found significant *qualitative* differences in the nature of that process. While our female respondents change jobs almost as often as their male counterparts, it is often not for their own personal career advancement, but to accommodate their partner's career moves (also see Dex, 1987):

“This is probably not the job I would choose, but frankly ... when my husband got a chance at [firm] it was a big move up, so we decided his career would come first and I would do the best I could”. Engineer, WWS, female.

“We both have careers, he [husband] works in engineering too and we really split all the stuff at home, but my husband has the really prestigious job, so that really does tend to narrow my options. I have moved jobs twice for him, once to the US and once to France. It does wreck havoc on my long-term plans”. Engineer, WWS, female, with children.

Significantly, this dynamic of non self-motivated job hopping occurs in the elite professional workforce within our case study. That is, this ‘trailing spouse syndrome’ (see Hardhill, 2002) is not solely an attribute of women working in the secondary labour market. While this finding is key from the point of view of social equity¹², it also has key implications for female workers’ abilities to acts as conduits through which firms can access external sources of information and knowledge transfer through job hopping. Moreover, new product development in high technology sectors is favoured by cooperation between individuals with partially overlapping tacit knowledge of a technical sort’ (Lawson and Lorenz, 1999: 310). As such, beneficial information transfer between firms through labour mobility (self-motivated or not) only functions when employees remain in the *same* sector or move into similar sectors where those same types of information, skill and competencies are equally valued. On the other hand, frequent transfers *between* occupations and sectors not only serves to devalue these embodied skills at the level of the individual female worker, but also the social networks of relationships between employees in different firms which take time to develop; a key form of corporate social capital which non–self-motivated labour mobility devalues and undermines.

Second, we also found a significant difference in the levels of job hopping between the majority of female workers with minor or no home and childcare responsibilities, compared with the majority

¹² In terms of these professional women often making sub-optimal career choices in order to increase their partner's career mobility, with the result that their own career trajectories tend to be more erratic, unplanned, with more time spent under-employed.

of their female colleagues who have children (see also Dumelow *et al.*, 2000). Crucially it is typically more difficult for this latter group of female high end workers to move between firms, thus limiting their abilities to act as agents of information and knowledge diffusion within the region:

“Well, I have changed positions in the past, and, yes, it does help move things along, but right now life is so complicated. I’m near my daughter’s nursery here, my husband commutes to London, so I have to be nearby. If he didn’t commute, I’d be freer, but I’m responsible for the kids, so it’s very complicated”. Engineer, WWS, female with children.

“I can’t change jobs right now. Never! I truly am just holding it all together. Just! Work and home and home and work. Having a child has meant I’ve really had to reassess my career”. Engineer, HD, female with children.

Lower levels of occupational mobility as evidenced by many women in our Cambridge case study therefore maintain a segregation *within* the female worker group itself, based on women’s position in the life-cycle, in turn heavily correlated with childcare responsibilities. Indeed, historically women have played the dominant role in the social reproduction of the family. As such, Folbre (1994) argues that women tend to maximize not individual utility, but *family* utility, whereby they try to ensure the highest possible level of collective well-being for the family. In this regard, our female respondents with children may have lower levels of job mobility in an attempt to minimise the disruptive effect that changing jobs can have on the entire family unit. This disruption includes changing complex commuting patterns that incorporate nursery, school, and a partner’s commute; possible redistribution of domestic duties; and even possible relocation of home, school, and social networks.

Thus, while limiting individual female employees’ abilities to further their own careers relative to their male colleagues, these constrained levels of job hopping among the female employees highlighted also constrain those workers’ abilities to acts as conduits though which firms can access external sources of tacit knowledge, and through which tacit knowledge is diffused across firms in the region. Significantly, this gendered constraint was recognised by both male and female workers in our respondent sample but remains largely unidentified in the geographical literature.

(III) Firms’ use of knowledge and absorptive capacity

The third key area in which gender inequalities impact upon female workers’ abilities to underpin firms’ economic competitiveness centres on processes of knowledge-*use* within local firms. For

high-tech firms, competitiveness is sustained by becoming a moving target through continuous technological learning and the rapid development and commercialisation of new ideas (Block, 1990; Storper, 1995). Crucially however, this is dependent not only on firms' employees' abilities to *access* external sources of information as outlined above, but also on their abilities to assimilate, reconfigure, transform and apply new information to commercial ends; or in other words, on their 'absorptive capacities' (Cohen and Levinthal, 1990, 1994; Feldman and Klofsten, 2000; Howells, 2000; Hotz-Hart, 2000). Different absorption rates are not random but depend upon both the social and cultural structures within firms (Farrands, 1997), because the ability to absorb new knowledge within a firm will always depend on socio-cultural constructions of what is acceptable and desirable (Schoenberger, 1997). The innovation literature has thus consistently highlighted a set of cultural norms that, if widely shared by the members of a firm, actively promote the generation of new ideas and help in the implementation of new approaches. These norms include a climate of openness in which debate is encouraged; a willingness to listen to other people's ideas; creative dissent or the right of employees at all levels to challenge the status quo; and multiple advocacy, that learning requires more than one 'champion' if it is to succeed (Deal and Kennedy, 2000; DiBella *et al.*, 1996; O'Reilly, 1989).

Significantly however, the masculinist corporate cultures identified in many of the local firms in our case study either fail to evidence these traits, or else contradict them, in turn impacting on female employees' abilities to make their voices heard, and for firms to make full use of female employees' embodied competencies, skill-sets and knowledge. It is a precondition for learning that members of a firm be able to communicate with one another (Amin and Wilkinson, 1999; Spender, 1996). That is, learning and innovation are fundamentally *collective* processes. The open exchange of ideas amongst members of a project team or a firm functions to stimulate thought and generate a level of creative thinking that solitary reflection rarely stimulates (Lawson and Lorenz, 1999). However, our results suggest significant gender inequalities in the abilities of female employees to make their voices and ideas heard relative to their male colleagues, consistent with Massey's earlier (1995) demonstration of masculinist corporate cultures within high tech firms in Cambridge:

"The boys do just get heard more. In our office there were three of us sitting in a corner, and I sit as the head of a triangle opposite two blokes. And if people come in to ask a question, they would always ask the two blokes, even if it was something that I was the group expert on. Even managers that should know better, but they don't realise they're doing it".

Engineer, BSN, female

"Males being heard more? - I've definitely seen that. You send an e-mail to one of the project managers asking some questions. And you get no response, not even I'm busy I'll get

back to you. But if my male line manager sends an e-mail he gets a response immediately. And then it looks like we haven't made a conscious effort to do our work and get the results, even though we've probably made more of an effort than the male who got the answer in the end!". Engineer, HD, female

While these constraints have negative implications for individual female employees' abilities to progress up career ladders, they also have negative implications for the firms that employ them. Specifically, our female respondents outlined consistently how they have articulated insights and knowledge that were not incorporated into final product designs because of gender constraints on the ability of female employees to make themselves heard relative to their male colleagues:

"We actually tested it once. I went to a meeting, with (admittedly very challenging) questions, and basically was asked not to return. One of the guys went for me, with exactly the same questions and they answered them. At first I found it funny, but then you realise they're missing out on what the female employees have to say. But it's embarrassing to admit it, and even worse because it's a female issue". Engineer, WWS, female

"A male developer complained about my work and gave three specific examples, but I proved that everything I did 'wrong' was a knock-on effect from the developer himself. But the people who mattered didn't say anything; but all the ladies and men who weren't in charge of the product came to me and said 'that was really good, you dealt with it well'. But it won't make a difference... you still get the same customer complaints again and again because when you explain, they don't pass it on". Engineer, BSN, female

This latter quote also shows how that it is not a case of female employees' knowledge and viewpoints falling on completely deaf ears. However, often those who do hear are not in positions of power within the firm, and as such, these gender inequalities mean that firms are not capitalising fully on the skill-sets, competencies, knowledge and ideas embodied in female employees. Our results are consistent with other studies which suggest that gender diversity within firms' workforces is positively correlated with superior corporate performance, based on the key premise that the generation of new knowledge results from combining diverse knowledges, and the more diverse these knowledges, the better (Lawson and Lorenz, 1999). First, the US Congressional Committee on the Advancement of Women and Minorities in Science, Engineering and Technology Development (2000) showed gender diversity to sustain superior corporate performance measured in terms of annual sales, growth revenues, market shares, shareholder value, market share, shareholder value, net operating profit, worker productivity, and total assets¹³. Second, Catalyst's

(2004) study of 353 Fortune 500 companies in the US demonstrates a link between gender diversity in the composition of top management teams and financial performance. Third, in the UK the 2003 Female FTSE Index found a similar link between firms' economic performance and the presence of females on boards of directors (see Vinnicombe and Singh, 2003). However, these competitive advantages are not premised simply on the *presence* of women in a firm's workforce or management team, but also on a corporate culture in which everyone's opinions are valued, and in which male colleagues are willing to listen to the inputs of female colleagues. The gender divisions we outline within our case study firms in Cambridge, in terms of the constraints on female employees making themselves heard, therefore also undermine key processes of creative dissent, constant questioning and multi-directional knowledge flows that are widely theorised to underpin firms' innovative capacities.

Hard at work? women in high tech

In this paper we have sought to unpack the gendered social and relational properties of ICT firms in Cambridge's high tech regional economy, not only to make visible significant gender inequalities in patterns of work and social interaction among workers in Cambridge's high tech economy, but also to specify the ways in which those inequalities in turn constrain female workers' abilities to contribute to key processes widely theorised to underpin economic competitiveness of firms in the region. These are summarised in *Table 2*.

[TABLE 2 HERE]

Three key factors combine to make these results significant. First, all of the gendered patterns of work and social interaction identified here are inconsistent with the main processes of information and knowledge diffusion and absorption highlighted in the regional learning and innovation literature over the past two decades as underpinning firms' abilities to learn, innovate and compete. Second, these constraints on female workers' abilities to contribute to key processes widely theorised to underpin firms' economic competitiveness were confirmed by the experiences of not only the majority of our female respondents, but also the majority of our *male* respondents. While the respondents upon which analyses are based do not have privileged access to the 'truth', they

¹³ In terms of firms' annual sales, growth revenues, market shares, shareholder value, market share, shareholder value, net operating profit, worker productivity, and total assets. This report draws on data from the American Management Association¹³ which surveyed over 1000 of its members for its report: *Senior Management Team: Profile and Performance, 1996*.

do have privileged access to their own experiences (Baxter and Eyles, 2001). Moreover, these are the very workers who, by virtue of their daily activities within local firms, continually create and recreate the economic geographies of Cambridge's high tech regional economy. Third, these three gendered impacts are not just an amalgam of discrete idiosyncratic experiences by different female workers, but all three commonly experienced by the majority of the female respondents in our sample (albeit to varying extents as detailed below). Significantly therefore, we found patterning across female employees in different firms across the region.

Our results are consistent with the growing emphasis in contemporary feminist analyses that gender relations are not some simple binary, but rather are unruly and complicated (McDowell, 2000). The gendered patterns of work and social interaction sustaining the constraints that we identify are particularly acute for the parents of younger children in our respondent sample. These workers provide an excellent window onto these issues based on their self-recognition of how they function at work differently than they did before they had children. For many of our respondents, the heavy demands at home mean they need to keep their efforts at work within boundaries that often did not exist when they were younger (when they could act as 'honorary males' (Acker, 1990)) and which still do not exist for many of their male colleagues. As such, we cannot examine the impacts of gender upon workers' abilities to function in ways commensurate with firms' economic competitiveness outside of parental and household duties more widely, nor from generational divisions in the workforce. We also need to examine how gendered constraints on female employees' abilities to participate in the types of social interaction widely regarded as central to firms' abilities to compete vary over employee life cycle. Moreover, while our study did not fully explore these issues with male workers, evidence from our interviews suggests that many fathers of young children experience similar tensions, as various individual and societal expectations regarding the active involvement fathers in child-rearing change over time, although again these are rarely highlighted in the geographical literature.

For female employees with families, the reality is particularly complex. Many of our female respondents consciously put boundaries around the number of hours they put in at work in order to take on additional home and childcare duties, and so ensure social reproduction of the household unit (see Folbre, 1994; McDowell, 2000, 2001). However, while this in turn places limits on these women's abilities to build their own careers and to contribute to the processes cited as underpinning firms' economic competitiveness (in terms of reduced total hours worked, corporate travel, and attendance at after-work events), nevertheless in turn it allows their male *partners* to perform at a higher level at work. As such, many female employees with compromised work patterns actually

support their male partners' abilities to contribute fully to processes of information diffusion, social networking, and the long work hours theorised to underpin firms' abilities to compete, demonstrating the need to analyse the overall contributions of female employees in the context of broader household units of analysis rather than as discrete, atomistic agents. Further, while extensive research on dual career couples suggests that buying domestic and childcare help allows both members of the couple to function at work (Gregson and Lowe, 1998; Hardhill, 1994; McDowell, 2001), our results suggest that purchased help is still often insufficient to allow women to devote themselves fully to work; that is, in a manner consistent with the work patterns identified in the literature as central to high tech dynamism.

In contrast, for our female respondents *without* children, the issue instead centres on the masculine cultures that dominate in high tech firms, consistent with Massey's earlier (1995) work. Many female employees often feel unwelcome or patronised at social events dominated by men. Similarly, while many younger women often feel comfortable in *intra*-firm socialising, they feel less so with *inter*-firm socialising. This serves to limit their ability to access and exchange information at an inter-firm level, with potentially wider implications for firms' innovative capacities as outlined earlier. We further argue that this diversity of social interaction is made invisible in the literature by the focus on employee social interaction that is theorised as gender-neutral (read, implicitly male). For example, many of our female respondents *do* socialise with colleagues, but do so in a different manner than that captured by conventional theories of innovative learning regions. Instead of socialising around the basis of work, alternative social outlets for female employees often focus on children, friendships, or other interests.

We argue, therefore, that firms and regional development agencies alike have a vested interest in understanding how many of their female employees face constraints and inequalities that minimise their willingness and ability to function at work in the ways widely theorised as central to high tech economic success. These are not only issues of individual women paying a price for trying to achieve a work-life balance, but also potentially of firms themselves simultaneously bearing a cost. While our research has begun to unpack the nature of these processes from the perspective of individual female workers, the next obvious stage of research therefore is explicitly to *measure* the impacts of the gender inequalities we outline in this paper on firms' profitability, productivity, and new rates of innovation. Indeed, these issues are but part of a potentially large and highly significant future research agenda based on four key interrelated questions. First, to what extent do women who are not supported in their efforts to balance the demands of work and homelife set limits on their efforts within the workplace in the short-term, or else withdraw their labour from regional economies in the long-term? Second, how might firms operating in different legal and

institutional frameworks modify their hiring, retention, and promotion strategies to reduce any measured effects of gender inequality on their economic competitiveness? Third, in what ways does women's curtailing of their expected social functions relative to their male colleagues (travelling less, displaying less inter-firm mobility, socialising less outside and inside of the firm) reinforce their occupational segregation in high tech regional labour markets? And fourth, to what extent does a recognition of gendered patterns of work and social interaction force a fundamental reconceptualisation of the large body of regional learning and innovation theory itself?

Arguably, by expecting such total commitment from employees, firms are setting standards that are hard for their employees to meet, and not just for female employees with children. Moreover, the changing division of labour at home and changing norms surrounding active parenting mean firms may witness an increasing number of *male* employees also adopting these self-imposed limits on the intensity of work and social interaction (a novel twist on the notion that 'we are all women workers now'), with potential impacts on firms' abilities to compete as we have outlined in this paper. Certainly, firms across the OECD are beginning to experiment more extensively with measures intended to retain women once they have had children, including the provision of on-site childcare and helping pay for nannies and home help. But these are not enough. Firms also need actively to rethink the (often implicit) requirements surrounding inter- and intra-firm socialising, given their crucial role in information and knowledge diffusion, and to seek to make it something that *all* employees can participate in. These measures might help minimise some of the tensions surrounding employees' needs to balance the demands of work with childcare and other home and family commitments, and so increase the ability of female employees to further their own careers and economic well-being, and to contribute more to the key innovative and productive processes theorised to underpin economic competitiveness of firms in the region.

Wider policy implications

Over the last two decades we have witnessed the growth of a 'regional development industry' (Lagendijk and Cornford, 2000). The climate of increased neoliberalism has created a demand for models of development which offer guidance on how to increase competitiveness, as regional development agencies seek to elevate the position of their respective areas to 'hold down the global' (Hudson, 1999; Peck and Tickell, 1994). It is in this context that policy makers across the globe have become fixated with the Porterian notion of 'clusters'¹⁴ as an important development tool

¹⁴ See Porter (1990, 1994, 1996, 1998)

(Maskell and Malmberg, 2002; Keeble and Wilkinson, 2000; Norton, 2001; OECD, 1999; Swann *et al.*, 1998), with high tech clusters in particular attracting massive attention, viewed as offering a clean and high-wage mode of economic development capable of high rates of regional growth. It is striking that cluster policies focus almost exclusively on the tangible ‘hard’ institutions that underpin high tech regional economic development, such as the provision of venture capital, additional spending for education, incubator space, prestigious addresses in local university-based science parks and technical assistance (Florida and Kenney, 1990; Lorenz, 1992; Malecki and Oinas, 1999; Markusen, 1999; Scott, 2000). In contrast, so-called ‘soft’ socio-cultural influences such as gender tend to be sidelined, indeed ignored as irrelevant frictions that are best left to sociologists! We argue that such a view is fundamentally misplaced. Gender divisions within local firms are not some discrete variable. Rather, they define the very nature of ‘the economic’ itself, through gendered patterns of work and social interaction which are constructed and reconstructed in local firms over time through the daily interactions of their male and female employees. Further, to sideline gender is to ignore significant constraints on female employees’ abilities to contribute fully to key processes theorised to underpin firms’ innovative capacities and economic competitiveness. By framing our gender analyses in terms of economic competitiveness, we argue that this will potentially be more persuasive to policy makers than a more general appeal to social equity and gender equality for its own sake.

One way for firms to capitalise fully on women’s embodied skills and knowledge is potentially through the policy levers of childcare provision and work-life balance programs. Our results show that the lack of flexible and high quality childcare provision and measures to help workers achieve a better ‘work-life balance’ are major barriers which constrains women’s abilities to participate in key corporate and social events that underpin innovation. Childcare and work-life balance policies are too often regarded as a pastoral add-ons to keep employees happy, rather than as fundamental enabling mechanisms that allows firms to fully capitalise on employees’ embodied competencies, upon which firms’ competitive advantage is based. Indeed, even when childcare and/or work-life balance issues are acknowledged in government policy, it is too often seen as a concern of the individual not of the firm. In contrast, we argue that childcare and work-life balance policies should come under the umbrella of competitiveness policy. Specifically, many women’s abilities to act as disseminators of information and knowledge between firms are crucially dependent on childcare provision and their ability to mediate the demands of work, home, and family. As such, these issues should be a concern of individual firms *and* regional policy-makers. This is especially the case in England where recent devolution of economic development funds to the regional level through the Regional Development Agencies (RDAs), gives these agencies both the power and the legitimacy to act within this sphere.

Finally, we argue that the findings from the Cambridge case study do have a certain degree of generalisability. While the nature of the firms studied here is locally contingent, many of the gendered structures in which firms are embedded, along with the attendant daily patterns of social interaction which maintain them on a daily basis, *are* general to firms in other regions. Like any labour market study, we can only understand fully Cambridge's high tech economy by situating it in the multi-scaled legal and institutional frameworks in which local firms are simultaneously located. Thus, in the same way that the Cambridge labour market is unavoidably shaped by a national neo-liberal policy framework whose central mantra is 'labour market flexibility', so too are the labour markets in the UK's other high tech regional economies including Oxford, London, and the M4 Corridor. Moreover, results from the wider research project of which this paper is part ¹⁵, show that the gender inequalities we highlight here are also visible in ICT firms operating within other European national policy frameworks (specifically Sweden and Italy). Indeed, while Scandinavia is typically regarded as *more* progressive than the UK with respect to social equity within the labour market, comparisons of Cambridge's ICT firms with their Swedish counterparts in Stockholm and Linköping suggest that that female ICT workers in both countries face *similar* gender inequalities in the workplace (see Feldman and Gray, 2004). Significantly therefore, our results hold relevance not only for firms in other high tech regional economies also operating within a neo-liberal policy framework (e.g. the USA), but also for European firms in regions operating outside that framework.

However, this is not to deny that the fact that certain elements of the Cambridge high tech economy, and in particular the central role of Cambridge University with its masculinist university culture, might set it apart as a potentially unique case. Yet how many high tech economies are *not* linked to male-dominated universities? And within those universities, how many departments of computer science, electronic engineering and physics approach parity in the gender composition of their faculty and student bodies? Sadly, Cambridge is not unique. More worryingly still, by ignoring the gendered social relations that underlie key 'blueprint regions' such as Cambridge (see European Commission, 2002), cluster policies currently being developed by many local and regional development agencies run the risk of generating a tier of copycat regions in which those same types of social relationships, that reinforce the multiple exclusions of women within the firm, are reproduced and hence strengthened at the national and inter-national levels (see also MacLeod, 2001).

¹⁵ This research is part of the wider EU-funded 'Regional Impact of the Information Society on Employment and Integration' (RISESI) project (see www.risesi.org).

Conclusion

In this paper we have critiqued the dominant tendency within the regional learning and innovation literature to divorce learning and innovation processes from *people* with very real gendered identities and commitments which motivate and shape their daily work activities. Drawing on the case study of the ICT sector in Cambridge - one of Europe's blueprint high tech regional economies – we have outlined significant inequalities in the dominant patterns of work and social interaction among female versus male employees. Further, we have also outlined how these gender inequalities in patterns of work and social interaction constrain female workers' abilities to contribute fully to the key processes widely theorised in the geographical literature as underpinning the economic competitiveness of firms in the region. As such, this is not simply a case of female employees being socially excluded in the workplace, but of their simultaneous exclusion from key parts of firms' productive processes. We therefore advocate a broadening of high tech cluster policy to incorporate childcare and work-life balance policies as a potential tool in shaping the plausible responses of local workers and firms in regional economies. The further integration of feminist and regional economic geographies, while holding the potential for a more socially relevant economic geography, is therefore essential yet embarrassingly incomplete.

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Table 1 - Employment and location quotients in the ICT industry in Cambridgeshire, 1999

SIC	Description	Cambs Emp.ment	Location Quotient
30.02	Manufacture of... ...Computers and other info processing machinery	1721	5.6
31.30	...Insulated wire and cable	290	2.0
32.10	...Electronic valves, tubes and other electronic components	933	2.6
33.20	...Instruments for measuring, checking testing or navigation	2824	3.8
64.20	Telecommunications	2896	1.6
72.10	Hardware consultancy	267	2.5
72.20	Software consultancy and supply	5974	2.7
72.40	Database activities	161	1.8
72.60	Other computer related activities	1376	2.3

Source: Cambridge County Council 1999

Table 2 – Gendered constraints on female employees’ abilities to contribute to key processes widely theorised to underpin firms’ economic competitiveness

Factors identified in the literature as promoting economic competitiveness	Self-identified gender structures among female respondents
<p>Informal socialising: inter- & intra- firm levels</p> <ul style="list-style-type: none"> - Premised on blurred work and social identities - Diffusion of embodied (tacit) knowledge - Recombined in new ways in new firms - Reinforces formal corporate interactions 	<p>Minimal afterwork informal socialising</p> <ul style="list-style-type: none"> - More rigid separation of work & social life - Avoid social events dominated by men - Adopt compromise levels of networking - Part-time contracts to accommodate childcare and home commitments – mean missed opportunities to socialise at work
<p>Job hopping self motivated</p> <ul style="list-style-type: none"> - Diffusion of embodied tacit knowledge – ‘we know more than we can tell - Firms gain new competencies via: - Once and for all movement of personnel - Ongoing links with new employees’ previous firms 	<p>Non self motivated job hopping</p> <ul style="list-style-type: none"> - Remain in less satisfying job to facilitate work/life balance - Moving to accommodate male partner - Moves between sectors undermines sectorally-specific knowledge - Job hopping also constrained by potential disruption to family and dependants
<p>High absorptive capacity</p> <ul style="list-style-type: none"> - All employees heard - Climate of openness - Questioning of status quo - Multi-directional knowledge flows - Multiple advocacy - Creative dissent 	<p>Inability to be heard</p> <ul style="list-style-type: none"> - Male colleagues (even with same info!) are heard more - Female employees’ ideas often not incorporated into products - Reduced trouble-shooting efficiency